



Government of Meghalaya  
Education Department

**DERT**

DIRECTORATE OF EDUCATIONAL  
RESEARCH & TRAINING



# CM IMPACT Meghalaya Learning Enhancement Programme



CHIEF MINISTER'S INITIATIVE TO MAXIMIZE PASS ACHIEVEMENT  
AND CLASSROOM TRIUMPH

Module 1 (March-August)

CLASS

10

Achieving grade-appropriate learning levels

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# Class 10: Module 1

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## Note for Teachers

Dear Teacher,

The **Meghalaya Class Readiness Programme MCRP**, implemented at the start of this academic year was a **bridge course** which focused on enhancing the learning outcomes and competencies of the previous classes to help achieve the current grade-level outcomes. We sincerely appreciate your dedication, hard work, and commitment to this initiative, ensuring every student moves forward in their learning journey. The MCRP plays a crucial role in ensuring students, particularly those struggling, acquire the necessary competencies to progress through their classes without difficulty.

On completion of the MCRP, in order to assist you in conducting regular classes effectively and to keep the momentum alive, chapter-wise activities will be shared with you throughout the academic year. This will help students attain grade-level learning through experiential, activity-based elements linked to learning outcomes and competencies, and will aid you in reinforcing concepts covered in each chapter. This approach will also encourage students to reflect on and apply what they learn.

**While you will be teaching the subject as per your timetable and syllabus, it is suggested that you conduct the given activities along with the chapter you are teaching from the NCERT textbook.**

The following are some important points that will help you understand the usage of the modules in a better manner:

- The modules provide **suggestive activities** you can undertake while teaching a chapter. These activities are aligned with the theme/concepts of the chapter and have experiential learning at their core. These are also aligned to specific learning outcomes and competencies, thus helping your students acquire certain skills.
- At the end of each chapter, a competency-based assessment is included to help you identify your students' learning levels and determine areas that may require additional revision. These assessment activities are **aligned with the formative assessments suggested in the Assessment Blueprint** (revised in February 2025).
- A learning level tracker (as given during MCRP) is provided. Please use this to monitor individual students' achievement of learning outcomes and competencies. This will give you a clear picture of how your students are doing and what areas they need extra support in.

If you have any queries, please contact our helpline number: **6909366037**

Wishing you an engaging and fruitful academic year ahead! Here's hoping your students become independent learners and your classroom interactions remain exciting, learning outcome-driven and without additional burden to you.

# Meghalaya Learning Enhancement Programme

ENGLISH

## UNIT : 1

## Chapters: A Letter to God, Fire and Ice

## Activity 1 The Known and the Unknown



35 mins

## Instructions

- Divide the class into groups. Each group can be of 4-5 students.
- Print out the following passage and distribute it in groups. If you are unable to print it, you may write the passage on the board.
- Next, ask students to read the passage. You may explain the passage in the local language if required.
- Based on their reading, ask the students to answer the questions below by writing in their notebooks after discussing them in their groups.

***The Known and the Unknown***

*Faith is often described as trust in something beyond our understanding, like a belief in a higher power or a sense of purpose. It can be comforting, giving people hope in difficult times. Ironically, many people find it easier to trust in the unknown, like fate or the universe, than to trust other humans. Trusting in others can feel risky, while trusting in something intangible feels safer, even if it cannot be proved. Some may believe in this unknown force without questioning it, yet fail to see the importance of building trust with those around them. It's a curious balance – faith in something we cannot see, versus the risk of relying on the people we can.*

**Choose the correct answers from the options given:**

- According to the passage, why do people often find it easier to trust the unknown?
  - It is easier to understand
  - Trusting in the unknown requires less effort
  - Trusting in something intangible does not feel risky
  - The unknown is always right
- What is the irony mentioned in the passage?
  - People trust their friends more than fate
  - People trust in the unknown more than they trust other humans
  - Trusting others is always easier than trusting fate
  - Faith is unnecessary in today's world
- What is implied by the phrase "a curious balance" in the passage?
  - There is no real difference between trusting the unknown and trusting humans
  - People have to carefully decide whether to trust the unknown or others
  - It is easy to trust either the unknown or other humans
  - Faith in the unknown leads to stronger human relationships

**Answer the following questions:**

D. How does the passage describe the relationship between faith and trusting humans?

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E. What do you think the passage suggests about the nature of trust itself?

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F. Do you think the passage's argument about trusting the unknown versus trusting others is still relevant in today's society? Why or why not?

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## Activity 2 Determiners



35 mins

### Instructions

- Explain the concept of Determiners through the notes below. Tell the students that in this activity, the focus will be on 4 kinds of Determiners - Articles, Demonstrative, Possessive, and Quantifiers.
  - Define determiners** - "Words used before a noun to specify it."
 

**Explain their functions with specific examples.** - "This book" specifies a particular book. "Some pens" indicate an unspecified number.
  - Introduce the following determiners:**

**Articles** (*a, an, the*) - explain the differences between indefinite (*a, an*) and definite (*the*) articles. *I need a pencil. (any pencil) I need the pencil. (a specific pencil)*

**Demonstratives** (*this, that, these, those*) - show the uses related to distance and number with examples. - *this car (near, singular) those bikes (far, plural)*

**Possessives** (*my, your, his, her, our, their*) - relate to ownership. *This is my dog.*

**Quantifiers** (*some, much, many, a few, any, several, little, all, etc.*) - specify quantity. *I have some money. He does not have any notebooks.*
- Write the following sentences on the board, and ask students to rewrite them using the correct determiners:
  - There is few water in the glass.
  - He has a oranges in his lunchbox.
  - I bought much books from the fair.
  - She found any mistakes in the assignment.

- E. There are little students in the classroom today.
- F. We need an hour to complete this task.
- G. They have many information about the project.
- H. He drank a juice in the morning.
- I. I have some friend in this city.
- J. She put much sugar in her tea.

## Activity 3 Formal Letter Writing



35 mins

### Instructions

- Begin by explaining the types of formal letters in communication.
  - o **Letter of Application** - used when applying for a job, internship, or any position. It includes the applicant's qualifications, experience, and interest in the position.
  - o **Letter of Complaint** - written to express dissatisfaction about a product, service, or experience, requesting a resolution.
  - o **Letter of Request** - written to request something, such as permission, information, or a favour.
  - o **Letter of Invitation** - written to invite someone to an event or occasion, such as a meeting, party, or ceremony.
  - o **Letter of Thanks** - a letter expressing gratitude, such as thanking someone for a gift or help.
  - o **Letter of Apology** - written to apologise for a mistake, misunderstanding, or an unfortunate situation.
  - o **Letter of Congratulation** - used to congratulate someone on an achievement or milestone, such as passing exams or winning a competition.
  - o **Letter to the Editor** - written to express an opinion on a public issue, usually intended for publication in a newspaper or magazine.
  - o **Letter of Recommendation** - written by a teacher, employer, or mentor to recommend someone for a job, scholarship, or opportunity.
  - o **Formal Letter of Inquiry** - written to ask for information or clarification about a subject, product, or service.
- Discuss on a basic format for formal letters.
  - o **Sender's Address** (Top left) - the address of the person writing the letter. It usually includes the house number, street, city, and postal code. This can be omitted if the letter is printed on letterhead.
  - o **Date** (Below sender's address) - the date when the letter is being written.
  - o **Recipient's Address** (Left-hand side) - the address of the person or organisation to whom the letter is being sent. Include the title, name, position (if applicable), and full address.
  - o **Salutation** (Greeting) - begin with a formal greeting. Use "Dear" followed by the person's title and last name. If you do not know the name of the person, use "Dear Sir/Madam."
  - o **Body of the Letter** - this is the main part of the letter, where the purpose is explained. It is often divided into paragraphs:
    - o **Introduction:** state the purpose of your letter.
    - o **Main content:** provide details or explanations related to the purpose of the letter.
    - o **Conclusion:** summarise or state the action you would like to be taken or the response you expect.
    - o **Closing** - use a formal closing phrase such as "Yours sincerely" or "Yours faithfully".



- [illegible]

## UNIT: 1

## Assessment



35 mins

## Section A (Literature)

Choose the correct answer from the given options:

1. Why did Lencho write a letter to God?
  - a) To complain about the bad weather
  - b) To seek help after his crops were destroyed by hail
  - c) To request a new plough
  - d) To thank God for the rain
2. What was the amount Lencho asked for in his letter to God?
  - a) Fifty pesos
  - b) One hundred pesos
  - c) Twenty pesos
  - d) Ten pesos
3. What is the central theme of the poem "Fire and Ice"?
  - a) The destructive power of nature
  - b) The conflict between fire and ice
  - c) The end of the world and human emotions
  - d) The beauty of contrasting elements
4. According to the poem, which of the following is compared to fire?
  - a) Hatred
  - b) Love
  - c) Desire
  - d) Jealousy

Read the following extracts and answer the questions:

**Extract 1**

*The house — the only one in the entire valley — sat on the crest of a low hill. From this height one could see the river and the field of ripe corn dotted with the flowers that always promised a good harvest. The only thing the earth needed was a downpour or at least a shower. Throughout the morning Lencho — who knew his fields intimately — had done nothing else but see the sky towards the north-east. Now we're really going to get some water, woman.' The woman who was preparing supper, replied, 'Yes, God willing.'*

5. How does this description reflect Lencho's hopes for the harvest?
  - a) It shows Lencho's faith in nature's ability to provide a fruitful harvest.
  - b) It highlights Lencho's lack of confidence in his crops.
  - c) It reflects Lencho's belief that the flowers symbolise a bad omen.
  - d) It shows Lencho's acceptance that the harvest will fail.

**Extract 2**

*To say that for destruction ice  
Is also great  
And would suffice.*

6. What does "suffice" mean in the context of the poem?

- a) To have no effect
- b) To be enough or adequate
- c) To be insufficient
- d) To cause an overwhelming effect

**Answer the following questions:**

7. What was the reaction of the postmaster when he read Lencho's letter?

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8. What is the speaker's opinion about the two ways the world can end?

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9. How does the story "A Letter to God" highlight human generosity and belief in justice?

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10. Discuss the poet's view on the end of the world in the poem.

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## Section B (Grammar)

**Complete the sentences below with the correct determiners:**

1. \_\_\_ book on the table belongs to my brother.
2. Can you please pass me \_\_\_ pen over there?
3. We need to buy \_\_\_ apples from the market for the pie.
4. \_\_\_ dog is very friendly and loves to play with children.
5. \_\_\_ chairs are not comfortable in this room.
6. She is looking for \_\_\_ new job in the city.
7. \_\_\_ of the students in the class have already finished their homework.
8. I met \_\_\_ old friend from school at the party yesterday.
9. \_\_\_ house near the park is up for sale.
10. There is \_\_\_ milk left in the fridge. We need to buy more.

## Section C (Writing)

Imagine that you live in an area with many traffic problems. Write a letter to a local authority regarding traffic problems in your area.

Points to include -

- o Address the letter to the local council or traffic authority.
- o Mention the traffic-related problems in your area (e.g. congestion, accidents, lack of traffic signs).
- o Suggest possible solutions or improvements.
- o Politely request them to take action.
- o Thank them in advance for considering your request.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# UNIT: 1 Answer Key

## Section A (Literature)

1. b)
2. b)
3. c)
4. c)
5. a)
6. b)
7. The postmaster was initially shocked and amused when he read Lencho's letter. However, he was also moved by Lencho's faith and decided to help by collecting money from his colleagues. He even sent the money to Lencho, although it was not from God but from the post office employees.
8. The speaker believes that the world could end either through the intense passion of fire or the cold indifference of ice. He expresses a preference for fire, associating it with desire, but acknowledges that ice, representing hatred, could also lead to destruction.
9. The story highlights human generosity through the actions of the postmaster and the other employees. Despite being amused by Lencho's letter, they come together to help him in his time of need, raising money to send him. This act of kindness shows that humans, even when faced with the most extraordinary requests, can display compassion and generosity. The story also explores Lencho's belief in justice. When he receives the money, he is disappointed, believing that God's money has been tampered with by the post office employees. His belief in justice is so strong that he refuses to accept that humans might have helped him, insisting that only God could have provided the money. This reflects a blend of innocence, faith, and a certain purity in his understanding of the world.
10. In the poem "Fire and Ice", Robert Frost explores the idea of the world's destruction through the two elements of fire and ice, representing the destructive power of human emotions. The poet presents the possibility of the world ending in fire, symbolising the catastrophic consequences of intense desire and love, which can consume and destroy. Alternatively, the world could end in ice, representing hatred and coldness, which can also lead to an equally destructive and apocalyptic end. Frost uses these metaphors to suggest that both extreme emotions—passion and hatred—are capable of bringing about the world's end, offering a deep reflection on the power of human emotions and their potential for harm.

## Section B (Grammar)

1. **The** book on the table belongs to my brother.
2. Can you please pass me **that** pen over there?
3. We need to buy **some** apples from the market for the pie.
4. **The** dog is very friendly and loves to play with children.
5. **These** chairs are not comfortable in this room.
6. She is looking for **a** new job in the city.
7. **Most** of the students in the class have already finished their homework.
8. I met **an** old friend from school at the party yesterday.
9. **That** house near the park is up for sale.
10. There is **some** milk left in the fridge. We need to buy more.

## Section C (Writing)

Since creative writing tasks are subjective in nature, the answers will vary from student to student. Some aspects to consider while evaluating a formal letter are:

- Purpose and Clarity: ensuring there is clarity about why the letter is being written (e.g. making a request, raising a complaint, applying for something), yet remaining polite.
- Layout and Format: maintaining a standard layout and format, including sender's address, date, recipient's address, salutation, subject (optional), body of the letter, closing, and signature.
- Tone and Language: using a formal tone, being polite, using neutral language, and using active voice.
- Grammar and Punctuation: ensuring correct grammar, proper use of capitalisation, punctuation, sentence structure, and avoiding contractions.
- Avoiding Ambiguity: ensuring the purpose is clear, and avoiding unnecessary
- Professionalism: using appropriate titles (e.g. Mr., Ms., Mrs., Dr., Sir) when addressing the recipient, avoiding emotive language or jokes, and maintaining a respectful and professional tone at all times.
- Length: keeping the letter concise
- Proofreading: after writing, always proofread the letter to check for any spelling, grammar, or punctuation errors.

## Learning Level Tracker

Keep a record of unit assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

**Level 3:** Solves problems independently

[illegible]

## UNIT : 3

## Chapters : Two Stories about Flying, The Ball Poem

## Activity 1

The Importance of Flight  
and the Courage Behind It

35 mins

## Instructions

- Divide the class into groups. Each group can be of 4-5 students.
- Print out the following passage and distribute it in groups. If you are unable to print it, you may write the passage on the board.
- Next, ask students to read the passage.

***The Importance of Flight and the Courage Behind It***

*For centuries, humans have gazed at the sky, dreaming of soaring above the clouds. The idea of flight has captivated our imagination, symbolising freedom, exploration, and the desire to conquer the natural world. Flying, for many, represents the ultimate achievement of human ingenuity and ambition. It allows us to bridge vast distances, connect with distant cultures, and explore places that were once beyond our reach. However, the importance of flight extends beyond its practical applications; it also symbolises the courage to overcome the seemingly impossible.*

*In the past, humans believed that flight was a fantasy. Early myths and stories warned against the dangers of trying to fly. Yet, despite these warnings, the dream of flight persisted. As civilisation advanced, the desire to conquer the sky became a challenge that inspired scientists, inventors, and adventurers. The Wright brothers, for example, faced immense difficulties when they began their experiments in aviation. They had to confront not only technical challenges but also scepticism from the public and experts who believed human flight was a fantasy.*

*The courage required to attempt flight was immense. The pioneers of aviation risked their lives and reputations in the pursuit of a dream. Early flight attempts were fraught with danger, and many early aviators met with tragic ends. However, the desire to push the boundaries of human potential was stronger than the fear of failure. It was this bravery, coupled with relentless determination, that eventually led to the success of powered flight in 1903.*

*Flying became more than just a means of transportation; it became a symbol of human progress. The courage shown by those who dared to fly paved the way for innovations that changed the world. Today, we can travel across continents in a matter of hours, opening up opportunities for trade, communication, and cultural exchange that would have been unimaginable just a century ago. The courage to fly, to challenge the limits of human ability, ultimately changed the course of history, making the impossible a reality.*

*In conclusion, the dream of flight was once thought to be impossible. Yet, it was the courage of the early pioneers who believed in the power of human innovation that turned this dream into a reality. Through their bravery, we now enjoy the many benefits of flight, a testament to the strength of human determination and the unyielding quest to explore the unknown.*



- Ask students to work in groups to summarise the passage in a paragraph, capturing the key points about why flight was important and the courage it took to begin flying. Each group should write the key points in a notebook.
- Afterward, each group presents their summary to the class. Discuss the similarities and differences in each group's summary to reinforce understanding and ensure key ideas are captured.

## Activity 2 Subject Verb Concord



35 mins

### Instructions

- Explain the concept of Subject Verb Concord through the notes below.

#### Teachers' Notes

**Subject Verb Concord** refers to the grammatical rule that the verb must agree with the subject in number (singular or plural) and person (first, second, or third person). The subject and verb must match in terms of whether the subject is singular or plural, and this is essential for constructing grammatically correct sentences.

*Singular Subjects Take Singular Verbs, and Plural Subjects Take Plural Verbs*

*Singular Subject:* Refers to one person, thing, or concept.

*Plural Subject:* Refers to more than one person, thing, or concept.

*Examples:*

*Singular:* The dog runs fast. (Here, "dog" is singular, so we use the singular verb "runs.")

*Plural:* The dogs run fast. (Here, "dogs" is plural, so we use the plural verb "run.")

**Compound subjects joined by "and" take a plural verb:** When two or more subjects are connected with "and," they form a plural subject, which requires a plural verb.

**Examples:**

Tom and Jerry are best friends. (The compound subject "Tom and Jerry" is plural, so we use the plural verb "are.")

The teacher and students are ready for class. (The compound subject "teacher and students" is plural, so we use the plural verb "are.")

**Exception:** If the compound subject refers to one entity or a single idea, the verb can be singular.

Fish and chips is a popular dish in Britain. (Fish and chips are treated as one dish, so the verb "is" is used.)

**When subjects are joined by "or" or "nor," the verb agrees with the subject closest to it.**

**Examples:**

Neither Tom nor his friends are going to the concert. (The plural subject "friends" is closest to the verb, so we use the plural verb "are.")

Either the teacher or the students have made a mistake. (The plural subject "students" is closest, so we use "have.")

**Collective nouns take a singular verb when acting as a whole.** Indefinite pronouns such as "everyone," "someone," "each," and "everybody" are always considered singular, so they take a singular verb.

**In sentences that start with "there is" or "there are," the verb agrees with the subject that follows.**

**Uncountable nouns (e.g., information, advice, furniture, bread) are treated as singular,** even though they might refer to multiple items in concept. Therefore, they take a singular verb.

**"None" can be either singular or plural** depending on whether it refers to a singular or plural noun.

**"Either" and "neither" are usually followed by a singular verb when referring to a singular noun,** but they can also agree with plural nouns when necessary.

"Both" and "each" take a singular verb when referring to the entire group or individual items.

- Divide the class into 4-5 groups.
- Provide each group with a different set of 10 sentences that either have Subject Verb Concord errors or are correct.
- Each group should sort the sentences into two categories: Correct and Incorrect.
- After sorting, students should correct the incorrect sentences and should explain in brief why the subject and verb do not agree in each case.
- After the activity, the groups should submit their responses to you.
- You can have each team review the other's work by reading aloud their responses. During this time, there can be a discussion on the rules for Subject Verb Concord.
- Let the class decide which team did the best!

#### Examples of Sentences with Correct and Incorrect Subject Verb Concord:

- The team is practising for their big match.
- Neither the teacher nor the students was late to the assembly.
- The government have introduced new policies for the economy.
- Either the teacher or the students were supposed to clean the board.
- Everyone were excited about the weekend trip.
- Neither of the two plans were acceptable to the committee.
- The data are being analysed by the research team.
- Each of the athletes was given a medal at the ceremony.
- The books on the shelf are covered in dust.
- None of the children has finished their homework yet.

## Activity 3 Story Writing



35 mins

### Instructions

- Explain to the students, basic guidelines for writing a story based on a situation. You can refer to the teacher's notes for the same.
- Divide the class into 3 groups - a, b, c.
- Write the following situations on the board.

- o First Situation: One day I got wings to fly. And that led to so much adventure.
- o Second Situation: When the pilot of a passenger aeroplane faced a tough situation.
- o Third Situation: When a child lost his puppy.
- Provide paper to the groups for writing.
- Group "a" builds the plot and begins writing the story based on the first situation. Then the paper with the plot gets passed to group "b", which then has to complete the story.
  - o Similarly, group "b" builds the plot and begins writing the story based on the second situation. Then the paper with the plot gets passed to group "c", which then has to complete the story.
  - o Similarly, group "c" builds the plot and begins writing the story based on the third situation. Then the paper with the plot gets passed to group "a", which then has to complete the story.
- After the activity is completed, the stories can be read aloud. This activity will help students with the guidelines of story-writing, and at the same time bring out their creativity and individuality as well as teamwork.
- You can refer to the note for discussion as given below.

### Teachers' Notes

- **Understand the situation thoroughly.** Read and understand the situation prompt. Identify the key elements, such as setting, characters, conflict, and resolution. Think about how you can develop the story based on the situation. Consider how the situation can evolve, the challenges your character might face, and how the story can end.
- **Structure your story**
  - o Introduction (Opening): Describe the setting, time, and place. Introduce the character(s): Provide brief background information about the main character. Start the story with action or intrigue to grab the reader's attention.
  - o Rising action and building the plot: Present the challenge, problem, or conflict that the character faces.
  - o Climax: The turning point of the story where the character faces their biggest challenge or makes an important decision. This is the moment of highest tension or conflict.
  - o Falling action: The events leading towards the resolution. The problem is being solved or lessons are learned.
  - o Conclusion (Ending): The final part of the story where everything is resolved. You can offer a reflection, a lesson learned, or a feeling of closure.
- **Develop characters and dialogue:** Introduce interesting and relatable characters. Make sure the main character has a clear goal, motivation, and conflict. Use dialogue to move the plot forward and reveal character traits.
- **Use descriptive language and sensory details:** Describe what the character sees, hears, smells, tastes, and feels to make the story more immersive. This helps the reader connect with the story and imagine the scene.
- **Maintain consistent point of view and tense:** Decide if the story will be told in the first person (I, we) or third person (he, she, they). Ensure the point of view is consistent throughout the story. Choose the appropriate tense (past or present) and stick with it throughout the narrative.
- **Focus on the conflict and resolution:** A story without conflict is often dull. The conflict could be internal.
- **Stay on topic and be relevant:** Ensure your story is directly related to the situation given.
- **Proofread and edit:** Read through the story carefully to check for errors. Make sure your sentences are clear and well-structured. Avoid overly long sentences that may confuse the reader. Pay attention to punctuation marks like commas, periods, quotation marks, etc., especially when using dialogue.

- **Be creative and original:** A good story often has a surprising or unique twist. Think of something unexpected that could happen in the given situation. Let your voice come through in the writing. Your creativity, personality, and style will make the story unique and enjoyable to read.

This image shows a full page of handwriting practice paper. It features multiple sets of horizontal lines designed to guide letter formation. Each set consists of three lines: a solid top line, a dashed middle line, and a solid bottom line. These sets are repeated vertically down the entire page, providing ample space for practicing cursive or other handwriting styles. The paper is otherwise blank, with no margins, text, or illustrations.

# UNIT: 3 Assessment



35 mins

## Section A (Literature)

Choose the correct answer from the given options:

1. What did the young seagull see when he looked down at the sea?
  - a) He saw other birds flying below.
  - b) He saw the water far below, which made him afraid.
  - c) He saw fish swimming in the sea.
  - d) He saw his family calling him.
2. The black aeroplane...
  - a) confused the narrator so his aeroplane would crash.
  - b) was competing with the narrator's aeroplane.
  - c) helped the narrator to land safely.
  - d) was just another aeroplane flying in the storm.
3. The boy lost his ball because.....
  - a) it got stolen.
  - b) it fell and broke.
  - c) he was careless.
  - d) it fell in the water.
4. What is the central theme of the poem "The Ball Poem" by John Berryman?
  - a) The joy of playing with a ball
  - b) The inevitability of death
  - c) The emotional pain of losing something or someone
  - d) The importance of material possessions

Read the following extracts and answer questions 5 and 6:

### Extract 1

"...The next moment he felt his wings spread outwards. The wind rushed against his breast feathers, then under his stomach, and against his wings. He could feel the tips of his wings cutting through the air. He was not falling headlong now. He was soaring gradually downwards and outwards. He was no longer afraid. He just felt a bit dizzy. Then he flapped his wings once and he soared upwards. His parents and his brothers and sister had landed on this green flooring ahead of him. They were beckoning to him, calling shrilly..."

5. What does the phrase 'soaring gradually downwards and outwards' in this extract most nearly mean?

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### Extract 2

"What is the boy now, who has lost his ball,  
 What, what is he to do? I saw it go  
 Merrily bouncing, down the street, and then  
 Merrily over — there it is in the water!"

No use to say 'O there are other balls':  
An ultimate shaking grief fixes the boy  
As he stands rigid, trembling, staring down  
All his young days into the harbour where  
His ball went."

6. In your own words, describe the boy's reaction when he loses his ball.

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**Answer the following:**

7. What was the importance of hunger in the young seagull's decision to fly?

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8. What role did the bird's family play in his journey?

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9. What lesson about life and loss does the boy learn in "The Ball Poem"?

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## Section B (Grammar)

**Fill in the blanks using the correct Subject Verb Concord.**

1. The dog \_\_\_\_\_ (run) in the park every morning.
2. Neither the teacher nor the students \_\_\_\_\_ (know) the answer.
3. The children \_\_\_\_\_ (play) in the garden right now.
4. She \_\_\_\_\_ (be) very excited about the upcoming holiday.
5. Each of the books \_\_\_\_\_ (have) a different cover design.
6. The team \_\_\_\_\_ (win) the match yesterday.
7. There \_\_\_\_\_ (be) a lot of traffic on the road today.
8. My father and I \_\_\_\_\_ (go) to the cinema later.
9. The news \_\_\_\_\_ (be) very surprising yesterday.
10. Neither the cat nor the dog \_\_\_\_\_ (want) to go outside.

## Section C (Writing)

**Write a story based on the following situation:**

A kitten named Luna is afraid of bigger animals. Her cat family helps her, and finally, Luna is not fearful anymore.

Clues for the story:

- Shadow, a bigger cat is scary.
- Noises from the neighbour's dog.
- Mother and sister introducing Luna to Shadow - Shadow is not scary.
- Feeling braver

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# UNIT: 3 Answer Key

## Section A (Literature)

1. d)
2. c)
3. d)
4. c)
5. The phrase "soaring gradually downwards and outwards" typically refers to a smooth gliding movement to go down slowly, while also spreading or expanding.
6. The boy is filled with deep sorrow when he loses his ball. He is in shock and cannot move. His body is shaking due to the loss.
7. Hunger was very important in the young seagull's decision to fly. He was initially afraid to fly, but when his mother held a piece of fish in front of him, tempting him with food, his hunger drove him to overcome his fear. Unable to resist the urge to eat, he finally spread his wings and took flight, realising that flying was the only way to reach the food.
8. The bird's family played a very important role in helping him gain confidence during his first flight. Once the bird began flying, his mother swooped past him, her wings making a loud noise. Then his father flew over him. He saw his two brothers and his sister flying around him curvetting and banking and soaring and diving. Their presence helped him trust himself and keep going even though he was still afraid. Then his parents and siblings had already landed on a green ground ahead of him. They were calling out to him, waving, and encouraging him to come over. This made the bird feel less scared and more supported, as he knew they were watching and cheering for him.
9. In "The Ball Poem," the boy learns the painful but important lesson of loss. His ball, which he was playing with joyfully, ends up in the water, and he is unable to retrieve it. The poet emphasises that the boy cannot replace the ball easily because it holds more meaning than just a simple object. Through this experience, the boy learns about responsibility and the inevitable losses that come in life. The loss teaches him how to cope with difficult emotions and accept the idea that possessions, once lost, can never truly be replaced. This understanding is part of growing up.

## Section B (Grammar)

1. The dog **runs** in the park every morning.
2. Neither the teacher nor the students **know** the answer.
3. The children **are playing** in the garden right now.
4. She **is** very excited about the upcoming holiday.
5. Each of the books **has** a different cover design.
6. The team **won** the match yesterday.
7. There **is** a lot of traffic on the road today.
8. My father and I **are going** to the cinema later.
9. The news **was** very surprising yesterday.
10. Neither the cat nor the dog **wants** to go outside.



## Section C (Writing)

Since creative writing tasks are subjective, the answers will vary from student to student. Some aspects to consider while evaluating a story - based on a situation are:

- The plot is the sequence of events that make up the story. It includes an introduction, rising action, climax, falling action, and conclusion.
- Characters are the people or beings that drive the story forward.
- The setting is where and when the story takes place.
- The conflict is the central problem or challenge the characters face.
- The theme is the central idea or message the story conveys.
- The point of view is the perspective from which the story is told.
- Dialogue is the conversation between characters.
- Style and Language - the way the story is written affects its tone and impact.
- Pacing refers to how quickly or slowly the events unfold in the story.
- Often, stories have a deeper moral or lesson for the reader.

**Level 3: Solves problems independently**

[illegible]

## UNIT : 4

## Chapters : From the Diary of Anne Frank, Amanda!

## Activity 1 Air Pollution in Delhi (July to December 2024)



35 mins

## Instructions

- Divide the class into 3 groups.
- Print out the following passage and distribute it in groups. If you are unable to print it, you may write the passage on the board.
- Next, ask students to read the passage.

***Air Pollution in Delhi (July to December 2024)***

*Air pollution in Delhi continues to be a serious concern, particularly during the colder months when the air quality deteriorates significantly. In cities like Delhi, poor air quality often leads to severe health problems such as respiratory diseases, cardiovascular issues, and premature deaths. According to the World Health Organization (WHO), air pollution is responsible for over 7 million deaths annually, with India being a major contributor to this figure.*

*The Air Quality Index (AQI) is a scale that measures air pollution. An AQI between 0-50 is considered "Good", while an AQI above 300 is classified as "Hazardous" and poses a serious health risk to the general population. The following table presents the AQI levels in Delhi from July to December 2024.*

***Air Quality Index (AQI) in Delhi (July to December 2024)***

| Month     | Average AQI | Air Quality Classification | Major Contributing Factors                         |
|-----------|-------------|----------------------------|--|
| July      | 160         | Unhealthy                  | Vehicular emissions, dust storms                   |
| August    | 180         | Unhealthy                  | Vehicular emissions, industrial emissions          |
| September | 150         | Unhealthy                  | High traffic, low rainfall, dust                   |
| October   | 135         | Unhealthy                  | Increased vehicular traffic, construction dust     |
| November  | 250         | Very Unhealthy             | Crop residue burning, low wind speeds              |
| December  | 350         | Hazardous                  | Smog formation, crop residue burning, cold weather |

***The Indian government has implemented several measures to curb air pollution, including:***

***The Odd-Even Scheme:*** To reduce vehicular emissions, Delhi has implemented the Odd-Even Scheme, which restricts cars based on their number plates on alternate days.

**Promotion of Electric Vehicles (EVs):** The government is encouraging the adoption of electric vehicles by offering financial incentives and building more charging infrastructure.

**Smog Towers:** Delhi has installed several smog towers to filter the polluted air in heavily affected areas, particularly during the winter months.

**Ban on Crop Residue Burning:** The government has imposed a ban on crop residue burning and introduced alternatives for farmers, such as providing machines for stubble management.

Despite these efforts, air pollution remains a significant challenge in Delhi, and further steps are needed to improve the city's air quality. Long-term solutions include increasing green spaces, improving public transportation, and enforcing stricter emission standards.

- Each group of students will represent one of the following:
  - o **The Government**: Justifies policies and actions such as the Odd-Even scheme, Smog Towers, and subsidies for electric vehicles.
  - o **Environmental Activists**: Argue for more immediate action and stricter regulations on industrial emissions and crop residue burning.
  - o **Local Citizens**: Express concerns about how air pollution impacts their daily lives and discuss the challenges of using public transport or electric vehicles.
- Each group will discuss and prepare their points after which, they will present the same in class.
- Conclude the role-play with a class discussion: What measures seem most feasible in the short and long term?

## Activity 2 Modals



35 mins

### Instructions

- Explain the concept of Modals through the notes below.

#### Teachers' Notes

Modals are auxiliary verbs that express necessity, possibility, permission, ability, or obligation. They help to add meaning to the main verb of a sentence by showing how the action is viewed by the speaker, such as whether it is certain, possible, allowed, or required.

#### Common Modals:

- **Can** – ability or permission  
*She can swim.* (ability)  
*You can leave early today.* (permission)
- **Could** – past ability, polite requests, or possibility  
*When I was younger, I could run very fast.* (past ability)  
*Could you help me with this?* (polite request)  
*It could rain tomorrow.* (possibility)
- **May** – permission or possibility  
*May I use your phone?* (permission)

*It **may** snow this evening.* (possibility)

- **Might** – slight possibility or suggestion

*She **might** come to the party.* (slight possibility)

*You **might** want to reconsider that decision.* (suggestion)

- **Shall** – formal suggestion, offer, or future action (often used with "I" and "we")

***Shall** we go for a walk?* (suggestion)

*I **shall** finish the work tomorrow.* (future action)

- **Should** – advice, recommendation, or expectation

*You **should** eat more vegetables.* (advice)

*He **should** be here by now.* (expectation)

- **Will** – future action, willingness, or strong likelihood

*I **will** call you later.* (future action)

*She **will** help us.* (willingness)

- **Would** – polite requests, hypothetical situations, or past habitual actions

*Would you like some tea?* (polite request)

*If I were you, I **would** study more.* (hypothetical situation)

- **Must** – necessity, obligation, or strong recommendation

*You **must** wear a helmet when riding a bike.* (obligation)

*This **must** be the right address.* (strong likelihood)

- **Ought to** – advice or moral obligation

*You **ought** to apologise for being late.* (advice)

#### Important Points to Remember:

- **Modals do not change form** according to the subject (e.g., *She can, They can*).
- **They are followed by the base form** of the main verb (e.g., *She can swim*).
- **Modals express degrees of certainty:** *can* (high certainty), *may* (less certain), *might* (least certain).

- Divide the class into groups of 4-5 students each.
- Provide a few scenarios to each group on paper (either printed or hand-written).
- Each group will enact the scenarios given to them. While one student will act out the role, the other will respond according to the scenario.
- The scenario will be read, and it will be decided which modal verbs are appropriate for the situation.
- Students will role-play the scenario using the correct modals, and make sure to express the intended meaning clearly and naturally.
- You can share a role-play example based on a scenario:

Example: *You are a teacher and need to tell your students that they must finish their homework.* Possible Modals to Use: *must, should, can*

Example Dialogue:

Teacher: "You must finish your homework by tomorrow."

Student: "What if I can't finish it in time?"

Teacher: "You should start now to avoid any problems. If you need help, you can ask me."

Explanation: "**Must**" is used to indicate an obligation or necessity. "**Should**" is used here as a suggestion to help the student manage their time. "**Can**" is used to offer assistance or give permission to ask for help.

Scenarios:

- o You are at a restaurant and want to politely ask for a glass of water.
- o You are a friend offering help with a difficult task.
- o You are suggesting a study method to your classmate for their upcoming exam.
- o You need to ask your boss for permission to leave early.
- o You are at the doctor's office and need to ask for an appointment.
- o You are on the phone with a customer service representative, and you want to inquire about a product.
- o You are asking your friend if they would like to join you for a movie night.
- o You are writing an email to your teacher to ask for an extension on a homework deadline.
- o You need to ask your colleague if they have time to help with a project.
- o You are at the bank and need to ask about opening a new account.
- o You want to ask if it's possible to borrow a friend's notes.
- o You want to suggest to a friend that they should take a break.
- o You want to ask your parents if you can go out with friends.
- o You want to give advice to a friend who's feeling stressed.
- o You are in a meeting and want to ask if you can provide input.
- o You are at the airport, and you want to ask if you can board the flight earlier.
- o You are advising a friend on their career choice.
- o You are advising a friend who wants to improve their grades.
- o You are asking your teacher if you may leave the classroom for a moment.
- o You want to suggest to your friends that they might want to bring a jacket, as it could get cold.
- Share your feedback on the role plays focusing on the use of 'modals'.
- After students perform their role-play, ask them to explain why they chose certain modals in specific situations. Encourage students to be mindful of the context and tone when using modals.

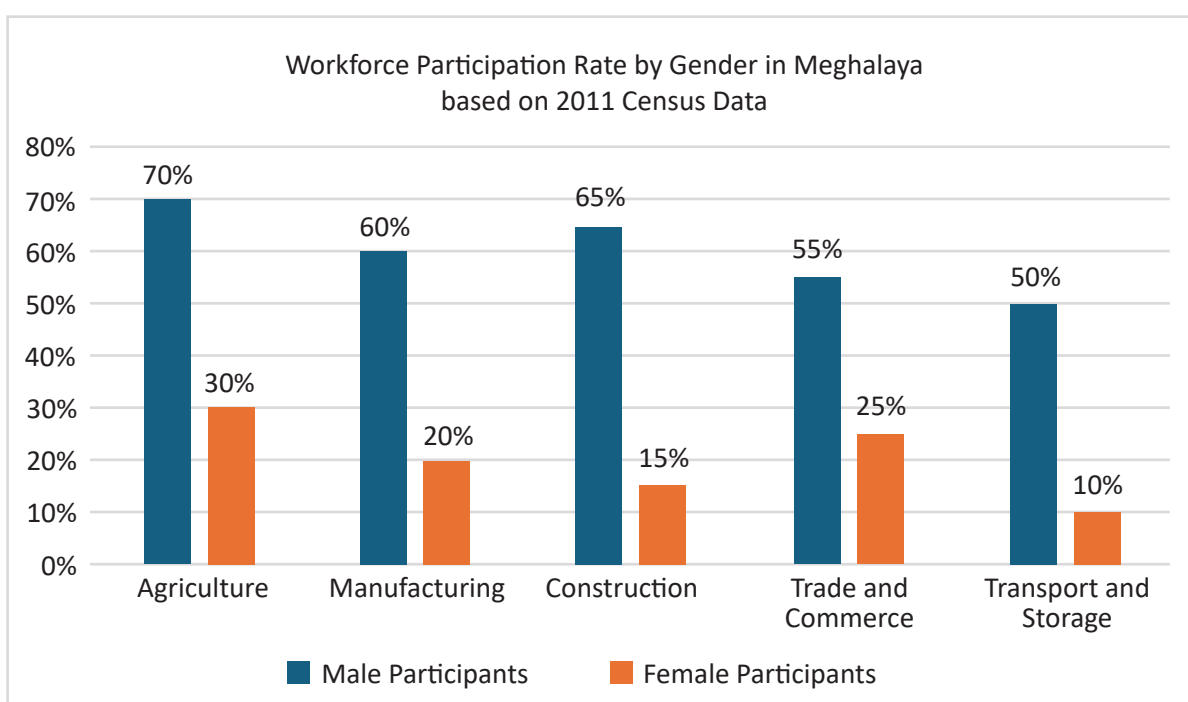
## Activity 3 Analytical Paragraph Writing



35 mins

### Instructions

- Explain the concept of writing an analytical paragraph on a given map/chart/graph/cue etc.
- You can refer to the notes given below.
- Divide the class into 4-5 groups.
- Provide printouts of the following information to each group or draw it on the board.
- Ask groups to go through the information in the figure.



- Each group should write an analytical paragraph to describe the information on the participation of the women workforce in Meghalaya as per the data given.
- Once the group completes writing paragraphs they will share it with the class.
- Share your feedback with the groups.

### Teachers' Notes

An **analytical paragraph** is a type of writing where you examine and interpret data, facts, or information presented in a given graph, chart, table, map, or other types of cues. The purpose of an analytical paragraph is to break down the given data, explain its meaning, identify patterns, and offer insights or conclusions based on that data. When writing an analytical paragraph based on data, you need to not only present the facts but also interpret them, showing how they relate to each other and what they signify.

#### Guidelines for writing an analytical paragraph:

- **Understand the data:** Before writing, carefully study the data or cue (such as a graph, chart, or map) provided. Look at the labels, figures, and trends.

- Identify key patterns, trends, or comparisons in the data.
- **Introduction to the data:** Start your paragraph by briefly describing the data or cue you're analysing. Mention what kind of data it is, and provide a brief overview. For example: "The bar graph shows the population distribution in different regions of the country."
- **Presenting the key data:** Focus on the most important points from the data. You don't need to cover everything, just highlight significant trends or comparisons. Compare data points where relevant. For example, you could compare two categories or look at how numbers change over time.
- **Interpretation:** After stating the data, analyse what it means. Discuss any patterns, trends, or anomalies. For example, if a chart shows an increase in a particular activity, you can explain why this might have happened based on the context (such as seasonal changes, economic factors, etc.). Discuss the relationships between different data points. For example: "While the male workforce participation rate is higher, female participation is notably lower, especially in rural areas."
- **Provide insights and conclusion:** Summarise the key takeaways from the data and what they imply. Offer any conclusions or implications of the data. For example, you might explain how the data suggests the need for policy changes, further research, or increased awareness.
- **Use formal language and objectivity:** Since this is an analytical task, maintain a formal tone. Avoid using subjective opinions or emotional language. Stick to objective analysis of the data presented, based on facts.
- **Avoid Repetition:** Avoid repeating the same information. Each sentence should add new value to your analysis.

## Structure of an Analytical Paragraph

- **Introduction Sentence:** Introduce the data or cue. Briefly state what the data shows.
- **Body:** Present and compare the key points or trends in the data. Interpret what the data reveals, looking for patterns or important insights.
- **Conclusion:** Offer a summary or conclusion based on the data analysis. Discuss the implications or any conclusions that can be drawn from the data.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



## UNIT: 4

## Assessment



35 mins

## Section A (Literature)

Choose the correct answer from the given options:

1. Why did Anne start writing a diary?
  - a) She wanted to be a famous writer.
  - b) She felt lonely and needed a friend.
  - c) Her teacher asked her to write a diary.
  - d) She wanted to improve her handwriting
2. Why was the Maths teacher, Mr. Keesing annoyed with Anne at first?
  - a) She used to write her diary in school.
  - b) She fought with her classmates.
  - c) She did not attend his class.
  - d) She used to talk a lot.
3. Why does the speaker constantly scold Amanda in the poem?
  - a) She is always late
  - b) She is distracted and not listening
  - c) She is too quiet
  - d) She doesn't do her homework
4. What does Amanda dream of doing?
  - a) Going to school
  - b) Riding a horse
  - c) Swimming in the sea
  - d) Playing with her friends

Read the following extracts and answer questions 5 and 6.

## Extract 1

"Paper has more patience than people.' I thought of this saying on one of those days when I was feeling a little depressed and was sitting at home with my chin in my hands, bored and listless, wondering whether to stay in or go out. I finally stayed where I was, brooding: Yes, the paper does have more patience, and since I'm not planning to let anyone else read this stiff-backed notebook grandly referred to as a 'diary' unless I should ever find a real friend, it probably won't make a bit of difference. Now I'm back to the point that prompted me to keep a diary in the first place: I don't have a friend."

5. What does Anne mean by "Paper has more patience than people"?

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## Extract 2

"(I am an orphan, roaming the street.  
I pattern soft dust with my hushed, bare feet.)"

6. What does the phrase 'roaming the street' suggest?

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Answer the following:

7. "Mr Keesing had a good sense of humour and was open to change." How does this statement reflect his character?

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8. What do Amanda's imaginary worlds tell us about her personality?

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9. What does Anne's diary tell us about her personality and her view of life?

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10. How does the poem, Amanda! reflect the theme of childhood and parental control?

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## Section B (Grammar)

**Fill in the blanks with the correct modal verb.**

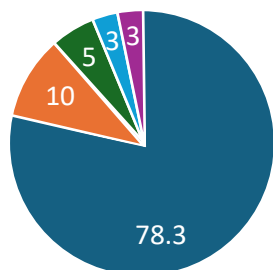
1. You \_\_\_\_\_ bring your homework tomorrow, or you'll have to do it in class.
2. We \_\_\_\_\_ go to the cinema if we finish our work early.
3. You \_\_\_\_\_ eat more vegetables to stay healthy.
4. He \_\_\_\_\_ have forgotten about the meeting; he's not here yet.
5. They \_\_\_\_\_ come to the party, but they haven't decided yet.
6. She \_\_\_\_\_ speak three languages fluently.
7. We \_\_\_\_\_ leave now if we want to catch the last bus.
8. You \_\_\_\_\_ be more careful with your phone; it might break.
9. We \_\_\_\_\_ visit the museum when we're in town next week.
10. I \_\_\_\_\_ find my keys anywhere! I must have left them at home.

## Section C (Writing)

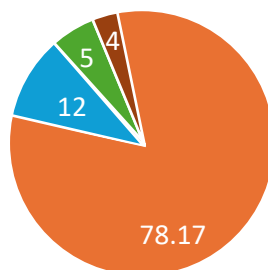
**Write an analytical paragraph summarising the data provided in the figures. Discuss the diversity as well as integration related to languages in Meghalaya.**

*Note: The numbers signify the percentage of people speaking the language.*

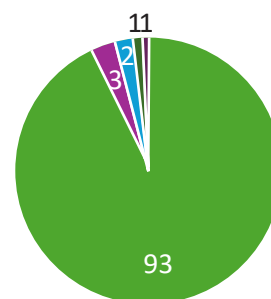
## Languages Spoken in Khasi Hills



## Languages Spoken in Jaintia Hills



## Languages Spoken in Garo Hills



■ Khasi ■ Garo ■ English ■ Hind ■ Bengali    ■ Pnar ■ Khasi ■ English ■ Hind    ■ Garo ■ Khasi ■ English ■ Hind ■ Assanese

**Data Source: Census of India 2011 (Wikipedia)**

[illegible]

## UNIT: 4 Answer Key

### Section A (Literature)

1. b)
2. d)
3. b)
4. c)
5. Writing is a way to express emotions freely.
6. The phrase 'roaming the street' suggests that Amanda wants to be free without restrictions.
7. At first, Mr Keesing was strict and often punished Anne for talking too much. However, after reading Anne's humorous essay, he laughed and stopped punishing her. This shows that he could accept different perspectives, appreciate humour, and change his approach as a teacher.
8. Amanda is creative and seeks freedom. She dreams of being a mermaid, an orphan, and Rapunzel, all representing independence and a peaceful life away from restrictions.
9. Anne's diary shows that she was smart, kind, and curious. She liked to observe people and situations. Even when she faced problems, she stayed hopeful. Writing helped her feel better and express her emotions. She had a deep understanding of life and people. She tried to stay happy even in hard times. Her diary helps us understand her thoughts and feelings. It also shows her courage and strength. Despite her young age, she was mature and thoughtful. Her diary is not only a personal story but also a record of history. It teaches us about the power of hope and writing.
10. The poem Amanda! reflects the theme of childhood and parental control by highlighting the tension between a child's desire for freedom and a parent's attempt to impose rules for their well-being. Amanda, like many children, longs for independence and space to express herself without being constantly told what to do. Her mother's frequent instructions, such as sitting up straight or speaking properly, contrast sharply with Amanda's daydreams of freedom, where she imagines herself as a carefree child or swimming in the sea. These fantasies reveal her longing to escape the restrictions of parental control. At the end of the poem, Amanda's silence signifies her frustration and the emotional impact of excessive control, suggesting that too many rules can suppress a child's happiness and sense of self. Through Amanda's experience, the poet explores the delicate balance between guiding children for their own good and allowing them the freedom to develop their own individuality.

### Section B (Grammar)

1. You **must** bring your homework tomorrow, or you'll have to do it in class.
2. We **might** go to the cinema if we finish our work early.
3. You **should** eat more vegetables to stay healthy.
4. He **must** have forgotten about the meeting; he's not here yet.
5. They **might** come to the party, but they haven't decided yet.
6. She **can** speak three languages fluently.
7. We **should** leave now if we want to catch the last bus.
8. You **should** be more careful with your phone; it might break.
9. We **will** visit the museum when we're in town next week.
10. I **can't** find my keys anywhere! I must have left them at home.

## Section C (Writing)

Since creative writing tasks are subjective in nature, the answers will vary from student to student. Some aspects to consider while evaluating an analytical paragraph are:

- Does the paragraph start with a clear and focused topic sentence?
- Does the paragraph go beyond summary and show critical thinking?
- Does the paragraph stay focused on one main idea?
- Are linking words or phrases used effectively to connect ideas (e.g., furthermore, in contrast, this shows that)?
- Is there a variety of sentence structures and vocabulary?
- Does the paragraph end with a sentence that summarizes or reinforces the main point?
- Does it offer a concluding thought or insight based on the analysis?

**Level 3:** Solves problems independently

[illegible]

## UNIT : 5

## Chapters: Glimpses of India, The Trees

## Activity 1 Colours of Indian Culture



35 mins

## Instructions

- Provide students with printouts of the passage below or you can write it on the board.
- Next, ask students to read the passage.

**Colours of Indian Culture****Rajasthan – Land of Forts and Faith**

Rajasthan, known for its grand forts and royal palaces, reflects the glory of India's historic past. Cities like Jaipur and Udaipur are admired for their architectural wonders such as the Amber Fort and the City Palace. The State is also known for its folk music and dance, including the lively "Ghoomar". Local crafts like blue pottery, leatherwork, and tie-dye textiles are cherished by both locals and visitors. Rajasthan celebrates festivals from all faiths. While Diwali lights up homes and palaces, Eid is joyfully observed with community prayers and feasting. Historic towns like Ajmer are home to religious landmarks such as the Ajmer Sharif Dargah, a symbol of spiritual unity.

**Meghalaya – The Hill State of Harmony**

Nestled in North-East India, Meghalaya is known for its lush green hills, cascading waterfalls, and misty valleys. The State is home to vibrant tribal communities like the Khasis, Garos, and Jaintias, who maintain a strong connection to Nature and their ancestral traditions. Bamboo and cane crafts are an essential part of life here, used to make everything from furniture to musical instruments. While many in Meghalaya follow Christianity, the state also respects indigenous beliefs. Churches are beautifully decorated during Christmas, and harvest festivals like "Nongkrem" dance are celebrated with prayer, dance, and thanksgiving to nature.

**Tamil Nadu – A Tapestry of Tradition**

In the Southern part of India, Tamil Nadu is a land of ancient monuments, classical art, and spiritual heritage. The Meenakshi temple in Madurai and the Brihadeeswarar temple in Thanjavur are known for their grand "gopurams" (temple towers) and exquisite stone carvings. The State is also the heart of "Bharatanatyam", one of India's oldest classical dance forms. Tamil Nadu's famous Kanchipuram silk sarees and bronze sculptures reflect the region's love for fine craftsmanship. The people of Tamil Nadu celebrate a range of festivals. Pongal, a harvest festival, is marked by colourful kolams (rice flour designs), traditional cooking, and offerings to the Sun God.

India's strength lies in its diversity — where every region contributes something special to the nation's shared identity. From the deserts to the hills and the coasts, this journey through Rajasthan, Meghalaya, and Tamil Nadu is just a small glimpse into the larger story of unity in diversity.

- You can address any difficult words or concepts students might need clarity on. You can refer to the notes below for the same.

### Teacher's Notes (Words and Concepts)

**Forts** are strong buildings built for defence, often by kings or rulers in the past.

**Palaces** are large, beautiful homes where royal families lived.

**Folk music and dance** are traditional forms of music and dance that are passed down through generations in a region.

**Blue pottery** is a famous Rajasthani craft using a shiny blue glaze to make decorative pottery.

**Leatherwork** refers to hand-made items created using leather, like shoes and bags.

**Tie-dye textiles** are fabrics made by tying and dyeing sections to create colourful patterns.

**Spiritual unity** means harmony and respect among people of different religions.

**Tribal communities** are groups of people who follow ancient customs and often live close to nature.

**Indigenous beliefs** are original spiritual or religious practices followed by native people of an area.

**Bamboo and cane crafts** are items like baskets or mats made using bamboo or cane by hand.

**Harvest festival** is a celebration held when crops are gathered, to thank nature or the gods.

**Gopuram** is a tall, richly decorated tower at the entrance of a South Indian temple.

**Bharatanatyam** is one of India's oldest classical dance forms, known for graceful movements and expressions.

**Kanchipuram silk sarees** are traditional silk garments woven in the town of Kanchipuram, known for their quality and elegance.

**Bronze sculptures** are statues made of bronze, often showing gods or cultural stories.

**Kolam** is a decorative pattern made using rice flour, drawn on the ground during festivals.

**Diversity** means having many different cultures, languages, or traditions in one place.

**Unity in diversity** is the idea of people living peacefully together, despite their different backgrounds.

- Explain to the class, the concept of a brochure, specifically a travel brochure. You may use the following notes for definitions and a sample travel brochure for the students' understanding.

### Teacher's Notes – Travel Brochure

- A **brochure** is a small booklet or leaflet that gives information about a place, product, event, or service. It is often used to advertise or promote something. Brochures usually include: pictures or drawings; catchy headlines or slogans; short and clear sentences; useful details about the place/ product/ event/ service; contact information etc.
- A **travel brochure** is a type of booklet or leaflet that gives information about a travel destination. It is designed to attract tourists by highlighting the best features of a place. A travel brochure usually includes: a catchy slogan or title; pictures of famous landmarks or natural beauty; details about places to visit, things to do, and local culture; information on festivals, food, transport, and accommodation; clear and attractive layout with bullet points or short paragraphs. Travel brochures are often used by tourism departments or travel agencies to encourage people to visit a city, state, or country.

### Sample Travel Brochure

#### MADHYA PRADESH – "The Heart of Incredible India!"

*Discover heritage, wildlife, art, and mouth-watering flavours all in one State.*

#### Must-Visit Destinations:

- Khajuraho Temples – UNESCO World Heritage Site known for stunning ancient carvings.
- Kanha & Bandhavgarh National Parks – Spot the majestic Bengal tiger!
- Sanchi Stupa – A sacred Buddhist site with 2,000-year-old stupas.
- Gwalior Fort – A hilltop fortress with a grand history.
- Bhimbetka Rock Shelters – Prehistoric cave paintings over 30,000 years old.



**Famous Festivals:**

- Lokrang Festival (Bhopal) – Celebrates folk culture with music, dance & crafts.
- Khajuraho Dance Festival – Classical dance performances near ancient temples.
- Diwali & Dussehra – Celebrated with great enthusiasm and colourful lights.

**Flavours to Savour:**

- Poha-Jalebi – The State's iconic breakfast combo!
- Dal Bafla – Traditional dish similar to Dal Baati, served with ghee.
- Rogan Josh & Seekh Kebabs – Popular in regions like Bhopal.

**Traditional Crafts:**

- Chanderi & Maheshwari Sarees – Known for delicate silk and cotton weaves.
- Dokra Art – Ancient metal casting using the lost-wax method.
- Terracotta & Tribal Paintings – Express the stories of the Gond and Bhil tribes.

**Why Visit Madhya Pradesh?**

Perfect for history lovers, wildlife explorers, and culture seekers.

Warm-hearted locals and rich traditions.

A blend of modernity and ancient charm.

**Don't Forget Your Camera!**

Whether it's spotting tigers, admiring temple carvings, or enjoying street food – Madhya Pradesh offers picture-perfect moments at every turn.

**Plan Your Adventure Today!**

Visit: State website

- Divide the class into 3 groups, each representing a State from the passage.
- Provide the groups with some materials, if available: chart paper, colour pens, watercolours, and brushes. Otherwise, the groups can use their notebooks for the activity.
- Ask the groups to **design a Travel Brochure based on the State they are representing. The brochure can include:**
  - A catchy slogan for the State
  - Places to visit
  - Any famous festivals and/or food
  - Traditional craft(s)
  - Creative elements, such as images or drawings, bullet points, and concise *sentences*.
- The groups can have a short presentation of their Travel Brochures.

## Activity 2 Determiners



35 mins

### Instructions

- Begin the class with a revision on Determiners that are covered in the previous class.
- Next, explain the remaining 3 types of Determiners - Numbers, Distributive, and Interrogative. You can refer to the notes below.

#### Teacher's Notes

**Determiners** - "Words used before a noun to specify it."

**Their function and example.** - "This bag" specifies a particular bag. "Some flowers" indicate an unspecified number.

**Introduce the following determiners:**

**Numbers** (one, two, first, second, etc.): Numbers provide specific information about quantity or order.

**Examples:** "One of the primary reasons for the failure of the plan was poor communication among the team members." "She was the second person in her family to graduate with honours from a prestigious university."

**Distributive** (each, every, either, neither): Distributives focus on individuals within a group or on a choice between items. **Examples:** "Each participant was given a certificate of appreciation at the end of the workshop." "Neither of the proposed solutions was effective in addressing the underlying issue."

**Interrogative** (what, which, whose): Interrogative determiners are used to form questions. **Examples:** "What specific measures can we take to reduce pollution in our city and its surrounding areas?" "Which of these novels do you think would be most suitable for the upcoming book review competition?"

- Divide the class into 5 groups.
- Provide each group with 5 Determiners and ask them to choose the correct determiners for the sentences given.
- Ask them to make 5 sentences with the given determiners.
- Each group needs to identify the types of determiners and write them.

#### Group 1

**Determiners:** Each, What, One, Neither, Whose

- \_\_\_\_\_ slice of cake is enough. (Determiner type: \_\_\_\_\_)  
New Sentence: \_\_\_\_\_
- \_\_\_\_\_ pencil is on the floor? (Determiner type: \_\_\_\_\_)  
New Sentence: \_\_\_\_\_
- \_\_\_\_\_ time is the lesson? (Determine type: \_\_\_\_\_)  
New Sentence: \_\_\_\_\_
- \_\_\_\_\_ answer is correct. (Determiner type: \_\_\_\_\_)  
New Sentence: \_\_\_\_\_
- \_\_\_\_\_ student has a textbook. (Determiner type: \_\_\_\_\_)  
New Sentence: \_\_\_\_\_

#### Group 2

**Determiners:** Two, Which, Every, What, Neither

- \_\_\_\_\_ book are you reading? (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

2. \_\_\_\_\_ of us are going to the museum. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

3. \_\_\_\_\_ of them wanted to apologise. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

4. \_\_\_\_\_ shoes are yours? (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

5. \_\_\_\_\_ morning I drink tea. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

### Group 3

**Determiners:** Three, What, Either, Whose, Every

1. \_\_\_\_\_ boys were late for school. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

2. \_\_\_\_\_ student must wear uniform. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

3. \_\_\_\_\_ reason did he give for being late? (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

4. \_\_\_\_\_ turn is it to clean the board? (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

5. \_\_\_\_\_ route will take you to the station. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

### Group 4

**Determiners:** Four, Each, Which, One, Two

1. \_\_\_\_\_ students were given detention. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

2. \_\_\_\_\_ route do you prefer? (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

3. \_\_\_\_\_ of the lights isn't working. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

4. \_\_\_\_\_ chairs are missing from the hall. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

5. \_\_\_\_\_ of the puppies has a name. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

### Group 5

**Determiners:** Neither, What, One, Whose, Each

6. \_\_\_\_\_ student has a textbook. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

7. \_\_\_\_\_ slice of cake is enough. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

8. \_\_\_\_\_ time is the lesson. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

9. \_\_\_\_\_ pencil is on the floor. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

10. \_\_\_\_\_ answer is correct. (Determiner type: \_\_\_\_\_)

New Sentence: \_\_\_\_\_

- After the activity, each group can present their work.
- While one group presents, the other groups can share their feedback.
- Correct the sentences if required.

## Activity 3 Analytical Paragraph Writing



35 mins

### Instructions

- Revise the concept of writing an analytical paragraph on a given map/chart/graph/cue etc. with the class.
- You can refer to the notes given below.

#### Teacher's Notes

An **analytical paragraph** is a type of writing where you examine and interpret data, facts, or information presented in a given graph, chart, table, map, or other types of cues. The purpose of an analytical paragraph is to break down the given data, explain its meaning, identify patterns, and offer insights or conclusions based on that data.

#### Guidelines for writing an analytical paragraph:

- **Understand the data:** Study the data or cue (such as a graph, chart, or map) provided. Identify key patterns, trends, or comparisons in the data.
- **Introduction to the data:** Start your paragraph by briefly describing the data or cue you're analysing. Mention what kind of data it is, and provide a brief overview.
- **Presenting the key data:** Focus on the most important points from the data. You don't need to cover everything, just highlight significant trends or comparisons. Compare data points where relevant.
- **Interpretation:** After stating the data, analyse what it means. Discuss any patterns, trends, or anomalies.
- **Provide insights and conclusion:** Summarise the key takeaways from the data and what they imply. Offer any conclusions or implications of the data.
- **Use formal language and objectivity:** Stick to objective analysis of the data presented, based on facts.
- **Avoid Repetition:** Avoid repeating the same information. Each sentence should add new value to your analysis.

#### Structure of an Analytical Paragraph

- **Introduction Sentence:** Introduce the data or cue. Briefly state what the data shows.
- **Body:** Present and compare the key points or trends in the data. Interpret what the data reveals, looking for patterns or important insights.
- **Conclusion:** Offer a summary or conclusion based on the data analysis. Discuss the implications or any conclusions that can be drawn from the data.

- Divide the class into 4-5 groups.
- Provide printouts of the following table to each group or draw the table on the board.

| State       | Literacy Rate (%) | Male Literacy (%) | Female Literacy (%) |
|-------------|-------------------|-------------------|---------------------|
| Kerala      | 94.0              | 96.1              | 92.1                |
| Bihar       | 61.8              | 71.2              | 51.5                |
| Maharashtra | 82.3              | 89.8              | 74.8                |
| Rajasthan   | 66.1              | 79.2              | 52.1                |
| Tamil Nadu  | 80.1              | 86.8              | 73.4                |

(Data source: Based on Government and Census estimates – simplified for classroom use)

- Ask groups to study the table and discuss it.
- After the discussion ask them to write an analytical paragraph based on the data given.
- Ask them to refer to the following points:
  - General observation about literacy across the five States.
  - Highlighting the State with the best performance and the one with the lowest.
  - Comments on the gender disparities observed and suggesting possible reasons for these trends.
  - Summarise findings.

**UNIT: 5****Assessment****35 mins****Section A (Literature)**

**Choose the correct answer from the given options:**

1. What is Coorg compared to in terms of its natural beauty?
  - a) a land of snow-capped mountains
  - b) a piece of heaven that must have drifted from the kingdom of God
  - c) a desert oasis in the south
  - d) a mirror of the British countryside
2. According to the chapter, what is the most distinct cultural feature of the people of Coorg?
  - a) their martial traditions and bravery
  - b) their love for music and dance
  - c) their farming techniques
  - d) their colourful tribal festivals
3. In the line "no sun bury its feet in shadow," what does the phrase "bury its feet in shadow" mean?
  - a) The Sun is completely hidden behind thick clouds.
  - b) The sunlight cannot pass through the trees to make shadows.
  - c) The Sun is slowly setting behind tall mountains.
  - d) The Sun is shining brightly without any hindrance.
4. What is the speaker's attitude towards the movement of trees?
  - a) indifferent and unconcerned
  - b) sad and regretful
  - c) hopeful and positive
  - d) controlling and restrictive

**Read the following extracts and answer questions 5 and 6:**

**Extract 1**

"During our childhood in Goa, the baker used to be our friend, companion and guide. He used to come at least twice a day. Once, when he set out in the morning on his selling round, and then again, when he returned after emptying his huge basket. The jingling thud of his bamboo woke us up from sleep and we ran to meet and greet him. Why was it so? Was it for the love of the loaf? Not at all. The loaves were bought by some Paskine or Bastine, the maid-servant of the house! What we longed for were those bread-bangles which we chose carefully. Sometimes it was sweet bread of special make."

5. State whether the following statement is True or False. Justify with a proper reason.  
*The children wanted to buy loaves of bread from the baker.*

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### Extract 2

"The trees are moving out into the forest,  
the forest that was empty all these nights."

6. What does the movement of trees symbolise in the poem?

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Answer the following:

7. Why does the writer describe the tea gardens as a "magnificent view"?

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8. In the poem 'The Trees', how does the poet create an atmosphere of silence and tension in the poem?

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9. Compare and contrast the life of a baker in Goa with that of a tea plucker in Assam.

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## Section B (Grammar)

Fill in the blanks with an appropriate Determiner from the list below. Also, mention the type of Determiner in the sentence.

Determiner List: one, two, three, each, every, either, neither, what, which, whose)

1. \_\_\_\_\_ student in the class must submit the project by Friday. (Determiner type: \_\_\_\_\_)
2. \_\_\_\_\_ of the books do you prefer — fiction or biography? (Determiner type: \_\_\_\_\_)
3. I have invited \_\_\_\_\_ friends to my birthday party. (Determiner type: \_\_\_\_\_)
4. \_\_\_\_\_ pen is this on the table? (Determiner type: \_\_\_\_\_)
5. \_\_\_\_\_ parent was asked to attend the meeting. (Determiner type: \_\_\_\_\_)
6. Only \_\_\_\_\_ of the options was correct. (Determiner type: \_\_\_\_\_)
7. He read \_\_\_\_\_ of the novels in the series. (Determiner type: \_\_\_\_\_)
8. \_\_\_\_\_ shirt are you going to wear for the function? (Determiner type: \_\_\_\_\_)
9. \_\_\_\_\_ of the twins is taller than the other. (Determiner type: \_\_\_\_\_)
10. She has planted \_\_\_\_\_ rose bushes in her garden. (Determiner type: \_\_\_\_\_)

## Section C (Writing)

**Write an analytical paragraph summarising the data provided in the table.**

### Forest Cover Loss in Selected Indian States (2017–2021)

| State             | Forest Loss (2017–2019) | Forest Loss (2019–2021) | Change in Loss | Main Reasons for Loss   |
|-------------------|-------------------------|-------------------------|----------------|---|
| Arunachal Pradesh | 230 sq. km              | 257 sq. km              | +27 sq. km     | Shifting farming, road construction, and encroachment                   |
| Manipur           | 219 sq. km              | 249 sq. km              | +30 sq. km     | Illegal logging, farming, and land clearing                             |
| Mizoram           | 198 sq. km              | 186 sq. km              | −12 sq. km     | Jhum farming, tree cutting  |
| Nagaland          | 210 sq. km              | 235 sq. km              | +25 sq. km     | Mining activities, infrastructure development, and shifting cultivation |
| Assam             | 190 sq. km              | 202 sq. km              | +12 sq. km     | Urban expansion, logging, and agricultural pressures                    |
| West Bengal       | 145 sq. km              | 156 sq. km              | +11 sq. km     | Agricultural expansion, encroachments, timber extraction                |
| Madhya Pradesh    | 142 sq. km              | 155 sq. km              | +13 sq. km     | Deforestation due to agriculture, urbanisation, and timber extraction   |
| Chhattisgarh      | 115 sq. km              | 130 sq. km              | +15 sq. km     | Mining, urbanisation, agricultural expansion                            |
| Uttarakhand       | 95 sq. km               | 115 sq. km              | +20 sq. km     | Development of tourism infrastructure, road building, illegal logging   |
| Karnataka         | 80 sq. km               | 90 sq. km               | +10 sq. km     | Expansion of agriculture, infrastructure development                    |

Source: Forest Survey of India, India State of Forest Report 2021

**Clues for the paragraph:**

- Comparison of forest loss in selected Indian States between 2017–2019 and 2019–2021.
- Key Changes: States with the largest increase or decrease in forest loss
- Common causes like shifting cultivation, urban expansion, and illegal logging.
- Improvements - where forest loss decreased, possibly due to conservation efforts.
- Summary of trends and their environmental impact.

[illegible]

## UNIT: 5

## Answer Key

## Section A (Literature)

1. a)
2. b)
3. c)
4. d)
5. False. The loaves of bread were bought by the maid-servant of the house. The children were more excited about the bread-bangles and sweet bread, which they carefully chose for themselves.
6. The movement of trees symbolises the struggle for freedom and the need for nature to reclaim its space, representing a fight against human dominance.
7. The writer calls the tea gardens a "magnificent view" because they stretch as far as the eye can see, with rows of tiny green tea plants. The backdrop of wooded hills, the shade trees, and the workers moving among the plants make the scene very beautiful.
8. The poet uses images like "silent trees", "smell of leaves and lichen", and "the still night" to build an atmosphere of quiet suspense. The silence reflects the calm before a powerful act of liberation.
9. The life of a baker in Goa and a tea plucker in Assam is different yet connected to local traditions. The baker in Goa was an important part of village life. He would visit houses daily, selling fresh bread, and was respected by everyone. His job provided stability, and he enjoyed a friendly bond with the people. On the other hand, tea pluckers in Assam work long hours in tea gardens, picking tea leaves with great skill. Their work is physically demanding, and they often earn low wages. Unlike bakers, they do not have direct contact with consumers. However, both jobs are deeply rooted in culture—bread in Goa and tea in Assam. Both professions require dedication and are vital to the local economy.

## Section B (Grammar)

1. Each student in the class must submit the project by Friday.  
Determiner: *Each*  
Type: Distributive
2. Which of the books do you prefer — fiction or biography?  
Determiner: *Which*  
Type: Interrogative
3. I have invited three friends to my birthday party.  
Determiner: *Three*  
Type: Numbers



4. Whose pen is this on the table?  
Determiner: *Whose*  
Type: Interrogative
5. Every parent was asked to attend the meeting.  
Determiner: *Every*  
Type: Distributive
6. Only one of the options was correct.  
Determiner: *One*  
Type: Numbers
7. He read all of the novels in the series.  
Determiner: *All*  
Type: Distributive
8. Which shirt are you going to wear for the function?  
Determiner: *Which*  
Type: Interrogative
9. Either of the twins is taller than the other.  
Determiner: *Either*  
Type: Distributive
10. She has planted six rose bushes in her garden.  
Determiner: *Six*  
Type: Numbers

## Section C (Writing)

Since creative writing tasks are subjective, the answers will vary from student to student. Some aspects to consider while evaluating an analytical paragraph are:

- Does the paragraph start with a clear and focused topic sentence?
- Does the paragraph go beyond summary and show critical thinking?
- Does the paragraph stay focused on one main idea?
- Are linking words or phrases used effectively to connect ideas (e.g., furthermore, in contrast, this shows that)?
- Is there a variety of sentence structures and vocabulary?
- Does the paragraph end with a sentence that summarises or reinforces the main point?
- Does it offer a concluding thought or insight based on the analysis?

**Level 3:** Solves problems independently

[illegible]

## UNIT : 7

## Chapters : Madam Rides the Bus, The Tale of Custard the Dragon

## Activity 1 Timeless Games



35 mins

## Instructions

- Provide printouts of the passage below or you may write it on the board.
- Ask students to read the passage.

*Timeless Games*

Children often play games that are passed down through generations and remain an integral part of their childhood. Deeply connected to the environment and community, they help children develop physical skills, foster friendships, and keep traditions alive, all while making use of the natural resources available in their surroundings. Here are ten examples of such games commonly played by children around us:

- **Ukrong (Tag):** A traditional game where one child is "it" and must tag others who try to avoid being caught. Played in open fields, often amidst the dense vegetation found in rural areas.
- **Langdii (Hopscotch):** Children draw squares on the ground and take turns hopping between the numbered boxes without stepping on the lines. The game is often played on dirt paths or courtyards in villages.
- **Pee-Tree (Hide and Seek):** A classic game where one child counts while others hide behind trees, rocks, or in the thick underbrush typical of rural landscapes. The seeker must find all the hidden players.
- **Kabaddi:** A popular game where two teams compete. One player from the attacking team enters the opposing team's half, tries to touch a player, and returns without being caught. It requires no equipment, just an open space, and is often played in fields or near village outskirts.
- **Seven Stones (Lagori):** A game where one team knocks down a pile of seven stones with a ball, and the other team tries to rebuild the stack before being hit. It is commonly played by children in village playgrounds or open fields.
- **Chhereh (Catch the Ball):** Children toss a ball into the air while others try to catch it. It's a simple yet active game played in open spaces, often near the edge of a forest or a village square.
- **Nukhla (Leapfrog):** A group of children forms a line, and one child bends over while others leap over them. The game is often played in fields or grassy areas.
- **Dukar (Duck Duck Goose):** Children sit in a circle, and one child walks around tapping the others' heads while saying "duck" until they choose one to be the "goose." The "goose" then chases the tapper around the circle.

- **Rolling Tyre:** Children often use discarded tyres and roll them down hills or across flat areas. The goal is to keep the tyre rolling for as long as possible, which is a simple yet competitive game.
- **Wangala (Harvest Dance):** While not exactly a competitive game, the Wangala dance is an important cultural tradition. During the harvest season, children participate in the dance by forming circles and moving in rhythmic steps, mimicking the motions of harvesting crops. It is often performed during festivals in the village.
- Divide the class into pairs and have them discuss which of the games in the passage they have played.
- Ask the pairs to write steps to play a game that they like, which is not there in the passage.
- Ask them to have a discussion on the advantages of playing such games. The discussion points can include physical fitness, teamwork, social skills, community, accessibility, and cost-effectiveness.
- After the activity, a few pairs should share with the class what they discussed and wrote about.

## Activity 2 Tenses



35 mins

### Instructions

- Explain the concept of Tenses to the class. You can refer to the notes below.

#### Teacher's Notes

**Tenses** indicate the time of an action, event, or state of being.

Examples:

Past: The team completed the assignment ahead of schedule.

Present: He attends a specialised learning programme every quarter.

Future: They will organise the conference next month.

#### Simple, Continuous, Perfect, Perfect Continuous Tense:

##### Simple Tense

Present Simple: She plays football every day.

Past Simple: He visited his grandmother yesterday.

Future Simple: They will travel to London next week.

##### Continuous Tense

Present Continuous: I am reading a book now.

Past Continuous: We were watching a film last night.

Future Continuous: She will be studying at 8 p.m.

##### Perfect Tense

Present Perfect: They have finished their homework.

Past Perfect: He had already left when I arrived.

Future Perfect: By tomorrow, we will have completed the project.

##### Perfect Continuous Tense

Present Perfect Continuous: I have been working all morning.

Past Perfect Continuous: She had been waiting for an hour before the bus came.

Future Perfect Continuous: By next year, he will have been teaching for ten years

- For class preparation, you may write some sentences on pieces of paper or may write them on the board.
- Divide the class into pairs.
  - Student A reads a sentence. Student B should identify the correct tense used in the sentence and say a new sentence using the same tense correctly.
  - Then they swap roles, and Student B gives the next sentence.
  - Example Round:

A: *They had been walking for hours.*

B: *That's Past Perfect Continuous. My sentence: I had been studying since morning.*

Then they switch roles.

- You may use the following sentences as prompts, or let students create their own sentences.
  - *I go to school by bus every day.*
  - *She is painting a beautiful picture.*
  - *They had finished the test before the bell rang.*
  - *We will visit the museum next weekend.*
  - *He was sleeping when the phone rang.*
  - *I have eaten all the biscuits!*
  - *By 2025, they will have completed the bridge.*
  - *She had been crying for hours.*
  - *We are studying English grammar now.*
  - *He plays the guitar very well.*
  - *They were playing football in the rain.*
  - *I will be staying with my aunt this summer.*
  - *She has been working hard lately.*
  - *The baby cried loudly last night.*
  - *I had left before she arrived.*
  - *We will have been travelling for five hours by then.*
  - *They have known each other for years.*
  - *He will go to the library tomorrow.*
  - *I was reading when you called.*
  - *She had been baking since morning.*
- You may decide how many sentences each pair should work on, depending on the number of students and time availability.
- During the activity, go around the class and guide the students wherever required.
- After the activity, a few students can share their experiences, and doubts can be cleared about Tenses.

## Activity 3 Story Writing



35 mins

### Instructions

- Remind the students about basic guidelines for writing a story based on a situation. You can refer to the teacher's notes for the same.
- Divide the class into groups of 4-5 students.
- Tell the groups that they will each write a story on the topic: ***The Tale of Timmy the Tortoise.***

- Ask them to follow a story structure, use **humour**, and a **surprising twist**. You can refer to the structure as below and explain the structure.

### Story Structure

#### **Introduction (Opening):**

Describe the setting, time, and place. Introduce the character(s): Provide brief background information about the main character. Start the story with action or intrigue to grab the reader's attention.

#### **Rising action and building the plot:**

Present the challenge, problem, or conflict that the character faces.

#### **Climax:**

The turning point of the story is where the character faces their biggest challenge or makes an important decision. This is the moment of highest tension or conflict.

#### **Falling action:**

The events leading towards the resolution. The problem is being solved, or lessons are learned.

#### **Conclusion (Ending):**

The final part of the story, where everything is resolved. You can offer a reflection, a lesson learned, or a feeling of closure.

- Write the following story starter on the board as a prompt for the students:

*There was once a quiet little tortoise named **Timmy** who lived with a group of loud, boastful animals – a parrot, a monkey, and a cat – who always talked about how brave they were. Timmy, however, was shy and often laughed at for hiding in his shell. But one day, when something truly frightening happened, the bold animals ran away in fear, and Timmy did something no one expected.*

- After the groups finish their stories, ask them to share their stories.
- After each presentation, share your feedback.

### Teacher's Notes

- **Understand the situation thoroughly.** Read and understand the situation prompt. Identify the key elements, such as setting, characters, conflict, and resolution. Think about how you can develop the story based on the situation. Consider how the situation can evolve, the challenges your character might face, and how the story can end.
- **Develop characters and dialogue:** Introduce interesting and relatable characters. Make sure the main character has a clear goal, motivation, and conflict. Use dialogue to move the plot forward and reveal character traits.
- **Use descriptive language and sensory details:** Describe what the character sees, hears, smells, tastes, and feels to make the story more immersive. This helps the reader connect with the story and imagine the scene.
- **Maintain consistent point of view and tense:** Decide if the story will be told in the first person (I, we) or third person (he, she, they). Ensure the point of view is consistent throughout the story. Choose the appropriate tense (past or present) and stick with it throughout the narrative.
- **Focus on the conflict and resolution:** A story without conflict is often dull. The conflict could be internal.
- **Stay on topic and be relevant:** Ensure your story is directly related to the situation given.
- **Proofread and edit:** Read through the story carefully to check for errors. Make sure your sentences are clear and well-structured. Avoid overly long sentences that may confuse the reader. Pay attention to punctuation marks like commas, periods, quotation marks, etc., especially when using dialogue.
- **Be creative and original:** A good story often has a surprising or unique twist. Think of something unexpected that could happen in the given situation. Let your voice come through in the writing. Your creativity, personality, and style will make the story unique and enjoyable to read.

## UNIT: 7

## Assessment



35 mins

## Section A (Literature)

Choose the correct answer from the given options:

1. What was the most fascinating thing for Valli?
  - a) Playing fun games outside
  - b) Watching people on the road
  - c) The bus going to the town
  - d) Talking to friendly travellers
2. How did the conductor treat Valli?
  - a) Rudely
  - b) Indifferently
  - c) Politely and playfully
  - d) Ignored her completely
3. What brave act did Custard perform in the poem?
  - a) He rescued Belinda from drowning.
  - b) He chased away the other pets.
  - c) He fought and killed a pirate.
  - d) He flew to save the town.
4. What does the poem highlight about bravery?
  - a) Bravery is only about looks.
  - b) Only small creatures can be brave.
  - c) Those who boast are always the bravest.
  - d) True bravery is shown through actions, not words.

Read the following extracts and answer questions 5 and 6.

## Extract 1

"Day after day she watched the bus, and gradually a tiny wish crept into her head and grew there: she wanted to ride on that bus, even if just once. This wish became stronger and stronger until it was an overwhelming desire. Valli would stare wistfully at the people who got on or off the bus."

5. In a sentence, write what the passage highlights.

## Extract 2

"Belinda was as brave as a barrel full of bears,  
And Ink and Blink chased lions down the stairs,  
Mustard was as brave as a tiger in a rage,  
But Custard cried for a nice safe cage."

6. Comment upon the contrast that is reflected in the above lines in the extract.

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Answer the following:

7. How did Valli arrange money for her bus ride?

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8. What is ironic about Custard the Dragon?

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9. Describe how *Madam Rides the Bus* reflects a child's curiosity and independence.

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10. How does the setting contribute to the overall mood of the poem, *The Tale of Custard the Dragon*?

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## Section B (Grammar)

Fill in the blanks with the correct tense form of the verb in brackets.

1. Every Saturday, the children \_\_\_\_\_ (play) games near the forest.
2. I \_\_\_\_\_ (climb) Shillong Peak last summer with my cousins.
3. We \_\_\_\_\_ (celebrate) Wangala festival for generations.
4. At this moment, she \_\_\_\_\_ (learn) a local dance in her village.
5. They \_\_\_\_\_ (collect) firewood when the rain suddenly started.
6. I \_\_\_\_\_ (never visit) Mawlynnong, but I would love to go someday.
7. By the time we reach Cherrapunji, it \_\_\_\_\_ (start) to rain.
8. The farmers \_\_\_\_\_ (work) in the paddy fields all morning.
9. He \_\_\_\_\_ (watch) the clouds roll over the hills when I called him.
10. Our school \_\_\_\_\_ (organise) a field trip to the Living Root Bridge next week.

## Section C (Writing)

Complete the story given below. Give a title to the story:

During the school holidays, a group of friends set off to explore the forest near their village. They had heard tales of a hidden trail behind the waterfall that led to something mysterious. With a map and their backpacks, they began the adventure of a lifetime.

Give it a title too.

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# UNIT: 7 Answer Key

## Section A (Literature)

1. c)
2. c)
3. c)
4. d)
5. The passage highlights Valli's strong desire and curiosity to experience a bus journey.
6. The contrast in the last two lines is between the bravery of the other pets and the cowardice of Custard. Ink and Blink are said to be fierce enough to chase lions, while Mustard is compared to an angry tiger. However, Custard, who is a dragon, behaves timidly and cries for safety, which is unexpected.
7. Valli saved money by not spending on sweets, balloons, or rides at the fair. She carefully collected small amounts until she had enough for a ticket.
8. Although Custard was often mocked for being a coward, he proved his true bravery when danger struck, while the others ran away in fear.
9. The story highlights Valli's strong desire to explore the world beyond her home. She carefully plans her journey, saves money, and experiences the excitement of travel alone. Her journey reflects her curiosity, independence, and sense of adventure. Despite her excitement, she also learns an important life lesson when she sees a dead cow on the road, which makes her realise that life has both joy and sorrow.
10. The setting of Belinda's little white house gives the poem a cosy and cheerful beginning, making the reader feel that it is a safe and happy place. This contrasts with the sudden danger that comes when the pirate appears. The lively descriptions of the house and its colourful characters set a playful and humorous mood, which is reinforced by the rhyming pattern. However, when the pirate enters, the mood briefly shifts to tension and action. In the end, the setting returns to normal, restoring the light-hearted tone. The poet effectively uses the setting to build contrast and make the events of the poem more engaging.

## Section B (Grammar)

1. Every Saturday, the children **play** games near the forest.
2. I **climbed** Shillong Peak last summer with my cousins.
3. We **have celebrated** the Wangala festival for generations.
4. At this moment, she **is learning** a local dance in her village.
5. They **were collecting** firewood when the rain suddenly started.
6. I **have never visited** Mawlynnong, but I would love to go someday.
7. By the time we reach Cherrapunji, it **will have started** to rain.
8. The farmers **have been working** in the paddy fields all morning.
9. He **was watching** the clouds roll over the hills when I called him.
10. Our school **is organising** a field trip to the Living Root Bridge next week.

## Section C (Writing)

Since creative writing tasks are subjective, the answers will vary from student to student. Some aspects to consider while evaluating a story - based on a situation are:

- The plot is the sequence of events that make up the story. It includes an introduction, rising action, climax, falling action, and conclusion.
- Characters are the people or beings that drive the story forward.
- The setting is where and when the story takes place.
- The conflict is the central problem or challenge the characters face.
- The theme is the central idea or message the story conveys.
- The point of view is the perspective from which the story is told.
- Dialogue is the conversation between characters.
- Style and Language - the way the story is written affects its tone and impact.
- Pacing refers to how quickly or slowly the events unfold in the story.
- Often, stories have a deeper moral or lesson for the reader.

## Learning Level Tracker

Keep a record of unit assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

**Level 3:** Solves problems independently

[illegible]

# Meghalaya Learning Enhancement Programme

**MATHS**

# Chapter 1 : Real Numbers

## Activity 1 Prime Factor Puzzle



35 mins

### Instructions

- Initiate the activity by a brief discussion on how a number can be broken down into smaller parts similar like a building is made up of many smaller bricks. Draw some visuals or numbers on the board.
- Divide the class into small groups of 3-4 students.
- Give each group a set of numbers (e.g., 36, 48, 60, 84, 90).
- Ask the groups to break down each number into its prime factors using a factor tree or division method. For example:
  - o  $36 \rightarrow 2 \times 2 \times 3 \times 3$  or  $2^2 \times 3^2$
- Once they factorise all their numbers, encourage them to compare their answers with other groups. Ask: "Did everyone get the same prime factors for the same number?"
- Discuss how this activity proves the Fundamental Theorem of Arithmetic—every number has a unique prime factorisation (ignoring the order of factors).
- Conclude by explaining:
  - o Prime factorisation is useful in finding HCF (Highest Common Factor) and LCM (Lowest Common Multiple).
  - o Every composite number can be broken down into a unique set of prime factors.

## Activity 2 Rational vs. Irrational Adventure



35 mins

### Instructions

- Start the activity by asking the students:
  - o "Can you think of numbers that cannot be written as simple fractions?"
- Convey that today they will discover the difference between rational and irrational numbers through an activity.
- Write a list of numbers on the board:
  - o For example:  $\sqrt{5}$ ,  $0.333\dots$ ,  $3.14159\dots$ ,  $\frac{22}{7}$ ,  $4$ ,  $\sqrt{16}$  (You may change the list of numbers)
- Ask the class to work in pairs and classify these numbers as either rational or irrational.
- Guide them with the below hint:
  - o "Can this number be written as a fraction of two integers?" (If yes, it is rational and if no, it is irrational)

- Discuss the correct classifications:
  - o Rational:  $0.333\dots$ ,  $\frac{22}{7}$ , 4,  $\sqrt{16}$  (examples)
  - o Irrational:  $\sqrt{5}$ , 3.14159... (examples)
- Encourage students to explore: "Can a number be both rational and irrational?"
- Conclude the activity by highlighting:
  - o Rational numbers can always be expressed as fractions and have either terminating or repeating decimals.
  - o Irrational numbers cannot be written as fractions and have non-terminating, non-repeating decimals.

## Activity 3 Decimal Expansion Investigator



35 mins

### Instructions

- Ask the students and lead a discussion for 5-7 minutes:
  - o Can you say which numbers have a decimal form that goes on forever while others stop?
  - o Can you predict whether a fraction will have a terminating or repeating decimal?
- Explain that today they will learn to classify decimals as terminating or non-terminating repeating.
- Write some fractions on the board:
  - o  $\frac{1}{4}$ ,  $\frac{1}{3}$ ,  $\frac{7}{8}$ ,  $\frac{5}{6}$  (You may change the numbers)
- Ask students to convert each fraction to its decimal form using long division.
- Guide them to identify which decimals terminate and which repeat indefinitely.
- Explain the rule:
  - o If the denominator (in its prime factorised form) contains only 2 and/or 5, the decimal terminates.
  - o Otherwise, the decimal repeats.
- Conclude by emphasising:
  - o Rational numbers have either terminating or repeating decimals.
  - o Knowing the denominator's prime factors helps predict the decimal form without division.

# Assessment



35 mins

Answer the following questions:

1. For integer 'm', form of every even integer is:
  - a) m
  - b)  $m+1$
  - c)  $2m$
  - d)  $2m-1$
2. If p and q are relatively prime, then their LCM is:
  - a) 1
  - b) p
  - c) q
  - d)  $p \times q$
3. If HCF of 306 and 657 is 9, then the LCM of these numbers is:
  - a) 2236
  - b) 2338
  - c) 22338
  - d) 757
4. The decimal expansion of a rational number is always:
  - a) Non-terminating
  - b) Non-terminating and non-repeating
  - c) Terminating or non-terminating repeated
  - d) None of these
5. The sum or difference of a rational number and an irrational number is:
  - a) A rational number
  - b) An irrational number
  - c) 1
  - d) 0
6. Using division method, express 5005 as a product of its prime factors.
7. Find the least number, which is exactly divisible by 15, 24 and 30.
8. Show that  $2 + \sqrt{3}$  is an irrational number.
9. A circular pipe of length 120 cm needs to be divided into equal sections without leaving any remainder. What is the maximum possible length of each section?
10. What is the HCF of the smallest prime number and the smallest composite number?

# Answer Key

1. (c)  $2m$
2. (d)  $p * q$
3. (c) 22338
4. (c) Terminating or non-terminating repeated
5. (b) An irrational number
6. Using the division of a number by prime numbers method, we can get the product of prime factors of 5005.  
Hence,  $5005 = 5 \times 7 \times 11 \times 13 = 5 \times 7 \times 11 \times 13$
7.  $15 = 3 \times 5$   
 $24 = 2^3 \times 3$   
 $30 = 2 \times 3 \times 5$   
Thus,  $\text{LCM} = 2^3 \times 3 \times 5 = 120$
8. Assume  $2 + \sqrt{3}$  is rational, i.e.,  $2 + \sqrt{3} = \frac{p}{q}$  (where  $p$  and  $q$  are co-prime integers, and  $q \neq 0$ ).  
 $\sqrt{3} = \left(\frac{p}{q}\right) - 2 \Rightarrow \sqrt{3}$  is a rational number.  
This contradicts the fact that  $\sqrt{3}$  is irrational. Therefore,  $2 + \sqrt{3}$  is irrational.
9. Prime factorisation of  $120 = 2^3 \times 3 \times 5$   
The maximum length of each section is the HCF of the prime factors, which is 1. Hence, the maximum possible length is **1 cm**.
10. The smallest prime number = 2  
The smallest composite number = 4  
Prime factorisation of 2 = 2  
Prime factorisation of 4 =  $2 \times 2$   
HCF of 2 and 4 is = 2



# Learning Level Tracker

Keep a record of unit/chapter assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

**Level 3: Solves problems independently**

[illegible]

## Chapter 2 : Polynomials

### Activity 1 Graph It Out



35 mins

### Instructions

- Start the activity with a brief discussion on a roller coaster track, where it moves up and down.  
Share that today we are going to plot some polynomial graphs and see where they touch the x-axis to understand the meaning of **zeroes of a polynomial**.
- Divide the class into groups of 3-4 students. Each group will get a different quadratic polynomial to work on. Either you take the below polynomials or any other as per your wish.
  - $f(x) = x^2 - 4$
  - $g(x) = x^2 + x - 6$
  - $h(x) = x^2 + 1$
- Ask each group to substitute different values of  $x$  in their polynomial equation to find the corresponding  $y$ -values.  
For the equation,  $f(x) = x^2 - 4$ ,  
If  $x = -3$ , then  $f(x) = (-3)^2 - 4 = 5$   
If  $x = 2$ , then  $f(x) = 2^2 - 4 = 0$   
They will complete this for values from -5 to 5.
- Using graph paper, students will be asked to **mark the points** obtained in the table and will then **join the points smoothly** to form a **parabola**.
- After that they will observe where the curve crosses the **x-axis** and mark those points, these points represent the **zeroes of the polynomial** because at these points  $y=0$ .
- Discuss the findings and highlight the key learnings:
  - If the parabola **touches the x-axis at one point**, it means the equation has **one repeated root**.
  - If it crosses **the x-axis at two points**, it means there are **two distinct real roots**.
  - If the curve **does not touch the x-axis**, the polynomial has **no real roots**.

## Activity 2 Build the Equation!



35 mins

### Instructions

- Start the class by a small ice-breaking question for the students:  
"Could you create an entire equation with only two numbers?"
- Ask students to make pair and follow the next steps:
  - Each pair gets a **set of two zeros**, for example: (2, -3) or  $(\frac{1}{2}, -4)$  or (-1, -2)
- Explain the formula: If  $\alpha$  and  $\beta$  are the zeroes, then the equation is  $f(x) = k(x - \alpha)(x - \beta)$
- Expand the equation, such that for zeros 2 and -3, the equation will be  $f(x) = (x - 2)(x - 3) = x^2 + x - 6$
- Ask the students to compare their expanded equation with  $ax^2 + bx + c$  and identify the coefficients.
- Conclude the activity by highlighting that Zeroes determine the structure of a polynomial.

## Activity 3 Zeroes in Motion – A Real-Life Experiment!



35 mins

### Instructions

- Begin the class by some ice-breaking questions like:
  - Have you thrown a ball in the air?
  - Did you notice how it **rises, stops and then falls**?
  - This motion follows a polynomial equation! Today, we will discover and model this motion.
- Ask students to throw a ball in the air and observe its motion first.
- As the motion is parabolic, refer the concept of physics and connect them to the quadratic polynomial:
  - Equation of Motion:  $h(t) = -t^2 + 4t$
  - Zeroes occur when the ball is at ground level.
  - Solve  $-t^2 + 4t = 0$
- Ask them to factorise, either individually or in group.
  - Factorise:  $t(t - 4) = 0$
  - Zeroes are  $t = 0$  and  $t = 4$  (start and end points).
- Conclude the activity by highlighting the significance of the zeros and its application in real world.

# Assessment



60 mins

Answer the following questions:

1. Sum of zeroes of the polynomial  $p(x) = x^2 - 3x + 2$  is:
  - a) 2
  - b) 3
  - c) -2
  - d) -3
2. If the graph of the polynomial  $y = p(x)$ , where it does not intersect the x- axis then the number of zeros is:
  - a) 1
  - b) 2
  - c) 3
  - d) No Zeroes
3. The degree of a zero polynomial is:
  - a) Always zero
  - b) Never zero
  - c) Negative
  - d) Undefined
4. If the graph of  $y = x^2 - 2x - 35$  cuts the x- axis at (7, 0) and (- 5, 0) then the zeroes of the polynomial  $x^2 - 2x - 35$  are:
  - a) 7, -5
  - b) 0, -5
  - c) 0, 7
  - d) 0, 0
5. For any polynomial  $p(x)$ , if  $p(a) = 0$ , then 'a' is called:
  - a) Constant of the polynomial
  - b) Zero of the polynomial
  - c) Degree of the polynomial
  - d) coefficient of the polynomial
6. Find the value of "p" from the polynomial  $x^2 + 3x + p$ , if one of the zeroes of the polynomial is 2.
7. Find the quadratic polynomial if its zeroes are 0,  $\sqrt{5}$ .
8. If 4 is a zero of the cubic polynomial  $x^3 - 3x^2 - 10x + 24$ , find its other two zeroes.
9. Does the polynomial  $a^4 + 4a^2 + 5$  have real zeroes?
10.  $\alpha$  and  $\beta$  are zeroes of the quadratic polynomial  $x^2 - 6x + y$ .  
Find the value of 'y' if  $3\alpha + 2\beta = 20$ .

# Answer Key

1. (b) 3
2. (d) No Zeroes
3. (d) Undefined
4. (a) 7, -5
5. (b) Zero of the polynomial
6. As 2 is the zero of the polynomial.  
We know that if  $\alpha$  is a zero of the polynomial  $p(x)$ , then  $p(\alpha) = 0$   
Substituting  $x = 2$  in  $x^2 + 3x + p$ ,  $\Rightarrow 2^2 + 3(2) + p = 0 \Rightarrow 4 + 6 + p = 0 \Rightarrow 10 + p = 0 \Rightarrow p = -10$
7. A quadratic polynomial can be written using the sum and product of its zeroes as:  $x^2 - (\alpha + \beta)x + \alpha\beta$  Where  $\alpha$  and  $\beta$  are the roots of the polynomial.  
Here,  $\alpha = 0$  and  $\beta = \sqrt{5}$  So, the polynomial will be:  $x^2 - (0 + \sqrt{5})x + 0(\sqrt{5}) = x^2 - \sqrt{5}x$
8. Given cubic polynomial is  $p(x) = x^3 - 3x^2 - 10x + 24$  4 is a zero of  $p(x)$ . So,  $(x - 4)$  is the factor of  $p(x)$ . Let us divide the given polynomial by  $(x - 4)$ . Here, the quotient  $= x^2 + x - 6 = x^2 + 3x - 2x - 6 = x(x + 3) - 2(x + 3) = (x - 2)(x + 3)$   
Therefore, the other two zeroes of the given cubic polynomial are 2 and -3.
9. In the given polynomial, let  $a^2 = x$ .  
Now, the polynomial becomes,  $x^2 + 4x + 5$   
Comparing with  $ax^2 + bx + c$ , here,  $b^2 - 4ac = 4^2 - 4(1)(5) = 16 - 20 = -4$   
So,  $D = b^2 - 4ac < 0$   
As the discriminant (D) is negative, the given polynomial does not have real roots or zeroes.
10. Let,  $f(x) = x^2 - 6x + y$   
From the given,  $3\alpha + 2\beta = 20$ —————(i)  
From  $f(x)$ ,  $\alpha + \beta = 6$ —————(ii)  
And  $\alpha\beta = y$ —————(iii)  
Multiply equation (ii) by 2.  
Then, subtract the whole equation from equation (i),  $\Rightarrow \alpha = 20 - 12 = 8$   
Now, substitute this value in equation (ii),  $\Rightarrow \beta = 6 - 8 = -2$   
Substitute the values of  $\alpha$  and  $\beta$  in equation (iii) to get the value of  $y$ ,  
such as:  
 $y = \alpha\beta = (8)(-2) = -16$

**Level 3:** Solves problems independently

[illegible]

## Chapter 6 : Triangles

### Activity 1 Are These Shapes Twins?



35 mins

#### Instructions

- Start with an engaging question and discuss it for 2-3 minutes:  
“Have you ever noticed that the image on a projector screen looks just like what’s on the laptop but bigger?”  
Based on the discussion establish the concept of **similar figures**—objects that have the same shape but different sizes!
- Group the students** and give each group **two sets of triangle cutouts**—one with **identical triangles** and another with **proportionally different triangles**.
- Ask students to **measure the angles** in each triangle and compare the corresponding ones and guide them to observe if the angles remain **equal** despite size differences.
- Now, instruct them to **measure and compare the sides** of each triangle and check if the ratio of corresponding sides is the same.
- Based on their observations, ask:
  - “Which triangles do you think are similar? Why?”
  - “Can you find any set where the sides are in proportion, but angles are not equal?”
  - Let students conclude that **similar triangles have equal angles and proportional sides**.
- Discuss and conclude by explaining **real-world applications** of similarity:
  - Scaled models of buildings** used by architects.
  - Enlarged or reduced images** in digital editing.
  - Maps and blueprints**, where measurements are scaled down.
  - Similar figures maintain **equal angles** and proportional sides.
  - The concept is used in **photography, maps, architecture, and design**.

### Activity 2 Divide and Conquer!



35 mins

#### Instructions

- Start the activity by asking the students:  
“Imagine a ladder leaning against a wall. If I place a horizontal plank at different heights, the ladder gets divided into different sections, but the ratios remain the same. Can we prove this mathematically?”
- Give each student a rectangular piece of paper.

- Instruct students to **fold the paper diagonally**, creating a **triangle**.
- Ask them to **fold another crease parallel to one side** inside the triangle.
- Have them **measure and compare** the segments formed on the two sides.
  - o “What do you notice? Are the segments divided in the same ratio?”
- Guide students to conclude:
  - o “A parallel line inside a triangle divides the two sides proportionally!”
  - o This is known as **Thales’ Theorem or Basic Proportionality Theorem**.
- Explain the real-world applications:
  - o **Railway tracks** – Tracks and sleepers maintain proportional distances.
  - o **Shadows of objects** – The height of a person and a lamp post create similar triangles.
- Wrap up by highlighting:
  - o **Thales’ Theorem (Basic Proportionality Theorem)** helps divide triangles proportionally.
  - o Used in **construction, road designs, and perspective drawings**.

## Activity 3 The Magic of Triangles!



35 mins

### Instructions

- Start the activity with a question:  
“Do you know that just knowing two angles of a triangle is enough to determine its shape? Can anyone explain it to us?”
- Provide students with:
  - o Graph paper
  - o Rulers and protractors
- Ask them to **draw any triangle** and label it **ABC**.
- Instruct them to **scale down the triangle proportionally** to get a smaller triangle **A'B'C'** (by dividing each side length by 2).
- Now, students should measure and compare:
  - o **Corresponding angles** – should be equal.
  - o **Corresponding sides** – should be in proportion.
- Guide students in a way:
  - o “Remember our starting question? Since the sum of angles in a triangle is always  $180^\circ$ , knowing two angles automatically determines the third. This means the triangles must have the same shape, making them similar!”
  - o Reinforce that this is the **AA (Angle-Angle) Similarity Criterion**.
- Discuss the real-life applications:
  - o **Mobile screen enlargement**: How a smaller screen maintains proportions when enlarged.
  - o **Mirrors and reflections**: Images in mirrors maintain similarity.
- Wrap up by telling:
  - o **AA Similarity** helps prove triangles are similar without knowing side lengths.
  - o Used in **optical illusions, architecture, and digital scaling**.



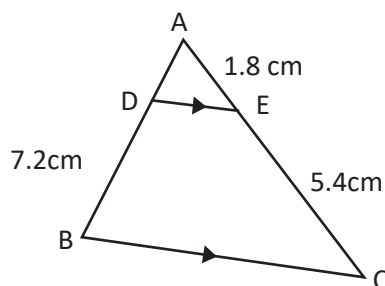
# Assessment



60 mins

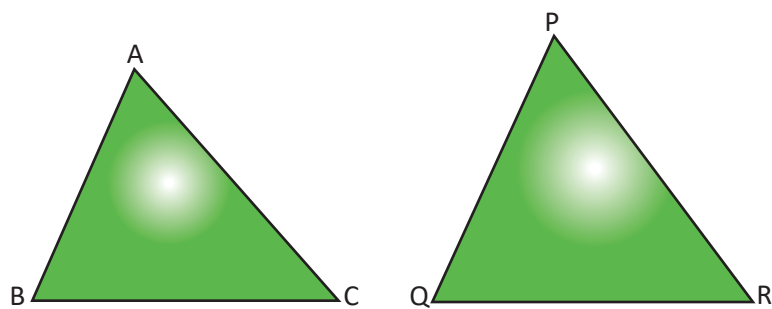
Answer the following questions:

- All geometrical congruent figures are:
  - Not similar
  - Similar
  - Unequal
  - None
- If  $\triangle ABC$  and  $\triangle DEF$  are two triangles in which  $AB/DE = BC/DF$  then the two triangles are similar if:
  - $\angle A = \angle F$
  - $\angle B = \angle D$
  - $\angle A = \angle D$
  - $\angle B = \angle E$
- In a triangle, the line segment joining from one vertex to the midpoint of the opposite side is called its:
  - Median
  - Perpendicular
  - Hypotenuse
  - Angle bisector
- Which of the following are not similar figures:
  - Circles
  - Squares
  - Equilateral triangles
  - Isosceles triangles
- Which of the following is not a similarity criterion for two triangles?
  - AAA
  - SAS
  - SSS
  - ASA
- The lengths of the diagonals of a rhombus are 24 cm and 32 cm. Calculate the length of the altitude of the rhombus.
- In the figure,  $DE \parallel BC$ . Find the length of side AD, given that  $AE = 1.8$  cm,  $BD = 7.2$  cm and  $CE = 5.4$  cm.

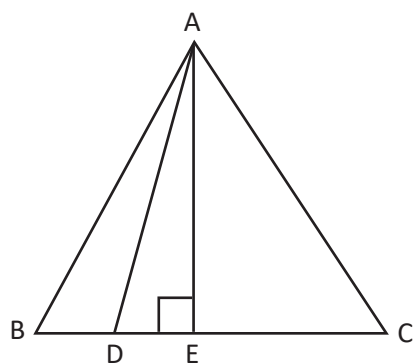


- The sides of two similar triangles are in the ratio 7:10. Find the ratio of areas of these triangles.

9. If the areas of two similar triangles are equal, prove that they are congruent.



10. In an equilateral  $\triangle ABC$ , D is a point on side BC such that  $BD = \left(\frac{1}{3}\right) BC$ .  
Prove that  $9(AD)^2 = 7(AB)^2$



# Answer Key

- (b) Similar
- (b)  $\angle B = \angle D$
- (a) Median
- (b) Isosceles triangles
- (d) ASA
- Diagonals of a rhombus are  $\perp$  bisectors of each other.  
 $\therefore AC \perp BD, OA = OC = \frac{AC}{2} \Rightarrow \frac{24}{2} = 12 \text{ cm}, OB = OD = \frac{BD}{2} \Rightarrow \frac{32}{2} = 16 \text{ cm}$
- Given,  $DE \parallel BC$   $AE = 1.8 \text{ cm}, BD = 7.2 \text{ cm}$  and  $CE = 5.4 \text{ cm}$   
 By basic proportionality theorem,  $\frac{AD}{DB} = \frac{AE}{EC}$ ,  
 $\Rightarrow \frac{AD}{7.2} = \frac{1.8}{5.4} \Rightarrow AD = \frac{(1.8 \times 7.2)}{5.4} = \frac{7.2}{4} = 2.4$   
 Therefore,  $AD = 2.4 \text{ cm}$ .
- Given, The ratio of sides of two similar triangles = 7:10  
 We know that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.  
 The ratio of areas of these triangles = (Ratio of sides of two similar triangles)<sup>2</sup>  
 $= (7)^2 : (10)^2 = 49:100$   
 Therefore, the ratio of areas of the given similar triangles is 49:100
- To prove  $\triangle ABC \cong \triangle PQR$ .  
 Proof:  $\triangle ABC \sim \triangle PQR$   
 $\therefore \text{Area of } (\triangle ABC) / \text{Area of } (\triangle PQR) = \frac{BC^2}{QR^2} = \frac{AB^2}{PQ^2} = \frac{AC^2}{PR^2}$   
 $\Rightarrow \frac{BC^2}{QR^2} = \frac{AB^2}{PQ^2} = \frac{AC^2}{PR^2} = 1$  [Since, ar  $(\triangle ABC) = \text{ar}(\triangle PQR)$ ]  
 $\Rightarrow \frac{BC^2}{QR^2} = 1 \Rightarrow \frac{AB^2}{PQ^2} = 1 \Rightarrow \frac{AC^2}{PR^2} = 1$   $BC = QR$   $AB = PQ$   $AC = PR$   
 Therefore,  $\triangle ABC \cong \triangle PQR$  [SSS criterion of congruence]
- Given, ABC is an equilateral triangle. And D is a point on side BC such that  $BD = (\frac{1}{3})BC$ .  
 Let a be the side of the equilateral triangle and AE be the altitude of  $\triangle ABC$ .  
 $\therefore BE = EC = \frac{BC}{2} = \frac{a}{2}$  And,  $AE = \frac{a\sqrt{3}}{2}$   
 Given,  $BD = 1/3BC \therefore BD = \frac{a}{3}$   $DE = BE - BD = \frac{a}{2} - \frac{a}{3} = \frac{a}{6}$   
 In  $\triangle ADE$ , by Pythagoras theorem,  $AD^2 = AE^2 + DE^2 = [\frac{a\sqrt{3}}{2}]^2 + (\frac{a}{6})^2 = (\frac{3a^2}{4}) + (\frac{a^2}{36}) = \frac{(37a^2 + a^2)}{36} = \frac{(28a^2)}{36}$   
 $= (\frac{7}{9}) a^2 = (\frac{7}{9}) (AB)^2$   
 Therefore,  $9(AD)^2 = 7(AB)^2$

**Level 3: Solves problems independently**

[illegible]

## Chapter 7 : Coordinate Geometry

### Activity 1 Find Your Distance!



35 mins

#### Instructions

- Start the class by asking students, "Have you ever wondered how Google Maps calculate the shortest distance between two places? Can anyone explain it?"  
Explain that today they will learn how to calculate distances mathematically on a coordinate plane.
- Set up the classroom as a coordinate grid:
  - o Mark the floor with a grid (using tape or chalk) and label axes.
  - o Assign coordinates to different positions in the classroom.
- Pair up students, each pair selects two points on the "classroom grid" and notes down their coordinates (e.g., A (2,3) and B (6,7)).
- Introduce the distance formula and demonstrate how to plug in values and calculate.
- Let students find distance between their chosen points and verify by measuring using the scale.
- Conclude with real world relevance, explain how the formula is used in GPS, sports, and designing city maps.
- Wrap up the activity by highlighting:
  - o Distance between two points is always positive.
  - o Discuss practical applications in real life (navigation, space missions, etc.).

### Activity 2 Divide in Section!



35 mins

#### Instructions

- Begin the class by saying:  
"If two friends are 100 meters apart and one walks one-fourth of the total distance, where will they meet?"
- Introduce the section formula to the students, explain that it helps to find the coordinates of a point dividing a line segment in a given ratio.
- Start a Paper-Folding activity:
  - o Distribute a rectangular sheet of paper to each student.
  - o Draw a straight line and mark two points A and B.
  - o Ask them to fold the paper at a point that visually seems to divide it in a 2:3 ratio.
  - o Measure and compare their estimated point with the calculated section formula result.

- Give different coordinate points and ratios for students to solve, let them practice on the board.
- Wrap up the activity by:
  - o Emphasizing on how division of a line is useful in scaling maps, blueprint designs, and animations.
  - o Telling real-world applications (architecture, animation, GPS tracking).

## Activity 3 Map the Treasure!



35 mins

### Instructions

- Set the context with an engaging scenario and tell students:

"Imagine you're a pirate and have found a treasure map! The treasure is buried inside a triangular region marked by three important landmarks. To claim your share, you need to determine the exact area of this region.

Are you ready?"
- Distribute coordinate grids (graph paper) to students.:
  - o Assign three random points A ( $x_1, y_1$ ), B ( $x_2, y_2$ ), and C ( $x_3, y_3$ ) representing the triangular treasure zone.
  - o Alternatively, let students choose their own three points on the grid.
- Guide them to apply the Triangle Area Formula.
- Let students verify and compare their results with a partner, meanwhile encourage the discussions among the students, say: "What happens when points are collinear?"
- Furthermore:
  - o Ask students to create a different triangular region and calculate its area.
  - o Let them swap their coordinates with classmates to verify each other's work.
- Wrap up the activity by:
  - o Discussing how coordinate-based area calculations help in **mapping, architecture, and navigation (GPS systems)**.
  - o Highlighting the **use of triangular decomposition in real-world land measurement**.

# Assessment



60 mins

**Answer the following questions:**

- The distance of the point P (3, 4) from the origin is:
  - 4 units
  - 3 units
  - 5 units
  - 7 units
- The coordinates of the midpoint of the line segment joining the points A(a, b) and B(0, 0) is:
  - $(\frac{a+b}{2}, a)$
  - $(a+b, b)$
  - $(\frac{a}{2}, \frac{b}{2})$
  - $(a, b)$
- If A (x<sub>1</sub>, y<sub>1</sub>), B (x<sub>2</sub>, y<sub>2</sub>) and C (x<sub>3</sub>, y<sub>3</sub>) are the three vertices of a triangle then area of a  $\Delta ABC$  is:
  - $\frac{1}{2} | x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2) |$
  - $\frac{1}{2} | x_2 (y_3 - y_1) + x_3 (y_1 - y_2) + x_3 (y_1 - y_2) |$
  - $\frac{1}{2} | x_3 (y_2 - y_1) + x_2 (y_3 - y_1) + x_1 (y_3 - y_2) |$
  - $\frac{1}{2} | x_1 (y_2 - y_1) + x_2 (y_3 - y_2) + x_3 (y_1 - y_3) |$
- The abscissa of any point on the Y – axis is:
  - 1
  - 1
  - 2
  - 0
- If A (- 1, 0), B (5, - 2) and C (8, 2) are the vertices of a triangle ABC, then its centroid is:
  - (6, 0)
  - (0, 6)
  - (4, 0)
  - (12, 0)
- Find the distance of the point P (2, 3) from the x-axis.
- Find a relation between x and y such that the point (x, y) is equidistant from the points (7, 1) and (3, 5).
- Find the value of k if the points A (2, 3), B (4, k) and C (6, -3) are collinear.
- Name the type of triangle formed by the points A (-5, 6), B (-4, -2) and C (7, 5).
- If A (-2, 1), B (a, 0), C (4, b) and D (1, 2) are the vertices of a parallelogram ABCD, find the values of a and b. Hence, find the lengths of its sides.

# Answer Key

- (c) 5 units
- (c)  $(\frac{a}{2}, \frac{b}{2})$
- (a)  $\frac{1}{2} | x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2) |$
- (d) 0
- (d) (4, 0)
- We know that,  $(x, y) = (2, 3)$  is a point on the Cartesian plane in the first quadrant.  
 $x$  = Perpendicular distance from  $y$ -axis  
 $y$  = Perpendicular distance from  $x$ -axis.  
 Therefore, the perpendicular distance from  $x$ -axis =  $y$  coordinate = 3
- Let  $P(x, y)$  be equidistant from the points  $A(7, 1)$  and  $B(3, 5)$ .  
 Then,  $AP = BP$   $AP^2 = BP^2$   
 Using the distance formula,  $(x - 7)^2 + (y - 1)^2 = (x - 3)^2 + (y - 5)^2$   
 $\Rightarrow x^2 - 14x + 49 + y^2 - 2y + 1 = x^2 - 6x + 9 + y^2 - 10y + 25$   
 $\Rightarrow x - y = 2$   
 Hence, the relation between  $x$  and  $y$  is  $x - y = 2$ .
- Given,  $A(2, 3) = (x_1, y_1)$ ;  $B(4, k) = (x_2, y_2)$ ;  $C(6, -3) = (x_3, y_3)$   
 If the given points are collinear, the area of the triangle formed by them will be 0.  
 $\Rightarrow \frac{1}{2} [x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2)] = 0$   
 $\Rightarrow \frac{1}{2} [2(k + 3) + 4(-3 - 3) + 6(3 - k)] = 0$   
 $\Rightarrow \frac{1}{2} [2k + 6 - 24 + 18 - 6k] = 0 \Rightarrow \frac{1}{2} (-4k) = 0 \Rightarrow 4k = 0 \Rightarrow k = 0$
- The points are  $A(-5, 6)$ ,  $B(-4, -2)$  and  $C(7, 5)$ .  
 Using distance formula,  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$   
 $AB = \sqrt{((-4+5)^2 + (-2-6)^2)} = \sqrt{(1+64)} = \sqrt{65}$ ;  $BC = \sqrt{((7+4)^2 + (5+2)^2)} = \sqrt{(121 + 49)} = \sqrt{170}$ ;  $AC = \sqrt{((7+5)^2 + (5-6)^2)} = \sqrt{144 + 1} = \sqrt{145}$   
 Since all sides are of different lengths,  $ABC$  is a scalene triangle
- Given vertices of a parallelogram  $ABCD$  are:  $A(-2, 1)$ ,  $B(a, 0)$ ,  $C(4, b)$  and  $D(1, 2)$   
 We know that the diagonals of a parallelogram bisect each other.  
 So, midpoint of  $AC$  = midpoint of  $BD$   
 $\Rightarrow [\frac{(-2+4)}{2}, \frac{(1+b)}{2}] = [\frac{(a+1)}{2}, \frac{(0+2)}{2}]$   
 By equating the corresponding coordinates,  $\frac{2}{2} = \frac{(a+1)}{2}$  and  $\frac{(1+b)}{2} = \frac{2}{2}$   
 $a + 1 = 2$  and  $b + 1 = 2 \Rightarrow a = 1$  and  $b = 1$   
 Therefore,  $a = 1$  and  $b = 1$ .  
 Let us find the lengths of sides of a parallelogram, i.e.  $AB$ ,  $BC$ ,  $CD$  and  $DA$   
 Using the distance formula,  $AB = \sqrt{[(1+2)^2 + (0-1)^2]} = \sqrt{(9+1)} = \sqrt{10}$  units  
 $BC = \sqrt{[(4-1)^2 + (1-0)^2]} = \sqrt{(9+1)} = \sqrt{10}$  units And  $CD = \sqrt{10}$  and  $DA = \sqrt{10}$  {the opposite sides of a parallelogram are parallel and equal}  
 Hence, the length of each side of the parallelogram  $ABCD = \sqrt{10}$  units.



## Learning Level Tracker

Keep a record of unit/chapter assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

**Level 3:** Solves problems independently

[illegible]

## Chapter 8 : Introduction to Trigonometry

### Activity 1 Measuring Heights Without Climbing!



35 mins

#### Instructions

- Start with an engaging question:
  - "Have you ever wondered how we measure the height of a tall tree or a building without actually climbing it?"
  - "How do engineers and surveyors find the height of a mountain or the depth of a valley?"

Today, we will discover a method that makes this possible—Trigonometry!
- Then take students outside to an open area where a tall object (e.g., flagpole, tree, or boundary wall) is visible.
- Assign one student to participate** in the demonstration.
- Ask the student to use a school notebook or textbook:
  - Instruct the student to hold the notebook **flat at eye level** and **tilt it upward slowly** while stepping back from the object.
  - When the **top edge of the notebook points exactly at the top** of the object, **stop** and mark the student's position on the ground.
- Measure the **horizontal distance** between the student and the base of the object and the **height of the student's eyes** from the ground using a simple measuring tape or scale.
- Use the  **$\tan \theta = \text{height/distance}$**  formula to estimate the height of the object. Where  $\theta$  is the measured angle of elevation, and **distance** is the horizontal distance between the observer and the base of the object.
  - Explain:** This formula comes from right-angle trigonometry, where  **$\tan(\theta) = \text{opposite/adjacent}$** . Here, the object's height is the opposite side, and the distance from it is the adjacent. So, by measuring the angle and distance, we can find the height.
- Compare this estimated height** with any known or measured height of the object (if available).
- Wrap up the activity by highlighting real world applications like **GPS, Land surveying, Astronomy, Satellite tracking**, etc.

### Activity 2 Shadow Play



35 mins

#### Instructions

- Start by asking the students, a relatable situation:
  - "Have you noticed how your shadow changes length at different times of the day?"

- o “What if I told you that you can calculate the height of a lamp post just by looking at its shadow?”  
Let’s try it out!
- Take students outside during a sunny day.
  - o If it’s cloudy or not feasible, use a torch or candle indoors to cast shadows of objects (like a pencil or stick) on a sheet of paper to perform the same measurements.
- Measure the height of one student and the length of their shadow.
- Measure the **shadow of a tall object** like a pole or a tree.
- Using similar triangles and trigonometry:
  - o  $\tan \theta = \text{height/shadow length}$
  - o Find the angle of elevation of the sun using the formula.
- Discuss how this principle is used in **architecture, astronomy, and timekeeping (sundials)**.
- Wrap up the activity by:
  - o Showing how **angles of elevation and depression** are applied in real-world problems, from **aircraft navigation to civil engineering**.
  - o Discussing the significance of trigonometry in designing solar panels based on the angle of the sun.

## Activity 3 Building Right-Angled Triangle



35 mins

### Instructions

- Start with a question:
  - o “Can we create our own right-angled triangles and test trigonometric formulas? Let’s do it using just ropes and sticks!”.
- Provide students with:
  - o Strings
  - o Measuring Tapes
- Ask them to form a **right-angled triangle** by measuring and tying three segments (e.g., 3m, 4m, 5m).
  - o Explain them that according to the Pythagorean Theorem, if the square of the longest side (hypotenuse) equals the sum of squares of the other two sides, the triangle is a right triangle. So, using ropes of 3m, 4m, and 5m will always form a right-angled triangle when arranged properly.
- Have them check if **Pythagoras’ Theorem** holds:
  - o  $a^2 + b^2 = c^2$
  - o where, a and b are sides (base & altitude), and c is the hypotenuse.
- Introduce **trigonometric ratios** and ask them to calculate **sin, cos, tan** for different angles.
  - o Note: Trigonometric ratios help us **find unknown angles and sides in right-angled triangles**, which is essential in fields like engineering, architecture, navigation, and physics.
- Compare their calculated values with a **trigonometry table**.
- Wrap up the activity by:
  - o Discussing how right-angled triangles are used in **architecture, bridge construction, and satellite communication**.
  - o Showing the importance of **Pythagoras’ Theorem** in trigonometry.

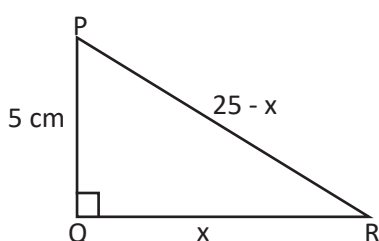
# Assessment



60 mins

Answer the following questions:

- The value of  $1 + \tan^2 45^\circ$  is:
  - 1
  - 0
  - 1
  - 2
- In  $\triangle ABC$  right angle at B, if  $AC = 13\text{cm}$ ,  $BC = 5\text{ cm}$  and  $AB = 12\text{ cm}$  then  $\sin A$  is equal to:
  - $\frac{13}{5}$
  - $\frac{5}{13}$
  - $\frac{12}{13}$
  - $\frac{13}{12}$
- The relation between  $\sin \theta$ ,  $\cos \theta$  and  $\cot \theta$  is:
  - $\frac{\cos \theta}{\sin \theta} = \cot \theta$
  - $\frac{\sin \theta}{\cos \theta} = \tan \theta$
  - $\frac{\tan \theta}{\sin \theta} = \cos \theta$
  - $\frac{\tan \theta}{\cos \theta} = \sin \theta$
- If  $\theta = 30^\circ$  then the value of  $\cos 2\theta - \sin 2\theta$  is:
  - 1
  - $\frac{1}{2}$
  - $-\frac{1}{2}$
  - 1
- $\sin 2A = 2 \sin A$  is true when A equals to:
  - $0^\circ$
  - $30^\circ$
  - $45^\circ$
  - $60^\circ$
- Find the value of  $\frac{(1-\tan^2 45^\circ)}{(1+\tan^2 45^\circ)}$
- What is the value of  $(\sec^2 A - 1)(\operatorname{cosec}^2 A - 1)$ ?
- If  $\operatorname{cosec} \theta = \frac{5}{4}$ , find the value of  $\cot \theta$ .
- If  $\tan 2A = \cot (A - 18^\circ)$ , where  $2A$  is an acute angle, find the value of A.
- In triangle PQR, right-angled at Q,  $PR + QR = 25\text{ cm}$  and  $PQ = 5\text{ cm}$ . Determine the values of  $\sin P$ ,  $\cos P$  and  $\tan P$ .



# Answer Key

1. (d) 2
2. (b)  $\frac{5}{13}$
3. (a)  $\frac{\cos \theta}{\sin \theta} = \cot \theta$
4. (b)  $\frac{1}{2}$
5. (d)  $0^\circ$
6.  $\frac{(1-1^2)}{(1+1^2)} = \frac{(1-1)}{(1+1)} = \frac{0}{2} = 0$
7.  $\tan^2 A \times \cot^2 A \Rightarrow \frac{\tan^2 A \times 1}{\tan^2 A} \Rightarrow 1$
8. We know that  $\cot 2\theta = \operatorname{cosec} 2\theta - 1 = \left(-\frac{5}{4}\right)2 - 1 \Rightarrow \frac{25}{16} - 1 \Rightarrow 25 - \frac{16}{16}$   
 $\cot^2 \theta = \frac{9}{16} \Rightarrow \cot \theta = \frac{3}{4}$
9. Given,  $\tan 2A = \cot (A - 18^\circ)$   
 As we know by trigonometric identities,  $\tan 2A = \cot (90^\circ - 2A)$   
 Substituting the above equation in the given equation, we get:  
 $\Rightarrow \cot (90^\circ - 2A) = \cot (A - 18^\circ)$   
 Therefore,  $\Rightarrow 90^\circ - 2A = A - 18^\circ \Rightarrow 108^\circ = 3A \Rightarrow A = \frac{108^\circ}{3}$   
 Hence, the value of  $A = 36^\circ$
10. Given, In triangle PQR,  $PQ = 5$  cm and  $PR + QR = 25$  cm  
 Let us say,  $QR = x \Rightarrow PR = 25 - QR = 25 - x$   
 Using Pythagoras theorem:  
 $PR^2 = PQ^2 + QR^2$   
 Now, substituting the value of PR, PQ and QR, we get:  
 $(25 - x)^2 = (5)^2 + (x)^2$   
 $25^2 + x^2 - 50x = 25 + x^2$   
 $625 - 50x = 25$   
 $50x = 600$   
 $x = 12$   
 So,  $QR = 12$  cm  
 $PR = 25 - QR = 25 - 12 = 13$  cm  
 Therefore,  
 $\sin P = \frac{QR}{PR} = \frac{12}{13}$   
 $\cos P = \frac{PQ}{PR} = \frac{5}{13}$   
 $\tan P = \frac{QR}{PQ} = \frac{12}{5}$

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**Level 3:** Solves problems independently

[illegible]

## Chapter 11 : Areas Related to Circles

### Activity 1 The Pizza Problem



35 mins

#### Instructions

- Start the class by asking students,
  - o "Imagine you and your friends have two circular paper plates. If I ask you to divide one into equal parts, how will you do it?"
  - o "Now, if one plate is larger than the other, how can we compare how much more space it has?"  
Let's find out by learning about the area of circles!
- Bring **two different-sized circular lids, bangles, or cutouts from paper/cardboard** in the class.
- Measure the **radius** of both circles and note them down.
- Ask students to calculate the **area using  $A = \pi r^2$**
- Compare the area of both circles and discuss:
  - o Does doubling the radius double the area?
  - o How does the area change with the increase in radius?
- Ask students to slice one of the circles into equal parts and rearrange it into a **rectangle-like shape** to show why the area formula works.
- Wrap up the activity by:
  - o Discussing how **radius plays a crucial role** in the area of a circle.
  - o Relating it to **real-life applications** like designing round tables, Ferris wheels, and circular gardens.

### Activity 2 Playground Walk



35 mins

#### Instructions

- Begin the class by saying:  
"Have you ever seen a running track or a circular playground? How do we measure the boundary of such a round field?"  
Today, let's explore how to calculate the **circumference** of a circle!
- Take students to the **school playground** or any **circular track**.
  - o If a circular track is not available, create one using white powder on the ground or draw a circle with chalk in the classroom.
- Ask one student to **walk around the boundary** of the circular track while another student measures the **diameter**.

- Use the formula  $C=2\pi r$  to **compare the estimated circumference with the actual steps taken** by the student.
- Let students try measuring the circumference of other circular objects like bicycle wheels or bottle caps in the classroom.
- Wrap up the activity by:
  - o Discussing the role of circumference in **tire manufacturing, athletics tracks, and even astronomy**.
  - o Explaining
  - o how engineers use these calculations when designing roundabouts and tunnels.

## Activity 3 Clock Decoded



35 mins

### Instructions

- Ask the students in the class:  
"Have you ever looked at a clock and noticed how the hands move? The hour and minute hands sweep out different angles over time. But can we calculate the distance travelled by the tip of the minute hand?"  
Let's find out!
- Ask students to observe a **wall clock** with a **minute hand of known length (say 10 cm)**.
- Discuss how the **minute hand moves in a circular path**, forming **arcs every 5 minutes**.
- Use the formula  $\text{arc length} = \frac{\theta}{360 \times 2\pi r}$  to calculate:
  - o Distance travelled by the minute hand in **5 minutes (30° arc)**.
  - o Distance in **15 minutes (90° arc)**.
  - o Distance in **30 minutes (180° arc)**.
- Wrap up the activity by:
  - o Discussing how **clocks are based on circle mathematics** and how **engineers use these principles in mechanical designs**.
  - o Highlighting the importance of arc length in **navigation, GPS calculations, and astronomy**.



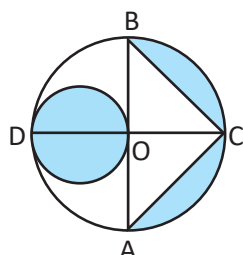
# Assessment



60 mins

Answer the following questions:

- The portion (or part) of the circular region enclosed by two radii and the corresponding arc is called the/an:
  - Arc of the circle
  - Perimeter of a circle
  - Sector of a circle
  - Segment of a circle
- The Area of a circle is  $49\pi \text{ cm}^2$ . Its circumference is:
  - $7\pi \text{ cm}$
  - $14\pi \text{ cm}$
  - $21\pi \text{ cm}$
  - $28\pi \text{ cm}$
- The angle made by the minute hand of a clock at its centre in 15 minutes duration is:
  - 600
  - 1800
  - 800
  - 900
- If the circumference of a circle increases from  $2\pi$  to  $4\pi$ , then its area is:
  - Four times
  - Triples
  - Doubled
  - Halved
- In a circle of radius 21cm, an arc subtends an angle of 600 at the centre. The length of an arc is: (take  $\pi = \frac{22}{7}$ )
  - 22 cm
  - 44 cm
  - 132 cm
  - 231 cm
- What is the area of a circle whose circumference is 44 cm?
- Calculate the area of a sector of angle  $60^\circ$ . Given, the circle has a radius of 6 cm.
- The cost of fencing a circular field at the rate of Rs. 24 per metre is Rs. 5280. The field is to be ploughed at the rate of Rs. 0.50 per  $\text{m}^2$ . Find the cost of ploughing the field (Take  $\pi = \frac{22}{7}$ ).
- In the figure, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle. If OA = 7 cm, find the area of the shaded region.



- The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?

# Answer Key

1. (c) Sector of a circle

2. (b)  $14\pi$  cm

3. (d) 900

4. (a) Four times

5. (a) 22 cm

6. Circumference of a circle =  $2\pi r$

$$\text{From the question, } 2\pi r = 44 \Rightarrow r = \frac{22}{\pi}$$

$$\text{Now, area of circle} = \pi r^2 = \pi \times \left(\frac{22}{\pi}\right)^2$$

$$\text{So, area of circle} = \frac{(22 \times 22)}{\pi} = 154 \text{ cm}^2$$

7. Given, The angle of the sector =  $60^\circ$

$$\text{Using the formula, The area of sector} = \left(\frac{\theta}{360^\circ}\right) \times \pi r^2$$

$$= \left(\frac{60^\circ}{360^\circ}\right) \times \pi r^2 \text{ cm}^2 \Rightarrow \text{area of the sector} = 6 \times \frac{7}{22} \text{ cm}^2 = \frac{132}{7} \text{ cm}^2$$

$$8. \text{ Length of the fence (in metres)} = \frac{\text{Total cost}}{\text{Rate}} = \frac{5280}{24} = 220$$

So, the circumference of the field = 220 m

$$\text{If } r \text{ metres is the radius of the field, then } 2\pi r = 220 \Rightarrow 2 \times \left(\frac{22}{7}\right) \times r = 220 \Rightarrow r = \frac{(220 \times 7)}{(2 \times 22)} \Rightarrow r = 35$$

Hence, the radius of the field = 35 m

$$\text{Area of the field} = \pi r^2 = \left(\frac{22}{7}\right) \times 35 \times 35 = 22 \times 5 \times 35 \text{ m}^2 = 3850 \text{ sq. m.}$$

Cost of ploughing  $1 \text{ m}^2$  of the field = Rs. 0.50

So, the total cost of ploughing the field =  $3850 \times \text{Rs. } 0.50 = \text{Rs. } 1925$

9. Radius of larger circle,  $R = 7$  cm

$$\text{Radius of smaller circle, } r = \frac{7}{2} \text{ cm}$$

Height of  $\triangle BCA = OC = 7$  cm

Base of  $\triangle BCA = AB = 14$  cm

$$\text{Area of } \triangle BCA = \frac{1}{2} \times AB \times OC = \frac{1}{2} \times 7 \times 14 = 49 \text{ cm}^2$$

$$\text{Area of larger circle} = \pi R^2 = \frac{22}{7} \times 7^2 = 154 \text{ cm}^2$$

$$\text{Area of larger semicircle} = 154/2 \text{ cm}^2 = 77 \text{ cm}^2$$

$$\text{Area of smaller circle} = \pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2} \text{ cm}^2$$

Area of the shaded region = Area of the larger circle – Area of a triangle – Area of larger semicircle + Area of the smaller circle

$$\Rightarrow \text{Area of the shaded region} = (154 - 49 - 77 + 77/2) \text{ cm}^2 = 66.5 \text{ cm}^2$$

$$10. \text{ The radius of car's wheel} = \frac{80}{2} = 40 \text{ cm (as } D = 80 \text{ cm)}$$

So, the circumference of wheels =  $2\pi r = 80\pi$  cm

Now, in one revolution, the distance covered = circumference of the wheel =  $80\pi$  cm It is given that the distance covered by the car in 1 hr = 66 km

Converting km into cm we get, Distance covered by the car in 1 hr =  $(66 \times 10^5)$  cm

$$\text{In 10 minutes, the distance covered will be} = \frac{(66 \times 10^5 \times 10)}{60} = 1100000 \text{ cm/s}$$

$$\therefore \text{Distance covered by car} = 11 \times 10^5 \text{ cm}$$

Now, the no. of revolutions of the wheels = (Distance covered by the car / Circumference of the wheels)

$$= \frac{11 \times 10^5}{80\pi} = 4375.$$

## Learning Level Tracker

Keep a record of unit/chapter assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

**Level 3:** Solves problems independently

[illegible]

## Chapter 13: Statistics

### Activity 1 The Morning Commute – Average Travel Time



35 mins

#### Instructions

- Begin by setting a familiar scene:  
“Every day, we all travel to school – some walk, some take a cycle, others a bus. Let’s find out how long each of us takes to reach school!”
- Before class, prepare slips and hand them to each student, asking them to write their **travel time (in minutes)** to school. Collect the slips.
- On the board, create intervals (like 0–10, 10–20, 20–30... up to 60) and invite students to come forward to tally the data into a grouped frequency table.
- Choose an **assumed mean** (say 30) and guide students through the **step deviation method** to calculate the **mean** step-by-step:
  - Find the midpoints ( $x_i$ ) of each interval
  - Calculate the deviation from the assumed mean ( $A$ ), i.e.,  $(x_i - A)$
  - Find the step deviation ( $u_i$ ), where  $u_i = (x_i - A) / h$ , and  $h$  is the class width
  - Apply the formula: **Mean** =  $A + (\sum f_i u_i / \sum f_i) \times h$
- Here:
  - $f_i$  is the frequency,
  - $u_i$  is the step deviation,
  - $A$  is the assumed mean,
  - $h$  is the class width,
  - $x_i$  is the midpoint of each class interval.
- Once calculated, pose questions:
  - “How close is this average to your time?”
  - “Is the assumed mean we picked helpful?”
  - “Where could this be useful in the real world?”
- Wrap up the activity by telling the real world use as  
“This method is a powerful tool for analysts and researchers who handle grouped data daily.”

## Activity 2 Which Score Pops Up the Most?



35 mins

### Instructions

- Start the activity by asking the students:  
"Let's say the class gave a surprise test. Which mark showed up the most?"
- Before class, prepare a fictional dataset of test marks (e.g., 10–20, 20–30, ..., 80–90) with random frequencies. Write it on the board.
- Guide students step-by-step:
  - Identify the modal class (the class interval with the highest frequency)
  - Apply the formula:  $\text{Mode} = l + \frac{(f_1 - f_0) / (2f_1 - f_0 - f_2)}{h} \times h$
- Here:
  - $l$  = lower boundary of the modal class
  - $f_1$  = frequency of the modal class
  - $f_0$  = frequency of the class before the modal class
  - $f_2$  = frequency of the class after the modal class
  - $h$  = class width
- Calculate and discuss:
  - "Is the mode always the most common value?"
  - "Can we have more than one mode?"
- Wrap up the activity by explaining the concept of mode as  
"Mode helps industries identify trends – like most popular shoe sizes, T-shirt sizes, etc."

## Activity 3 Story of a Village – Understanding Median



35 mins

### Instructions

- Start the activity with a scenario:  
"Imagine a small village in Meghalaya where 9 hardworking farmers recorded their daily income. Let's find out what a 'typical' day looks like for them!"
- Divide the class into teams of 4-5 students, each group will work together to solve the problem and discuss findings.
- Display the income data and write the following incomes on the board as:
  - ₹100, ₹150, ₹180, ₹200, ₹220, ₹250, ₹270, ₹300, ₹400
  - Tell students: "These are the daily earnings (in rupees) of 9 farmers in the village."
- Arranging the data:
  - Ask each group to **double-check** that the data is already arranged in ascending order (Explain: **Always arrange before finding the median!**).
- Find the median:
  - Guide them that Number of observations ( $n$ ) = 9 (odd).
  - Median position =  $(n + 1) / 2 = (9 + 1) / 2 = 5\text{th value}$ .
  - Ask groups to find and announce:  
→ **Median = ₹220**

- Add a twist by saying: "Breaking news! A wealthy farmer from the neighbouring town just moved in. He earns ₹5000 a day!"
  - So, add ₹5000 to the list on the board.
  - New Data: ₹100, ₹150, ₹180, ₹200, ₹220, ₹250, ₹270, ₹300, ₹400, ₹5000
- Finding the new median:
  - Now, New  $n = 10$  (even).
  - Median position = Average of 5th and 6th observations.
  - Formula for Median when  $n$  is even:  
$$\text{Median} = ((n/2)^{\text{th}} \text{ term} + (n/2 + 1)^{\text{th}} \text{ term}) / 2$$
  - Here, Median =  $(220 + 250) / 2 = 235$
- Also guide them to find mean as:
  - Total sum = ₹7070,  $n = 10$
  - Mean = Total sum/ $n$  = ₹707
- Give each group **2 minutes** to discuss:
  - Which changed more: the mean or the median?
  - Why is median considered more "reliable" here?

Let them think a bit then discuss about it.

**"The median gives a more honest picture when data includes extreme values. That's why economists, journalists, and researchers often prefer it — because it tells the real middle story!"**

# Assessment



35 mins

- While computing mean of grouped data, we assume that the frequencies are:
  - centred at the class marks of the classes
  - evenly distributed over all the classes
  - centred at the upper limits of the classes
  - centred at the lower limits of the classes
- The \_\_\_\_\_ of a class is the frequency obtained by adding the frequencies of all the classes preceding the given class.
  - Class mark
  - Class height
  - Average frequency
  - Cumulative frequency
- The method used to find the mean of a given data is(are):
  - direct method
  - assumed mean method
  - step deviation method
  - all the above
- The empirical relationship between mean, mode and median in asymmetrical distribution is:
  - $\text{Mode} = 3 \text{ Median} - 2 \text{ Mean}$
  - $\text{Mode} = 3 \text{ Median} + 2 \text{ Mean}$
  - $\text{Mode} = 2 \text{ Median} - 3 \text{ Mean}$
  - $\text{Mode} = \text{Median} - 2 \text{ Mean}$
- Mode is:
  - Least frequent value
  - middle most value
  - Most frequent value
  - none of the above
- Find the mean of the first 10 natural numbers.
- Find the value of  $y$  from the following observations if these are already arranged in ascending order. The Median is 63.  
Values: **20, 24, 42,  $y$ ,  $y + 2$ , 73, 75, 80, 99**
- While checking the value of 20 observations, it was noted that 125 was wrongly noted as 25 while calculating the mean and then the mean was 60. Find the correct mean.
- Construct the cumulative frequency distribution of the following distribution:

| Class       | Frequency |
|-------------|-----------|
| 12.5 – 17.5 | 2         |
| 17.5 – 22.5 | 22        |
| 22.5 – 27.5 | 19        |
| 27.5 – 32.5 | 14        |
| 32.5 – 37.5 | 13        |

- An aircraft has 120 passenger seats. The number of seats occupied during 100 flights are given in the following table:

| Number of seats | 100-104 | 104-108 | 108-112 | 112-116 | 116-200 |
|-----------------|---------|---------|---------|---------|---------|
| Frequency       | 15      | 20      | 32      | 18      | 15      |

# Answer Key

- a) Centred at the class marks of the classes
- d) Cumulative frequency
- d) all the above
- a) Mode = 3 Median – 2 Mean
- c) Most frequent value
- The first 10 natural numbers are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10  
Mean =  $(1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10) / 10 = 55/10 = 5.5$
- As the number of observations made is odd, so the median will be the middle term, i.e.  $y + 2$ .  
Therefore,  $y + 2 = 63$   $y = 63 - 2 = 61$
- Let  $y$  be the sum of observation of 19  $(20 - 1)$  numbers leaving 125.  
So,  $y + 25 = 20 \times 60 = 1200$  {Mean = (sum of observations/ no. of observations)}  
As we know,  $x + 25 = 20 \times 60 = 1200$   
Also  $x + 125 = 20 \times y = 20y$   
Next, Subtract  $125 - 25 = 20y - 1200 \Rightarrow 20y = 1300 \Rightarrow y = 65$
- The cumulative frequency distribution of the given distribution is given below:

| Class       | Frequency | Cumulative frequency |
|-------------|-----------|----------------------|
| 12.5 – 17.5 | 2         | 2                    |
| 17.5 – 22.5 | 22        | 24                   |
| 22.5 – 27.5 | 19        | 43                   |
| 27.5 – 32.5 | 14        | 57                   |
| 32.5 – 37.5 | 13        | 70                   |

| Class Interval | Class Marks (xi) | Frequency (fi)                          | Deviation (di = xi – a) | fidi                                 |
|----------------|------------------|---|-------------------------|--------------------------------------|
| 100 – 104      | 102              | 15                                      | – 8                     | – 120                                |
| 104 – 108      | 106              | 20                                      | – 4                     | – 80                                 |
| 108 – 112      | 110              | 32                                      | 0                       | 0                                    |
| 112 – 116      | 114              | 18                                      | 4                       | 72                                   |
| 116 – 120      | 118              | 15                                      | 8                       | 120                                  |
|                |                  | <b>N = <math>\Sigma fi = 100</math></b> |                         | <b><math>\Sigma fidi = -8</math></b> |

- $\therefore$  Assumed mean,  $a = 110$   
Class width,  $h = 4$   
And total observations,  $N = 100 = 110 + (-8/100) = 110 - 0.08 = 109.92$   
But we know that the seats cannot be in decimal.  
Therefore, the number of seats = 109 (approx.)



## Learning Level Tracker

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[illegible]

## Chapter 14 : Probability

### Activity 1 Lucky Draw Raffle



35 mins

#### Instructions

- Start by announcing an exciting situation:  
“Today, we’ll host a lucky draw to win... a homework-free pass!”
- Before class, prepare 10 folded chits – 6 with the word “Try Again” and 4 with “Winner” written on them. Put them in a box.
- Ask each student to come up, pick a chit, and show it. After each pick, replace the chit back to keep total outcomes unchanged.
- On the board, create a tally:
  - How many “Winners” vs “Try Again” were picked?
  - Ask students to calculate the theoretical probability of winning.
  - Guide students to calculate the theoretical probability of winning:  
Explain that the probability of an event is calculated as:  
 $\text{Probability} = (\text{Number of favourable outcomes}) / (\text{Total number of outcomes})$   
In this case, there are 4 “Winner” chits out of 10 total chits, so the theoretical probability is  $4/10$  or  $0.4$ .
  - Compare this with the actual outcomes from the experiment.
- Continue the activity with engaging variations:
  - What happens if we do not replace the chits after each draw?
  - What if every student gets a unique chit with only one chance to pick?
- Wrap up by connecting to real-world examples:
- **“This is the logic behind lotteries, quiz bowl draws, and even getting selected for a scholarship!”**

### Activity 2 Deck Detectives



35 mins

#### Instructions

- Begin the class by saying:  
“Imagine you’re strategists in a board game championship. Your power? Logic and probability!”
- Prepare the materials before the class:
  - Use a set of marbles (12 total), with 3 marbles of each colour: red, blue, green, and yellow.
  - If the marbles are not already coloured, you can colour them before the class to make them clearly distinguishable. For example, paint 3 marbles red, 3 marbles blue, 3 marbles green, and 3 marbles yellow.
- Divide the class into small groups of 4-5 students:
  - **Group A:** One group will focus on calculating the probability of drawing a red or blue marble.

- **Group B:** Another group will focus on calculating the probability of drawing a green or yellow marble.
- **Group C:** The remaining group can focus on exploring probabilities involving “not” a certain colour.
- Explain the setup:
  - “You have 12 marbles in a jar, with 3 marbles of each colour: red, blue, green, and yellow.”
  - Explain the total number of marbles and the number of each colour.
- Distribute a set of 5-6 question cards (written beforehand) randomly each group, such as:
  - “What’s the probability of drawing a red marble?”
  - “What’s the probability of drawing a blue marble?”
  - “What’s the probability of drawing a green marble?”
  - “What’s the probability of drawing a marble that is not green?”
  - “What’s the probability of drawing a marble that’s not yellow?”
- Let groups discuss and write answers:
  - Allow each group to discuss their questions and write down their answers. Ensure that students collaborate and explain their reasoning within their groups.
  - Once they are ready, call on each group to share their findings and explain why they chose their answers. Encourage them to walk through their calculations and logic.
- Add a “wild Entry round”:
  - Secretly remove 1 or 2 marbles from the jar
  - Ask the students how this change affects the probability. Have them revise their calculations based on the new scenario (If marbles are removed, the total number of marbles decreases, which changes the probability. The probabilities for each colour will need to be recalculated based on the new number of marbels.)
- Wrap up with:
 

**“Card games are full of probability – from blackjack to poker. Even shuffling is a statistical wonder!”**

## Activity 3 The Colour Count



35 mins

### Instructions

- Set the context with an engaging scenario and tell students:
 

“If you could randomly grab one candy from this jar... what’s your best bet for getting your favourite colour?”

To make it more engaging, draw a simple picture of a jar on the board or use cut-outs of candies in different colours (e.g., red, blue, yellow, green). You can label the number of each colour or use coloured paper balls/cut-outs to represent the candies.
- Before class, prepare a jar of coloured beads/candies/paper balls: e.g., 5 red, 3 blue, 2 yellow, 4 green, and show the jar to the students, explaining that each candy represents a different colour.
- Let each student draw one candy (without looking) and record their result:
  - Each student will take turns drawing one candy from the jar (without looking), recording the colour they picked, and then returning the candy to the jar before the next student draws.
  - After each student draws, ask them to write down the colour they picked on the board.

- Track the colour tallies and calculate the probabilities:
  - On the board, track the number of times each colour is picked by tallying the results.
  - **Theoretical Probability:**  
Discuss how to calculate the theoretical probability of picking each colour. For example, the probability of picking a red candy is the number of red candies divided by the total number of candies.  
 **$P(\text{red}) = \frac{\text{Total number of candies}}{\text{Number of red candies}}$**
  - **Experimental Probability:**  
Calculate the experimental probability by dividing the number of times a specific colour was picked by the total number of draws.
- Ask engaging questions to begin discussion:
  - “What if we remove the yellow candies entirely? How would that affect the probability?”
  - “What happens if we don’t return the candy each time? How would this change the probabilities?”
- Wrap up the activity by telling:  
**“Probability shows up in packaging, design, and even flavours – ever wonder why certain colours show up more often?”**

# Assessment



35 mins

Answer the following questions:

- The probability of a sure Event is:
  - 0
  - $\frac{1}{2}$
  - 1
  - Non-existent
- If the probability of a player winning a game is 0.79, then the probability of his losing the same game is:
  - 1.79
  - 0.31
  - 0.21%
  - 0.21
- The probability that a non-leap year has 53 Sundays is:
  - $\frac{1}{7}$
  - $\frac{2}{7}$
  - $\frac{5}{7}$
  - $\frac{6}{7}$
- A letter is selected at random from the letters of the words 'MATHEMATICS' then the probability of getting the letter M is:
  - $\frac{2}{11}$
  - $\frac{6}{11}$
  - $\frac{4}{11}$
  - $\frac{5}{11}$
- A die is thrown once, then the probability of getting an even prime number is:
  - $\frac{1}{6}$
  - $\frac{1}{2}$
  - $\frac{1}{3}$
  - $\frac{2}{3}$
- Find the distance of the point P (2, 3) from the x-axis.
- A die is thrown once. What is the probability of getting a number less than 3?
- The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap?
- 12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether it is defective or not. One pen is taken out at random from this lot. Determine the probability that the pen is taken out is a good one.
- A letter is chosen at random from the letters of the word "ASSASSINATION", then the probability that the letter chosen is a vowel is in the form of  $\frac{6}{(2x+1)}$ , then x is equal to.

# Answer Key

1. c) 1
2. d) 0. 21
3. a)  $1/7$
4. a)  $2/11$
5. a)  $1/6$
6. Given that a die is thrown once.  
 Total number of outcomes =  $n(S) = 6$  i.e.  $S = \{1, 2, 3, 4, 5, 6\}$   
 Let E be the event of getting a number less than 3.  
 $n(E)$  = Number of outcomes favourable to the event  $E = 2$ , Since  $E = \{1, 2\}$   
 Hence, the required probability =  $P(E) = n(E)/n(S) = 2/6 = 1/3$
7. Let P (x, y) be equidistant from the points A (7, 1) and B (3, 5).  
 Then,  $AP = BP$   $AP^2 = BP^2$   
 Using the distance formula,  $(x - 7)^2 + (y - 1)^2 = (x - 3)^2 + (y - 5)^2$   
 $\Rightarrow x^2 - 14x + 49 + y^2 - 2y + 1 = x^2 - 6x + 9 + y^2 - 10y + 25$   
 $\Rightarrow x - y = 2$   
 Hence, the relation between x and y is  $x - y = 2$ .
8. Given, Total number of apples in the heap =  $n(S) = 900$   
 Let E be the event of selecting a rotten apple from the heap.  
 Number of outcomes favourable to E =  $n(E)$   
 $P(E) = n(E)/n(S) \Rightarrow 0.18 = n(E)/900 \Rightarrow n(E) = 900 \times 0.18 \Rightarrow n(E) = 162$   
 Therefore, the number of rotten apples in the heap = 162
9. Numbers of pens = Numbers of defective pens + Numbers of good pens  
 $\therefore$  Total number of pens =  $132 + 12 = 144$  pens  
 $P(E) = (\text{Number of favourable outcomes}) / (\text{Total number of outcomes})$   
 $P(\text{picking a good pen}) = 132/144 = 11/12 = 0.916$   
 Given A letter is chosen at random from the letters of the word 'ASSASSINATION', then the probability that the letter chosen is a vowel and is in the form of  $6/2x+1$  then x is equal to So the word ASSASSINATION comprises of 13 letters and 6 vowels.  
 So out of these letters one letter can be chosen in 13 ways.  
 So, we have number of events is 6 and number of outcomes is 13  
 Also Probability is of the form  $6 / 2x + 1$   
 So Probability P = Number of events / number of outcomes  
 $\Rightarrow 6/(2x + 1) = 6 / 13$   
 $\Rightarrow 1/2x + 1 = 1/13$   
 $\Rightarrow 2x + 1 = 13$   
 $\Rightarrow 2x = 13 - 1$   
 $\Rightarrow 2x = 12 \Rightarrow x = 12 / 2 \Rightarrow x = 6$

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[illegible]

## Chapter 3: Pair of Linear Equations in two Variables

### Activity 1 Act it Out – You Be the Equation!



35 mins

#### Instructions

- Start by saying:  
“You are not just students today—you are variables and equations!”
- Prepare a group of 4 students and designate their roles, for example:
  - One student is  $x$
  - Another is  $y$
  - Two others hold equation cards:  
→  $x + y = 10$   
→  $x = 2y$
- Ask them:
  - “If  $x = 2y$ , then what can you substitute in the first equation ( $x + y = 10$ )?”
  - Let the “ $x$ ” student act it out:  
→ Replaces himself with “ $2y$ ” in the first equation.
  - Now solve together, calculate values, and assign them back to the students (e.g.,  $y = 2$ ,  $x = 4$ )
- Repeat with different sets of equations, rotating student roles.
- Wrap up the activity with:  
“Substitution is like putting one truth into another—making things simpler!”

### Activity 2 Bus Route Riddle – Where Do They Meet?



35 mins

#### Instructions

- Start with a scenario to grab attention:  
““There are two bus routes in our city. One starts from Point A and follows the route: ‘ $y = 2x + 1$ ’, while the other starts from Point B and follows: ‘ $y = -x + 7$ ’. Can you figure out where the buses will cross paths?””
- On the classroom board/floor/chart paper/graph paper draw the coordinate plane.
- Divide students into two teams:
  - One team will plot Bus Route A (using the equation  $y = 2x + 1$  and different values of  $x$  and  $y$ , such as  $(0,1)$ ,  $(1,3)$ ,  $(2,5)$ , etc.).
  - The other team will plot Bus Route B (using the equation  $y = -x + 7$  and different values of  $x$  and  $y$ , such as  $(0,7)$ ,  $(1,6)$ ,  $(2,5)$ , etc.).
- Once both lines are plotted, ask:



- Where do they intersect?
  - What does the point of intersection mean in this context?
- Now extend the activity with:
  - Give a new pair of equations with **no solution** (parallel lines).
  - Or a pair that **coincides** (infinitely many solutions).
- Wrap up with a discussion:
 

**“Graphical solutions help us visualise the concept of solutions – where two conditions (or lines) meet, never meet, or overlap completely!”**

## Activity 3 Solve It Like a Detective



35 mins

### Instructions

- Begin the class with telling students:
 

“You’re detectives trying to solve two clues at once. Both are true. But to find the criminal (values of  $x$  and  $y$ ), we need to eliminate one suspect first!”
- Write a system of equations on the board:
  - $3x + 2y = 16$
  - $5x - 2y = 4$
- Ask the class:
  - “Looking at these two equations, what do you notice about the coefficients of  $y$ ?” (In this case, the coefficients of  $y$  are  $+2$  and  $-2$ . This is important because when you add or subtract these equations, the  $y$  terms can cancel each other out.)
  - “Can we add or subtract these equations to eliminate  $y$ ? What do you think will happen if we add them?”
- Walk through the solution interactively on the board and try to solve the equation step by step:
  - The coefficients of  $y$  are opposites ( $+2$  and  $-2$ ), so we can **add** the equations to eliminate the  $y$  terms.
  - Now, let’s add the left-hand sides and the right-hand sides:  
 $(3x + 2y) + (5x - 2y) = 16 + 4$ ; This simplifies to  $8x = 20$ , Thus  $x = 2.5$
  - Once we have  $x = 2.5$ , substitute this value back into one of the original equations (for example,  $3x + 2y = 16$ ) to solve for  $y$ .
- Hand out 3 more systems of equations to student pairs, divide them into pairs and give each pair a new system of equations to solve, proceed:
  - Form pairs with your classmates.
  - Each pair will receive a system of equations.
  - Some systems will require adding the equations, some will require subtracting them, and some will need multiplying one or both equations first to align the coefficients for elimination.
- Examples of systems:
  - Pair 1:  
 $4x + 3y = 10$   
 $2x - 3y = 42$   
 (Here, you can add the equations because the coefficients of  $y$  are opposites.)
  - Pair 2:  
 $3x - y = 12$   
 $5x + y = 14$

(Here, you should add the equations because the coefficients of  $y$  are opposites.)

- Pair 3:

$$6x+4y=18$$

$$3x+2y=10$$

(In this case, you might need to multiply one or both equations to make the coefficients of  $y$  the same before subtracting.)

- Invite pairs to share their solutions, as each pair solves their system, let them share:
  - What did you eliminate?
  - What method did you choose (addition, subtraction, or multiplication)? Why did you choose that method?
- Conclude the activity by talking about the method of elimination

**“Like in real cases, elimination works when you cleverly cancel one part and focus on what remains.”**

# Assessment



45 mins

Answer the following questions:

- If the graphs of two lines pass through the same points, then the system of equations representing these lines is:
  - consistent
  - inconsistent
  - consistent dependent
  - inconsistent and dependent
- The pair of equations  $x = a$  and  $y = b$  graphically represents lines which are:
  - parallel
  - intersecting at  $(b, a)$
  - coincident
  - intersecting at  $(a, b)$
- Which of the following method(s) is/are used to find the solution of a pair of linear equations algebraically?
  - Substitution Method
  - Elimination Method
  - Cross- multiplication Method
  - All the above
- If  $(6, k)$  is a solution of the equation  $3x + y - 22 = 0$  then the value of  $k$  is:
  - 4
  - 3
  - 4
  - 3
- If the lines  $3x + 2ky - 2 = 0$  and  $2x + 5y + 1 = 0$  are parallel, then what is the value of  $k$ ?
  - $4/15$
  - $15/4$
  - $4/5$
  - $5/4$
- Find the solution of the equations  $x - y = 2$  and  $x + y = 4$ .
- The angles of cyclic quadrilaterals ABCD are:  $A = (6x + 10)^\circ$ ,  $B = (5x)^\circ$ ,  $C = (x + y)^\circ$  and  $D = (3y - 10)^\circ$ . Find the value of  $x$  and  $y$ .
- The father's age is six times his son's age. Four years hence, the age of the father will be four times his son's age. Find the present ages, in years, of the son and the father.
- The coach of a cricket team buys 7 bats and 6 balls for Rs.3800. Later, she buys 3 bats and 5 balls for Rs.1750. Find the cost of each bat and each ball.
- Solve the following pairs of equations by reducing them to a pair of linear equations:
 
$$\frac{1}{2}x + \frac{1}{3}y = 2$$

$$\frac{1}{3}x + \frac{1}{2}y = \frac{13}{6}$$

# Answer Key

1. c) consistent dependent
2. d) intersecting at (a, b)
3. d) All the above
4. a) 4
5. b) 15/4
6.  $x - y = 2 \Rightarrow x = 2 + y$

Substituting the value of x in the second equation we get  $\Rightarrow 2 + y + y = 4 \Rightarrow 2 + 2y = 4$

$$2y = 2 \Rightarrow y = 1$$

Now putting the value of y, we get  $\Rightarrow x = 2 + 1 = 3$

Hence, the solutions are  $x = 3$  and  $y = 1$ .

7. We know, in cyclic quadrilaterals, the sum of the opposite angles is  $180^\circ$ .  
Hence,  $A + C = 180^\circ \Rightarrow 6x + 10 + x + y = 180 \Rightarrow 7x + y = 170^\circ$   
And  $B + D = 180^\circ \Rightarrow 5x + 3y - 10 = 180 \Rightarrow 5x + 3y = 190^\circ$   
By solving the above two equations we get:  
 $x = 20^\circ$  and  $y = 30^\circ$ .

8. Let x years be the present age of father and y years be the present age of son.  
According to the given,  
 $(x + 4) = 4(y + 4) \Rightarrow x + 4 = 4y + 16 \Rightarrow x - 4y + 4 - 16 = 0$   
 $x - 4y - 12 = 0 \dots (i)$   
Also,  $x = 6y \dots (ii)$   
From (i) and (ii),  
 $6y - 4y - 12 = 0 \Rightarrow 2y = 12 \Rightarrow y = 6$   
Substituting  $y = 6$  in (ii),  
 $x = 6(6) = 36$

9. Let the cost of a bat be x and the cost of a ball be y.  
According to the question,  $7x + 6y = 3800 \dots (i)$   
 $3x + 5y = 1750 \dots (ii)$   
From (i), we get:  
 $y = (3800 - 7x)/6 \dots (iii)$   
Substituting (iii) in (ii). we get,  
 $3x + 5[(3800 - 7x)/6] = 1750 \Rightarrow 3x + (9500/3) - (35x/6) = 1750 \Rightarrow 3x - (35x/6) = 1750 - (9500/3)$   
 $(18x - 35x)/6 = (5250 - 9500)/3 \Rightarrow -17x/6 = -4250/3 \Rightarrow -17x = -8500 \Rightarrow x = 500$   
Putting the value of x in (iii), we get:  
 $y = (3800 - 7 \times 500)/6 = 300/6 = 50$   
Hence, the cost of a bat is Rs 500, and the cost of a ball is Rs 50.

10. Given,

$$\frac{1}{2}x + \frac{1}{3}y = 2$$

$$\frac{1}{3}x + \frac{1}{2}y = \frac{13}{6}$$

Let us assume  $\frac{1}{x} = m$  and  $\frac{1}{y} = n$ , then the equations will change as follows.

$$\frac{m}{2} + \frac{n}{3} = 2$$

$$\Rightarrow 3m + 2n - 12 = 0 \dots (1)$$

$$\frac{m}{3} + \frac{n}{2} = \frac{13}{6}$$

$$\Rightarrow 2m + 3n - 13 = 0 \dots (2)$$

Now, using cross-multiplication method, we get,

$$\frac{m}{(-26 - (-36))} = \frac{n}{(-24 - (-39))} = \frac{1}{(9 - 4)}$$

$$\Rightarrow \frac{m}{10} = \frac{n}{15} = \frac{1}{5}$$

$$\Rightarrow \frac{m}{10} = \frac{1}{5} \text{ and } \frac{n}{15} = \frac{1}{5}$$

So,  $m = 2$  and  $n = 3$

$$\frac{1}{x} = 2 \text{ and } \frac{1}{y} = 3$$

$$\Rightarrow x = \frac{1}{2} \text{ and } y = \frac{1}{3}$$

**Level 3: Solves problems independently**

[illegible]

## Chapter 4 : Quadratic Equations

### Activity 1 Target Trouble – Hit the Right Value!



35 mins

#### Instructions

- Begin with a scenario,  
“Imagine you're in a game where the score depends on where your ball lands. The scoring pattern follows a formula:  $Score = x^2 + 5x + 6$ . If your score is 0, can you tell me where the ball must've landed?”
- Write the expression on the board:  
→  $Score = x^2 + 5x + 6$
- Ask students to test values mentally or with calculators (or pre-made answer cards) to see what makes the Score zero.
- Once they guess the correct values ( $x = -2$  and  $x = -3$ ), discuss:
  - What is common between the two?
  - Why do these values work?
- Now convert expressions to equation form:
  - Turn expressions like  $x^2 + 7x + 10$  into equations like  $x^2 + 7x + 10 = 0$  and solve them **by factorisation method** (splitting the middle term).
- Wrap up the activity by highlighting  
“Any time we deal with a square term and we're solving for a value – we're likely in the world of quadratic equations!”

### Activity 2 Area Arguments (using Factorisation method)



35 mins

#### Instructions

- Introduce the class with a relatable problem:  
“A rectangular garden has an area of  $77 \text{ m}^2$ . Its length is 4 metres more than its width. Can you figure out its dimensions?”
- Guide the students through setting up the problem:
  - Let's break this down together. We know the width of the garden is unknown, so let's call it ' $x$ '. The length of the garden is 4 meters more than the width, so we can say the length is ' $x + 4$ '. The area of the garden is  $77 \text{ m}^2$ , and we know the area of a rectangle is calculated by multiplying its length and width. So, we'll write the equation as:  $x(x + 4) = 77$ .  
→ Now, let's expand this and form the equation:  $x^2 + 4x - 77 = 0$
- Work together to solve the equation using factorisation formula.
- Test the roots in real-world context (only positive values make sense).

- Create more such problems involving **squares, rooms, plots**, etc. and give them to groups.
- Wrap up the activity by telling:  
**“Quadratic equations help us find hidden dimensions in everyday structures—geometry meets algebra!”**

### Activity 3

## Rocket Launch – Time to Hit the Ground (using Quadratic formula)



35 mins

### Instructions

- Give students a situation:  
 “A rocket is launched, and its height in metres after  $t$  seconds is given by  
 $h = -5t^2 + 20t + 15$ .  
 When will it hit the ground?”
- Frame it by relating it with physics:
  - At ground level, height = 0  
 $\rightarrow -5t^2 + 20t + 15 = 0$
- Multiply both sides of the equation by  $-1$  to simplify:
  - The equation  $-5t^2 + 20t + 15 = 0$  becomes  $5t^2 - 20t - 15 = 0$  after multiplying both the left-hand side (LHS) and right-hand side (RHS) by  $-1$ .
  - Now, solve the equation using the quadratic formula:  
 $t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- Calculate step-by-step with students and interpret the roots:
  - One root will be negative (ignore it)
  - Positive root is time when it lands
- Relate this activity by telling:  
**“This is how physicists predict how long something takes to rise or fall—quadratic equations are all around us!”**



# Assessment



45 mins

- Which of the following is a quadratic equation?
  - $x^2 - 2x = (-2)(3 - x)$
  - $x^2 + 3\sqrt{x} + 2 = 5$
  - $(x - 2)(x + 1) = (x - 1)(x + 3)$
  - $(x + 2)^3 = 2x(x^2 - 1)$
- If  $x = 3$  is a solution of the quadratic equation  $3x^2 + (k - 1)x + 9 = 0$ , then  $k$  equals to:
  - 11
  - 11
  - 13
  - 13
- The roots of the equation  $ax^2 + bx + c = 0$  are non-real if:
  - $b^2 - 4ac = 0$
  - $b^2 - 4ac > 0$
  - $b^2 - 4ac < 0$
  - $b = 0$
- If  $\frac{1}{2}$  is a root of the quadratic equation  $x^2 - kx + 6 = 0$  then the value of  $k$  is:
  - 25
  - 25
  - $\frac{25}{2}$
  - $\frac{25}{4}$
- The Discriminant of the quadratic equation  $x^2 + 8x + 16 = 0$  is:
  - 3
  - 2
  - 1
  - 0
- The sum of two numbers is 27 and product is 182. Find the numbers.
- The sum of areas of two squares is  $468\text{m}^2$ . If the difference of their perimeters is 24cm, find the sides of the two squares.
- Solve the quadratic equation  $2x^2 - 7x + 3 = 0$  by using quadratic formula.
- In a flight of 600 km, an aircraft was slowed due to bad weather. Its average speed for the trip was reduced by 200 km/hr and the time of flight increased by 30 minutes. Find the original duration of the flight.
- Is it possible to design a rectangular park of perimeter 80 and area  $400\text{m}^2$ ? If so, find its length and breadth.

# Answer Key

- a)  $x^2 - 2x = (-2)(3 - x)$
- b) -11
- c)  $b^2 - 4ac < 0$
- c)  $\frac{25}{2}$
- d) 0
- Let  $x$  is one number  
Another number =  $27 - x$   
Product of two numbers = 182

$$\Rightarrow x(27 - x) = 182 \Rightarrow x^2 - 27x - 182 = 0 \Rightarrow x^2 - 13x - 14x + 182 = 0 \Rightarrow x(x - 13) - 14(x - 13) = 0 \Rightarrow (x - 13)(x - 14) = 0 \Rightarrow x = 13 \text{ or } x = 14$$

7. Let, the side of the larger square be  $x$ .

Let, the side of the smaller square be  $y$ .

$$\text{Condition 1} \Rightarrow x^2 + y^2 = 468$$

$$\text{Condition 2} \Rightarrow 4x - 4y = 24 \Rightarrow x = 6 + y \Rightarrow x^2 + y^2 = 468 \Rightarrow (6 + y)^2 + y^2 = 468$$

$$\text{on solving we get } y = 12 \Rightarrow x = (12 + 6) = 18 \text{ m}$$

$\therefore$  The length of the sides of the two squares are 18m and 12m.

8. Given  $2x^2 - 7x + 3 = 0$

On comparing the given equation with  $ax^2 + bx + c = 0$ , we get,  $a = 2$ ,  $b = -7$  and  $c = 3$

By using quadratic formula, we get,  $x = [-b \pm \sqrt{b^2 - 4ac}]/2a \Rightarrow x = [7 \pm \sqrt{49 - 24}]/4$

$$\Rightarrow x = [7 \pm \sqrt{25}]/4 \Rightarrow x = [7 \pm 5]/4$$

$$\text{Therefore, } \Rightarrow x = 7 + 5/4 \text{ or } x = 7 - 5/4 \Rightarrow x = 12/4 \text{ or } 2/4$$

$$\therefore x = 3 \text{ or } \frac{1}{2}$$

9. Let the duration of the flight be  $x$  hours.

$$\text{According to the given, } (600/x) - [600/(x + 1/2)] = 200$$

$$\Rightarrow (600/x) - [1200/(2x + 1)] = 200$$

$$\Rightarrow [600(2x + 1) - 1200x]/[x(2x + 1)] = 200$$

$$\Rightarrow (1200x + 600 - 1200x)/[x(2x + 1)] = 200$$

$$\Rightarrow 600 = 200x(2x + 1) \Rightarrow x(2x + 1) = 3$$

$$\Rightarrow 2x^2 + x - 3 = 0 \Rightarrow 2x^2 + 3x - 2x - 3 = 0$$

$$\Rightarrow x(2x + 3) - 1(2x + 3) = 0 \Rightarrow (2x + 3)(x - 1) = 0 \Rightarrow 2x + 3 = 0, x - 1 = 0$$

$$\Rightarrow x = -3/2, x = 1 \text{ (Time cannot be negative)}$$

$$\text{Therefore, } x = 1$$

Hence, the original duration of the flight is 1 hr

10. Let the length and breadth of the park be  $L$  and  $B$ .

$$\text{Perimeter of the rectangular park} = 2(L + B) = 80$$

$$\text{So, } L + B = 40 \text{ Or, } B = 40 - L$$

Area of the rectangular park =  $L \times B = L(40 - L) \Rightarrow 40L - L^2 = 400 \Rightarrow L^2 - 40L + 400 = 0$ , which is a quadratic equation.

Comparing the equation with  $ax^2 + bx + c = 0$ , we get  $a = 1$ ,  $b = -40$ ,  $c = 400$

$$\text{Since, Discriminant} = b^2 - 4ac \Rightarrow (-40)^2 - 4 \times 400 \Rightarrow 1600 - 1600 = 0$$

$$\text{Thus, } b^2 - 4ac = 0$$

Therefore, this equation has equal real roots.

Hence, the situation is possible.

$$\text{Root of the equation, } L = -b/2a \Rightarrow L = (40)/2(1) = 40/2 = 20$$

$$\text{Therefore, length of rectangular park, } L = 20 \text{ m}$$

$$\text{And breadth of the park, } B = 40 - L = 40 - 20 = 20 \text{ m.}$$

## Learning Level Tracker

Keep a record of unit/chapter assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

**Level 3:** Solves problems independently

[illegible]

## Chapter 5 : Arithmetic Progressions

### Activity 1 Race of Numbers



35 mins

#### Instructions

- Lay down 10 number cards (or write numbers) on the classroom floor, maintaining a pattern with a common difference between the numbers:
  - Example: 5, 8, 11, 14, ..., up to the 10th term
- Assign each student a number and have them **stand** at their value.
- Tell them:
  - “Each of you is a runner. You all started at different points, but you’re all running at the same speed – 3 steps ahead each time. What’s happening here?”
- Ask them:
  - “Who started the earliest?”
  - “Can we predict where the 15th runner would be?”
  - Let students compute and check using  $a + (n - 1) \times d$
- Repeat with a different AP where values decrease.
- Wrap up the activity by stating:
 

**“Arithmetic progressions are like steady runners—fixed speed, consistent changes. You just need the first point and step size to predict anything!”**

### Activity 2 Seats in the Theatre



35 mins

#### Instructions

- Begin with a real scenario:
 

“You’ve gone to watch a play. The front row has 10 seats, the next has 12, and the third has 14. If this continues, how many seats are there in the 15th row?”
- Ask students to identify:
  - First term ( $a = 10$ )
  - Common difference ( $d = 2$ )
- Guide them to find the number of seats in the 15th row  $\rightarrow a + (n - 1) \times d$ 
  - where  $a$  = first term,  $d$  = common difference, and  $n$  = row number.
- Now extend the activity to connect with other concepts:
  - “Can you find the total number of seats in 15 rows?”
  - Use sum formula:  $S_n = n/2 \times [2a + (n - 1) \times d]$
- Give each group a different row pattern:

- E.g., starts from 5 seats and increases by 3 per row: 8 seats decreasing by 1, etc.
- Wrap up the activity by telling:  
**"Theatre seating, staircases, or patterns in flooring—all often follow arithmetic progressions! Spot them in your world."**

## Activity 3 Fill in the Gaps



35 mins

### Instructions

- Ask the students in the class:  
 "Here's a puzzle: I have a series, but some numbers got smudged! Can you fill them in?"
- Write examples like:
  - $\_, 7, \_, 13, \_$
  - $5, \_, \_, 17, \_, 23$
- Encourage students to:
  - Guess the common difference
  - Use the difference to fill in missing terms
- Give 3–4 examples to groups with varying difficulty levels (some easy, some with bigger gaps or negative differences), set conditions like solving within a time limit, and have them explain their logic after solving:
  - Easy:  
 $\_, 7, \_, 13, \_$  (Common difference: 3)
  - Medium:  
 $5, \_, \_, 17, \_, 23$  (Common difference: 3)
  - Tricky (larger gaps):  
 $\_, 12, \_, \_, 24, \_, 30$  (Common difference: 6)
  - Challenging (negative difference):  
 $50, \_, 40, \_, \_, 25$  (Common difference:  $-5$ )
  - Bonus (mixed missing terms, needs extra attention):  
 $\_, \_, 15, 20, \_, 30$  (Common difference: 5)
- Make a game: fastest team to restore 3 sequences correctly wins.
- Wrap up the activity by saying that:  
**"Understanding the pattern allows us to restore or predict any term. This works with dates, salaries, payments and more!"**

# Assessment



60 mins

1. If common difference of an AP is 5, then  $a_{16} - a_{15}$  is:
  - a. 1
  - b. 31
  - c. 5
  - d. 15
2. The missing term in the box of the AP: 2,  $\square$ , 26,..... Is:
  - a. 6
  - b. 14
  - c. 12
  - d. 13
3. If  $5n + 3$  is the  $n^{\text{th}}$  term of an AP, then the common difference is:
  - a. 15
  - b. 12
  - c. 5
  - d. 1
4. If  $a = -2$ ,  $d = 5$  then the value of  $t_{10}$  is equal to:
  - a. 23
  - b. 33
  - c. 43
  - d. 53
5. The sum of first  $n$  natural numbers is:
  - a.  $n(n+1)/2$
  - b.  $n(n+1)$
  - c.  $n^2 + n$
  - d.  $n^3$
6. Find the 21st term of AP whose first two terms are -3 and 4?
7. In an Arithmetic Progression, if  $a = 28$ ,  $d = -4$ ,  $n = 7$ , then  $a_n$  is?
8. Find the sum of all three-digit numbers which leave remainder 3 when divided by 5.
9. Mona saved Rs 5 in the first week of a year and then increased her weekly saving by Rs 1.75. If in the  $n^{\text{th}}$  week, her weekly savings become Rs 20.75, find  $n$ .
10. The houses of a row are numbered consecutively from 1 to 49. Show that there is a value of  $x$  such that the sum of the numbers of the houses preceding the house numbered  $x$  is equal to the sum of the numbers of the houses following it. Find this value of  $x$ . [Hint:  $S_{x-1} = S_{49} - S_x$ ]

# Answer Key

1. c) 5
2. b) 14
3. c) 5
4. c) 43
5. a)  $n(n+1)/2$
6. First term = -3 and second term = 4  
 $a = -3$  and  $d = 4 - a = 4 - (-3) = 7$   
 $\therefore a_{21} = a + (21 - 1)d \Rightarrow -3 + (20)7 \Rightarrow -3 + 140 \Rightarrow 137$
7. For an AP,  
 $a_n = a + (n-1)d$   
 $\Rightarrow 28 + (7-1)(-4) \Rightarrow 28 + 6(-4) \Rightarrow 28 - 24 \Rightarrow a_n = 4$
8. Three-digit numbers which leave remainder 3 when divided by 5 are 103, 108, ..., 998  
 To find  $n$ ,  $a_n = a + (n-1)d \Rightarrow 998 = 103 + 5(n-1)$   
 $\therefore n = 180$   
 To find sum use the formula,  $S_n = n/2[2a + (n-1)d]$   
 $\Rightarrow S_{180} = 180/2[2(103) + 5(180-1)]$   
 $\therefore S_{180} = 99090$
9. Given that, Mona saved Rs.5 in the first week and then started increasing her savings each week by Rs.1.75  
 Hence, first term,  $a = 5$  and common difference,  $d = 1.75$   
 Also given,  $a_n = 20.75$   
 Find,  $n = ?$   
 As we know, by the  $n^{\text{th}}$  term formula,  $a_n = a + (n-1)d$   
 Therefore,  $20.75 = 5 + (n-1) \times 1.75 \Rightarrow 15.75 = (n-1) \times 1.75 \Rightarrow (n-1) = 15.75/1.75 = 1575/175 = 63/7$   
 $= 9 \Rightarrow n = 10$   
 Hence,  $n$  is 10.
10. Given  
 Row houses are numbers from 1, 2, 3, 4, 5.....49.  
 Thus, we can see the houses numbered in a row are in the form of AP.  
 So, First term,  $a = 1$  Common difference,  $d = 1$   
 Let' represent the number of the house as;  
 Sum of preceding the numbers of  $x =$  sum of following numbers of  $x$   
 i.e. Sum of ( 1, 2, 3,... $x-1$ ) = sum of [( $x+1$ ), ( $x+2$ ), ...,48, 49]  
 That is  $1 + 2 + 3 + \dots + (x-1) = (x+1) + (x+2) + \dots + 49$   
 $\Rightarrow [(x-1)/2][1+x-1] = [(49-x)/2][x+1+49]$   
 $\Rightarrow (x-1)x = (49-x)(x+50)$   
 $\Rightarrow x^2 - x = 49x + 2450 - x^2 - 50x$   
 $\Rightarrow x^2 - x = 2450 - x^2 - x$   
 $\Rightarrow 2x^2 = 2450$   
 $\Rightarrow x^2 = 1225$   
 $\Rightarrow x = \sqrt{1225}$   
 $\Rightarrow x = 35$   
 Therefore, the value of  $x$  is 35.

# Learning Level Tracker

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**Level 3:** Solves problems independently

[illegible]



# Meghalaya Learning Enhancement Programme

SCIENCE

# Chapter 1 : Chemical Reactions and Equations

## Activity 1 Science of Rust



35 mins

### Materials Required

Three iron nails, three bottles, water, salt, and airtight covers.

### Instructions

- Divide the students into three groups and give each group one iron nail.
- Ask the first group to place the nail in a dry bottle, the second group in a bottle with water, and the third group in a bottle with water and salt.
- Ask them to cover all bottles and leave them undisturbed for a week.
- After a week, ask the students to observe the nails and compare them.
- Ask the students:
  - a) What difference do you see in each nail?
  - b) How does the red coating develop on each nail?
  - c) Is this an example of a physical change or chemical change? Why or why not?
  - d) Which nail rusted the most?
  - e) Why do you think the nail in saltwater rusted the most?
- Explain that rusting is a chemical reaction: Iron + Oxygen + Water → Iron Oxide (Rust)  

$$\text{Fe} + \text{O}_2 + \text{H}_2\text{O} \rightarrow \text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$$
- Explain that salt increases water's conductivity, which speeds up rusting. Also, the salt helps the water to stick to the iron surface making it available for a longer time to react with the nail. The nail in plain water rusted more slowly, while the dry nail showed little or no rust.
- Discuss the climate of Meghalaya and ask if the climate favours the process of rusting. If yes, did they see their parents or neighbours take measures to prevent rusting?
- Guide them to understand how rusting affects tools, bridges, and fences making them less durable and more likely to break over time and how can it be prevented by applying oil, paint, or using stainless steel or a galvanisation process.
- Conclude by saying that rusting is a chemical process. Oxygen and water are both required for iron to rust. Iron will not get rust in dry air. Also, salt dissolved in the moisture (water) increases the process of rusting.

## Activity 2 Sugar to Carbon – A Thermal Breakdown



60 mins

### Materials Required

Stainless Steel Spoon, Sugar and Source of Heat

### Instructions

- Take out a spoonful of sugar using a steel spoon and show it to the students.
- Next, hold the spoon over a flame and ask the students to observe the changes.
- Ask them to observe it more closely as the sugar melts, turns brown, then black, and eventually produces smoke.
- Discuss with students by asking them:
  - a) What happens to the sugar when heated?
  - b) Why does the colour change from white to brown and then to black?
- Explain that heat causes sugar to melt, caramelise (sticky and brown syrup), and then break down into black carbon residue while releasing smoke.
- Explain that this process is called thermal decomposition, where heat breaks sugar into carbon, water vapour, and carbon dioxide, making the change irreversible.
- Further discuss and ask students:
  - a) Have you ever seen food get burnt while cooking?
  - b) Why does overcooked sugar turn into caramel or burn completely?
  - c) What happens when paper or wood is burned?
- Guide them to understand that most chemical changes cannot be reversed. Thermal decomposition involves breaking down a single reactant into multiple products using heat.

## Activity 3 Slaking Lime: The Hidden Heat



35 mins

### Materials Required

Limestone Powder, Bowl and Water

### Instructions

1. Show a small amount of quicklime (chuna) to the students and place it in a bowl or metal plate.
2. Ask a student to slowly add water while gently stirring the mixture.
3. Ask the students to touch the bowl after 1-2 minutes.

- Ask the students:
  - a) What do you feel when you touch the bowl?
  - b) Why do you think the bowl feels warm?
- Explain that the reaction is exothermic, meaning it releases heat. Explain the students the difference between exothermic and endothermic reactions.
- Chemical reaction involved:  
Calcium Oxide (Quicklime) + Water → Calcium Hydroxide (Slaked Lime) + Heat  
 $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{Heat}$
- Explain that in Meghalaya, slaked lime is commonly used in betel nut chewing (kwai) and construction (cement and plaster preparation). Discuss with the students what may happen if someone consumes more slaked lime with betelnut or betel leaves.
- Slaked lime from this reaction is also used for whitewashing houses and stabilising soil for agriculture (since slaked lime is basic, it is used to neutralise the excess acid present in the soil) in Meghalaya.
- Conclude the activity by saying that the reactions which release heat are called exothermic reactions, and the reactions which require heat are called endothermic reactions.

# Assessment



35 mins

**Multiple-Choice Questions:**

- Which of the following conditions accelerates the rusting of iron the most?
  - Dry air
  - Distilled water
  - Saltwater
  - Oil-coated surface
- What type of reaction occurs when sugar is heated until it turns black and produces smoke?
  - Combination reaction
  - Thermal decomposition
  - Displacement reaction
  - Neutralisation reaction
- What type of reaction is represented by the equation:  $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$ ?
  - Combination
  - Decomposition
  - Displacement
  - Neutralisation
- Which of the following is an example of a redox reaction?
  - $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
  - $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$
  - $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
  - $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- What happens when magnesium ribbon is burnt in air?
  - It forms magnesium carbonate
  - It forms magnesium chloride
  - It forms magnesium oxide
  - It forms magnesium hydroxide

**Very short answer:**

6. Why does rust occur faster in saltwater compared to plain water?

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7. Why should a magnesium ribbon be cleaned before burning in air? Give a balanced reaction for the burning of magnesium ribbon.

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**Short answer questions:**

8. Explain the reaction of quicklime with water. How is this reaction useful in Meghalaya's daily life?

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9. What is rancidity? How can it be prevented?

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**Long answer questions:**

10. Meghalaya's humid climate contributes to the faster rusting of iron objects. Explain the process of rusting using the chemical equation. Discuss at least two methods to prevent rusting and relate them to real-life applications.

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## Answer Key

- c) Saltwater
- b) Thermal decomposition
- c) Displacement
- a)  $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
- c) It forms magnesium oxide
- Rusting occurs faster in saltwater because salt (NaCl) enhances the conductivity of water, allowing faster electron transfer in the oxidation-reduction process. This speeds up the reaction of iron with oxygen and water, leading to rapid rust formation.
- Magnesium ribbon is cleaned to remove the oxide layer that forms on its surface, which can interfere with combustion. The balanced reaction for the burning of magnesium is:  

$$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$$
- When quicklime (CaO) reacts with water, it forms slaked lime (Ca(OH)<sub>2</sub>) and releases heat.  

$$\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{Heat}$$

This reaction is useful in Meghalaya for neutralising acidic soil, which is common due to heavy rainfall. Farmers use slaked lime to improve soil pH and enhance crop productivity.
- Rancidity occurs when fats and oils react with oxygen, leading to an unpleasant smell and taste. It can be prevented by:
  - o Storing food in airtight containers
  - o Adding antioxidants like vitamin C and E
  - o Refrigeration to slow down oxidation
  - o Using nitrogen to replace air in food packaging
- Rusting Process:  

Rusting is the slow oxidation of iron in the presence of oxygen and water, forming hydrated iron(III) oxide (rust). The chemical reaction is:

$$4\text{Fe} + 3\text{O}_2 + 6\text{H}_2\text{O} \rightarrow 4\text{Fe(OH)}_3$$

Fe(OH)<sub>3</sub> further reacts with oxygen to form rust:

$$2\text{Fe(OH)}_3 \rightarrow \text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O} \text{ (rust)}$$

Methods to Prevent Rusting:

  1. Galvanisation – Coating iron with zinc prevents rusting. This is used in Meghalaya for roofing sheets to protect them from moisture.
  2. Painting and Oiling – Applying paint or oil creates a protective layer. This is used on iron gates, fences, and tools to prevent rusting.

## Learning Level Tracker

Keep a record of unit/chapter assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

**Level 3:** Solves problems independently

[illegible]

## Chapter 2 : Acids, Bases and Salts

### Activity 1 Exploring Acidity in the Kitchen



35 mins

#### Materials Required

Pieces of Fruit, Water, Baking soda, Cups and Turmeric Powder

#### Instructions

- Take small pieces of local fruits, such as oranges and lemons. Crush each fruit separately and mix with a little water in different cups.
- Next, in a separate cup, dissolve a small amount of baking soda in water to create a basic solution.
- Prepare a turmeric solution by mixing turmeric powder with water in another cup.
- Add a few drops of the turmeric solution to each fruit mixture and the baking soda solution and ask the students to observe any colour changes.
- Ask students:
  - a) What happens to the colour of the turmeric solution when mixed with different liquids?
  - b) Do all liquids cause the same change? Why or why not?
- Guide students to understand that turmeric remains yellow in acidic solutions (like orange and lemon juice) but turns red in a basic solution (like baking soda water).
- Extend the discussion by asking:
  - a) Where else do we see acids and bases in everyday life?
  - b) Why do some foods taste sour while others do not?
- Conclude by linking the concept to real-life experiences, such as how citrus fruits are acidic and why baking soda is sometimes used to neutralise acidity in food.



## Activity 2 The Science of Soil pH



35 mins

### Materials Required

Cups, Soil Sample and Vinegar

### Instructions

- Divide students into two groups and ask each group to collect soil samples from two different locations and place them in separate cups.
- Pour a few drops of vinegar into each cup and observe whether bubbles ( $\text{CO}_2$  gas) form.
- In one of the cups, mix in a small amount of lime powder and repeat the vinegar test.
- Ask students to compare the reactions in both cups:
  - a) Did both soil samples react the same way with vinegar?
  - b) What difference did adding lime powder make?
- Explain that if bubbles form, the soil contains carbonates, which react with the acid (vinegar) to release carbon dioxide gas.
- Discuss what may happen if the soil is too acidic and how it may affect crop production.
- Highlight how farmers add lime ( $\text{CaCO}_3$ ) to reduce soil acidity and improve crop growth.
- Give local examples: Farmers in Meghalaya use limestone to improve soil conditions for crops like broom grass, oranges, and black pepper.
- Conclude by emphasising that maintaining the right soil pH helps farmers grow healthier and more productive crops.

## Activity 3 Various Salts



35 mins

### Materials Required

Table salt (Sodium chloride - NaCl), Baking soda (Sodium bicarbonate -  $\text{NaHCO}_3$ ), Plaster of Paris (Calcium sulphate -  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ )

### Instructions

- Place small amounts of each salt in separate cups and ask students to observe and compare their texture, colour, and solubility in water.
- Add a few drops of vinegar or lemon juice to all the cups and ask the students to observe.
- Ask the students to note down the change after adding vinegar or lemon juice. Ask the students
  - a) Did they see anything different in any of the cups?
  - b) Which cup produced the effervescence? (Effervescence indicates  $\text{CO}_2$  release.)
  - c) Can you guess which gas is released from that cup?
- Discuss the uses of these salts in daily life:
  - o Table salt: Used in cooking and food preservation.
  - o Baking soda: Used in baking, fire extinguishers, and as an antacid.
  - o Plaster of Paris: Used in making toys, molds and medical casts.
- Discussion Questions:
  - a) Why can baking soda be used as a fire extinguisher?
  - b) Why is baking soda used in cooking and medicine?
  - c) Why is Plaster of Paris used in making the medical casts?
- Explain to the students that baking soda acts as a fire extinguisher because it decomposes when heated, releasing carbon dioxide gas that displaces oxygen and smothers the fire.
- Baking soda is used in cooking to make food light and fluffy because it releases carbon dioxide when heated, and the carbon dioxide leaves the food, leaving spaces in the middle making it spongy and fluffy. It is used in medicine to relieve acidity and indigestion by neutralising excess stomach acid because baking soda is basic in nature.
- Plaster of Paris is used in making medical casts because it hardens quickly when mixed with water, providing strong support while remaining lightweight and moldable to freeze the movement of the broken bones.
- Conclude by saying that this activity demonstrates how different household salts interact with acids and bases, highlighting their unique properties and uses. Understanding these reactions helps us appreciate the role of salts in everyday life, from cooking and medicine to preservation.

# Assessment



35 mins

**Multiple-Choice Questions:**

- Which gas is released when an acid reacts with a metal?
  - Oxygen
  - Hydrogen
  - Carbon dioxide
  - Nitrogen
- A bakery uses baking soda in cake preparation. What is the primary reason for this?
  - To increase the weight of the cake
  - To release carbon dioxide for making the cake fluffy
  - To enhance the sweetness of the cake
  - To provide an acidic taste
- What is the primary purpose of adding quicklime ( $\text{CaO}$ ) to acidic soil?
  - To increase acidity
  - To neutralise the soil
  - To make the soil excessively alkaline
  - To reduce water retention
- What is the role of baking soda in medicine?
  - It prevents bacterial growth in water
  - It helps the body absorb water more efficiently
  - It neutralises stomach acid
  - It changes the pH of water
- What colour change is observed when turmeric solution is added to an acidic fruit juice like orange or lemon?
  - Blue to green
  - Yellow to red
  - No change
  - Red to blue

**Very short answer:**

- A solution has a pH of 8.2. Is it acidic, basic, or neutral? What will happen if a few drops of lemon juice are added to this solution?

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- How does Plaster of Paris help in fixing broken bones?

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**Short answer questions:**

8. A student accidentally spills hydrochloric acid on their hand. The school lab has slaked lime, vinegar, and baking soda available. Which one should be used for first aid and why?

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9. How does soil pH affect plant growth? Suggest a method to improve soil conditions for farming in Meghalaya.

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**Long answer questions:**

10. Meghalaya is known for its limestone reserves. Hence, a lot of cement factories are found in the state. A cement factory releases acidic waste into a nearby river, affecting aquatic life. Explain how the acidic waste can be treated before disposal. What role does pH play in the survival of aquatic organisms?

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# Answer Key

1. b) Hydrogen
2. b) To release carbon dioxide for making the cake fluffy
3. b) To neutralise the soil
4. c) It neutralises stomach acid
5. c) No change
6. The solution is basic since its pH is above 7. If a few drops of lemon juice (acidic) are added, the pH will decrease, making the solution less basic or neutral, depending on the amount added.
7. Plaster of Paris (POP) is used in making medical casts because it sets quickly when mixed with water and hardens to provide support to broken bones. It is lightweight and can be moulded easily before it hardens, ensuring the freezing of the movement of the injured area.
8. Baking soda should be used because it is a weak base that can neutralise the strong acid (HCl) on the skin, preventing further damage. Slaked lime is also a base, but it is too strong and may cause burns. Vinegar, being acidic, would worsen the situation.
9. Soil pH affects plant growth by influencing nutrient availability. Most plants grow best in slightly acidic to neutral soil (pH 6-7). Acidic soils in Meghalaya reduce the availability of essential nutrients. To improve soil conditions, farmers add lime ( $\text{CaCO}_3$ ) to neutralise excess acidity and create a favourable environment for crops.
10. Acidic waste from cement factories can be treated using neutralising agents like lime ( $\text{CaO}$ ) or calcium carbonate ( $\text{CaCO}_3$ ) before disposal. pH plays a crucial role in the survival of aquatic organisms because most aquatic life thrives in water with a pH between 6.5 and 8.5. Highly acidic water can harm fish and disrupt ecosystems. Proper pH regulation ensures a balanced aquatic environment, preventing the loss of biodiversity.

**Level 3:** Solves problems independently

[illegible]

## Chapter 5 : Life Processes

### Activity 1 How Plants Drink Water



35 mins

#### Materials Required

Fresh white flower (or a leafy stem from a local plant like mustard, coriander, or wild spinach), a transparent glass or bamboo cup, water, and turmeric paste (if available).

#### Instructions

- Divide students into groups and provide them with a leafy stem or flower.
- Ask them to fill a glass or bamboo cup with water and mix in a pinch of turmeric or natural plant dye (if available).
- Ask them to place the stem inside and leave it undisturbed for a few hours.
- After some time, ask them to observe any changes in the colour of the leaves or stem veins.
- **Ask the students:**
  - o What changes do you see in the leaves or flowers?
  - o How did the colour move through the plant?
  - o What does this tell us about how plants absorb water?
  - o Why do trees in Meghalaya grow well during the monsoon?
- Explain that water moves up from the roots through the stem using xylem, which acts like a straw. This process is called capillary action and is helped by transpiration (water loss from leaves) and the colour in the water helps us see how the water travels through the plant.
- And that this is why trees in Meghalaya remain green and healthy even in hilly areas, as they can absorb and transport water efficiently from the soil.
- Discuss with the students if they have seen banana plants growing well even after being cut at the base and explain that this is because the roots keep pulling water up.

## Activity 2 How Food Travels in Plants



35 mins

### Materials Required

Blackboard, small pieces of paper

### Instructions

- Draw a basic plant diagram on a chalkboard.
- Write "Water," "Minerals," "Sunlight," "Carbon dioxide," and "Food" on small papers or dried leaves.
- Ask students to place these labels in the correct parts of the plant (e.g., "Water" near the roots, "Food" near the leaves).
- Discuss how the plant gets and transports each of these elements.
- Ask the students:
  - o Where does the plant get water and minerals from?
  - o How does the plant prepare its own food?
  - o How is the food transported to different parts of the plant?
  - o What happens to stored food in plants like potatoes?
- Explain that water and minerals are absorbed by the roots and move up through the xylem, relate it to leaves preparing food using sunlight in photosynthesis (Carbon dioxide + Water + Sunlight → Food + Oxygen).
- Explain that the food moves to different parts of the plant through phloem, just like how people carry food from the market to their homes!
- Relate this to common crops in Meghalaya like ginger, and Colocasia (Kashriew in Khasi, Kachu in Assamese)—these plants store extra food in their roots and stems.
- Ask students if they have noticed rice plants turning yellow before harvest. Explain that this happens as the plant ages and chlorophyll breaks down, a process called senescence (natural ageing of the plant). Some nutrients from the leaves also move into the grains during this time.
- Conclude by explaining that farmers use this natural process to determine the right harvest time, ensuring the grains are mature and contain maximum stored nutrients.



**Activity 3****How Our Kidneys Work – A Natural Filtration Experiment****35 mins****Materials Required**

A clay pot or bamboo filter, sand, charcoal (burnt wood), small pebbles, and muddy water from a nearby source.

**Instructions**

- Fill a clay pot or a cut bamboo tube with layers of pebbles at the bottom, sand in the middle, and charcoal on top.
- Pour muddy water through the filter and ask students to observe how cleaner water drips out.
- Ask students to compare the filtered water with the original muddy water.
- Ask the students:
  - o Observation & Functioning: How did the filter change the dirty water? Which material helped clean the water the most?
  - o Connection to the Human Body: How does this experiment relate to our kidneys?
- Explain that kidneys act as natural filters: Just as a filter removes dirt from water, kidneys filter blood to remove waste like urea, which is produced when the body breaks down proteins. Urea needs a large amount of water to be dissolved which comes out of the body in the form of urine. They also help maintain the right balance of water, salts, and minerals.
- Explain that if kidneys fail, waste builds up in the body, leading to serious health problems. In rural Meghalaya, many people rely on natural springs or rivers for drinking water. Contaminated water can cause infections and diseases. Traditional filtration methods, like charcoal or sand inside bamboo pipes, help remove impurities, but additional purification steps like boiling are important to kill the germs.
- Conclude by discussing how drinking clean water is essential to be healthy. Drinking enough and clean water is crucial for maintaining healthy kidneys.

# Assessment



35 mins

## Multiple Choice Questions (MCQs)

- In human beings, which organ is responsible for filtering waste from the blood?
  - Liver
  - Kidney
  - Lungs
  - Stomach
- Which of the following helps transport water in plants?
  - Xylem
  - Phloem
  - Stomata
  - Chloroplast
- The process by which plants lose water in the form of vapour is called:
  - Translocation
  - Transpiration
  - Photosynthesis
  - Respiration
- What is the main excretory product in human urine?
  - Carbon dioxide
  - Oxygen
  - Urea
  - Glucose
- Why do mammals and birds have separate chambers for oxygenated and deoxygenated blood?
  - To prevent blood loss
  - To maintain constant body temperature
  - To store oxygen for later use
  - To remove waste quickly

## Very Short Answer Questions

- Name two ways in which plants remove waste from their bodies.  
\_\_\_\_\_
- Why is it important to stay hydrated for proper kidney function?  
\_\_\_\_\_

## Short Answer Questions

- Explain how food is transported in plants.  
\_\_\_\_\_  
\_\_\_\_\_
- What role do nephrons play in the excretion of waste in human beings?  
\_\_\_\_\_  
\_\_\_\_\_

## Long Answer Question

- Explain the process of excretion in human beings. How does the excretory system ensure that only waste is removed while essential substances are retained?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Answer Key

## Multiple Choice Questions (MCQs)

1. b) Kidney
2. a) Xylem
3. b) Transpiration
4. c) Urea
5. b) To maintain constant body temperature

## Very Short Answer Questions

6. Two ways plants remove waste:  
Storing waste in vacuoles, leaves, or old xylem as resins and gums.  
Releasing oxygen as a byproduct of photosynthesis.
7. Importance of staying hydrated for kidney function:  
Water helps flush out waste products like urea from the body.  
It prevents kidney stones and reduces the risk of infections.

## Short Answer Questions

8. How food is transported in plants:  
Food is transported through phloem in a process called translocation.  
It moves from leaves (where it is produced) to different parts of the plant.  
Movement occurs due to differences in osmotic pressure, driven by ATP.
9. Role of nephrons in excretion:  
Nephrons are the filtration units in the kidney.  
They filter waste, excess salts, and water from the blood.  
Useful substances like glucose and water are reabsorbed, and waste is excreted as urine.

## Long Answer Question

10. Process of excretion in human beings:  
The excretory system includes the kidneys, ureters, urinary bladder, and urethra.  
Kidneys filter blood and remove nitrogenous waste like urea. Filtration occurs in nephrons, where useful substances (water, glucose) are reabsorbed.  
Waste is collected as urine, which passes through the ureters to the bladder.  
Urine is stored in the bladder until it is excreted through the urethra.  
The system ensures only harmful substances are removed while essential nutrients are retained in the body.

**Level 3:** Solves problems independently

[illegible]

## Chapter 6 : Control and Co-ordination

### Activity 1 Test Your Reflexes



35 mins

#### Materials Required

A 30 cm ruler (or any straight object with markings)

#### Instructions

- Divide students into pairs and assign one student as the "dropper" and the other as the "catcher."
- Instruct the dropper to hold the ruler vertically at the 30 cm mark, while the catcher keeps their fingers ready near the bottom without touching it.
- Tell the dropper to let go of the ruler without warning, and the catcher must grab it as quickly as possible.
- Ask students to note the mark where they caught the ruler (lower numbers indicate faster reaction time). Repeat this process 3 times and calculate the average reaction distance.
- Encourage students to think about why they were able to catch the ruler or why they missed it.
- Ask students
  - o Which senses and body parts were involved in this process?
  - o How this test demonstrates how the brain processes signals in voluntary reactions?
- Explain that catching the ruler is a reaction, not a reflex. The eyes detect the falling ruler and send a signal to the brain, which then processes the information and sends commands to the muscles to catch it.
- Clarify that reflex actions, like pulling a hand away from a hot object or blinking when something comes close, do not involve the brain first. Instead, the spinal cord sends an immediate response to the muscles.
- Highlight that reaction time can be influenced by factors such as alertness, fatigue, and nutrition.
- Emphasise that good nutrition, including proteins and vitamins like B12 and D, helps maintain nerve function and quick muscle responses.
- Conclude by explaining that having a quick reaction time is important for activities like sports and driving, while reflexes help protect the body from harm.

## Activity 2 Hormone Role-Play: Adrenaline in Action!



35 mins

### Materials Required

Paper slips with real-life scenarios

### Instructions

- Write different situations on paper slips, such as:
  - o *"Climbing a tree and suddenly slipping."*
  - o *"Hearing a loud noise in the dark."*
  - o *"Escaping from a barking dog."*
  - o *"Getting ready to run in a school race."*
- Divide students into small groups. Each group picks a slip and acts out the scenario, showing:
  - o Physical changes (e.g., fast heartbeat, sweating, widened eyes).
  - o Emotional reactions (e.g., shouting, freezing, running away).
- After each performance, the class guesses which hormone is responsible (adrenaline) and lists its effects.
- Ask students:
  - o Why did their heartbeat increase during the role-play?
  - o What changes did they feel in their body during the activity?
- Explain that adrenaline prepares the body for action by increasing heart rate and breathing, making muscles tense, causing sweating to cool the body, and widening pupils for better vision. This automatic response is known as "fight or flight."
- Discuss how adrenaline is essential for survival as it helps the body respond quickly to danger or excitement. Ask students to recall a time they experienced an adrenaline rush and discuss how focus and breathing can help control it in stressful situations.

## Activity 3 The Shy Plant



35 mins

### Materials Required

Mimosa Pudica ("Lajwanti"), sticks, water.

### Instructions

- Show a Mimosa plant and ask, "Why do its leaves close when touched?"
- Explain that, unlike humans, plants do not have nerves but still respond to stimuli using internal mechanisms.
- Ask students to gently touch the leaves and observe them folding. Have them measure and record the time taken for the leaves to reopen.
- Pour water on the soil and observe if the leaves react. Discuss why Mimosa responds to touch but not to watering.
- Use sticks to tap the leaves with different strengths and observe whether the response changes.
- Ask, "How do plants sense and respond to their environment without nerves?"
- Introduce the concept of turgor pressure (changes in water pressure inside specialised cells) as the mechanism behind Mimosa's movement. Explain that the plant actively moves to protect itself from herbivores or environmental stress.
- Mention that while some plants react to changes in humidity before rain, Mimosa pudica responds specifically to touch. Discuss how Khasi farmers observe plant behaviours to understand environmental conditions.
- Conclude by explaining that plants lack a nervous system but still respond to external changes through water pressure and chemical coordination.
- Encourage students to share examples of other plants reacting to their surroundings, such as sunflowers tracking the sun or Venus flytraps closing around insects.

# Assessment



35 mins

## Multiple Choice Questions (MCQs)

1. Which part of the brain maintains posture and balance?
  - a) Cerebrum
  - b) Cerebellum
  - c) Medulla
  - d) Hypothalamus
2. The gap between two neurons where impulses are transmitted is called:
  - a) Axon
  - b) Synapse
  - c) Dendrite
  - d) Reflex arc
3. Which plant hormone promotes growth in stems?
  - a) Absciscic acid
  - b) Auxin
  - c) Cytokinin
  - d) Ethylene
4. Adrenaline is secreted by which gland during emergencies?
  - a) Thyroid
  - b) Adrenal
  - c) Pituitary
  - d) Pancreas
5. The "touch-me-not" plant (Mimosa) folds its leaves due to:
  - a) Growth-independent movement
  - b) Geotropism
  - c) Photosynthesis
  - d) Transpiration

## Very Short Answer Questions

6. Name two hormones involved in regulating blood sugar levels.  
\_\_\_\_\_
7. Why is iodine important in our diet?  
\_\_\_\_\_  
\_\_\_\_\_

## Short Answer Questions

8. Explain how electrical impulses travel in neurons.  
\_\_\_\_\_  
\_\_\_\_\_



9. How does auxin help plants bend toward light?

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**Long Answer Question**

10. Describe the reflex arc with a diagram. How does it help organisms survive in emergencies? Compare it with voluntary actions.

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# Answer Key

## Multiple Choice Questions (MCQs)

1. b) Cerebellum
2. b) Synapse
3. b) Auxin
4. b) Adrenal
5. a) Growth-independent movement

## Very Short Answer Questions Answer Key

6. Two hormones for blood sugar regulation:
  - o Insulin (*lowers blood sugar*)
  - o Glucagon (*raises blood sugar*)
7. Iodine is important because:  
It is essential for thyroxine hormone production, which regulates metabolism. Deficiency causes goitre.

## Short Answer Questions Answer Key

8. Electrical impulse transmission in neurons:
  - o Impulse starts at dendrites → travels through cell body → along axon → reaches synapse.
  - o At synapse, chemicals (neurotransmitters) carry the signal to the next neuron.
9. Auxin and phototropism:
  - o Auxin accumulates on the shaded side of stems.
  - o Causes cells to elongate, making the plant bend toward light.

## Long Answer Question Answer Key

10. Reflex arc and survival:
  - Process:
    1. Receptor detects stimulus (e.g., heat).
    2. Sensory neuron → spinal cord → motor neuron → muscle (e.g., hand withdrawal).
    3. Brain registers pain *after* the action.
  - Diagram labels: Receptor → sensory neuron → spinal cord → motor neuron → effector.
  - Survival advantage: Faster than voluntary actions (bypasses brain).
  - Comparison:

| Reflex Action              | Voluntary Action          |
|----------------------------|---------------------------|
| Instant (spinal cord)      | Slower (brain)            |
| Automatic (e.g., blinking) | Conscious (e.g., writing) |

# Learning Level Tracker

Keep a record of unit/chapter assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

### Level 3: Solves problems independently

[illegible]

## Chapter 9 : Light - Reflection and Refraction

### Activity 1 Exploring Refraction



35 mins

### Materials Required

A transparent glass or plastic container (any clear container will work, Water, A pencil or stick (anything with a distinct shape)

### Instructions

- Fill a transparent container with water, using a clear glass or plastic container so students can observe how light bends.
- Hold a pencil or stick at an angle and submerge it halfway into the water, ensuring it is visible both inside and outside the water.
- Ask students to observe the pencil carefully. Guide them to notice that the pencil appears bent or shifted at the water's surface.
- Ask students to describe what they observed. Explain that the pencil itself is not actually bent—this is an optical illusion caused by the bending of light as it moves from air (a less dense medium) into water (a denser medium).
- Introduce the concept of refraction, explaining that light changes speed when moving between different materials, causing it to bend.
- Clarify that refraction happens at the boundary where two different media meet, not within the medium itself.
- Ask students to think about other materials where light might bend, such as glass, oil, or air. Ask them to predict whether light would bend more, less, or not at all in those materials.
- Discuss how this principle of refraction is used in eyeglasses, magnifying glasses, microscopes, and even in the formation of rainbows.

## Activity 2 Convex Lenses and Focusing Light



35 mins

### Materials Required

A magnifying glass or any convex lens, A white sheet of paper, Natural sunlight (or a lamp with a strong light source)

### Instructions

- Choose a bright, sunny day for this activity or use a lamp with a strong light source. Gather a convex lens (such as a magnifying glass) and a white sheet of paper.
- Hold the convex lens a few inches above the white paper, positioning it so that sunlight passes through the lens and is focused onto the paper. Ensure students do not stare at the sun or hold the lens in one spot for too long.
- Ask students to observe how the light converges at a specific point on the paper, forming a small, bright spot.
- Explain that this bright spot is called the focal point of the convex lens. Emphasise that a convex lens bends (or converges) light rays so they meet at this focal point.
- Guide students to think about why light focuses in one spot. Explain that light rays from the sun are nearly parallel when they reach Earth, and the convex lens bends these rays inward, bringing them together at the focal point.
- Ask students to experiment with changing the distance between the lens and the paper. Encourage them to observe how the size and brightness of the focal point change.
- Discuss how different types of lenses (convex and concave) are used in optical devices like eyeglasses, cameras, and microscopes to focus or spread light.
- Provide real-world examples, such as how magnifying glasses can concentrate light, how cameras use lenses to focus images, and how human eyes adjust focus using a natural convex lens.
- Reinforce the concept by asking students how the focal point changes when they move the lens closer or farther from the paper.

**Activity 3****Understanding Lens Power and Corrective Eyewear****35 mins****Materials Required**

A pair of old corrective glasses (or any magnifying glasses), Paper and pen for calculations, Simple formula for lens power:  $P=1/F$  (where P is the power in dioptres and f is the focal length in metres)

**Instructions**

- Start by explaining that lenses are used in optical devices to focus light. Show a pair of old corrective glasses or a magnifying glass and explain that these lenses help people see clearly by adjusting the way light enters the eye.
- Introduce two types of lenses:
  - o Convex lenses (converging lenses) are thicker in the middle and help people who are farsighted (hyperopia).
  - o Concave lenses (diverging lenses) are thinner in the middle and help people who are nearsighted (myopia).
- Explain that the strength of a lens is measured by its power (P), which depends on its focal length (F, measured in metres). The formula to calculate lens power is:

$$P = \frac{1}{F}$$

where P is in diopters (D) and F is in metres (m).

- Provide students with focal lengths and ask them to calculate lens power:
  - o What is the power of a lens with a focal length of 1 metre?
  - o What is the power of a lens with a focal length of 0.25 metres?
  - o Which has more power?
- Discuss how positive power lenses (convex lenses) correct farsightedness, while negative power lenses (concave lenses) correct nearsightedness.
- Ask students why different people need different lens powers. Guide them to understand that the shape of the eyeball affects how light is focused inside the eye, requiring different lens corrections.
- Use local examples to discuss the need for corrective eyewear. Explain how long exposure to bright sunlight, foggy conditions, or dim lighting in rural homes can cause eye strain, increasing the need for vision correction.
- Encourage students to think about how lenses are used beyond glasses, such as in cameras, microscopes, and telescopes.

# Assessment



35 mins

## Multiple Choice Questions (MCQs)

1. Which phenomenon causes a pencil to appear bent when placed in a glass of water?
  - a) Reflection
  - b) Dispersion
  - c) Refraction
  - d) Diffraction
2. The focal length of a concave mirror is 10 cm. What is its radius of curvature?
  - a) 5 cm
  - b) 10 cm
  - c) 20 cm
  - d) 40 cm
3. When light travels from air to glass, it:
  - a) Bends away from the normal
  - b) Bends towards the normal
  - c) Travels straight
  - d) Reflects completely
4. Which mirror always produces a virtual, erect, and diminished image?
  - a) Concave mirror
  - b) Convex mirror
  - c) Plane mirror
  - d) Parabolic mirror
5. The power of a lens is +2.0 D. This lens must be:
  - a) Concave lens
  - b) Convex lens
  - c) Plane glass
  - d) Cylindrical lens

## Very Short Answer Questions

6. State the laws of reflection.

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7. Define 1 dioptre of power of a lens.

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## Short Answer Questions

8. Explain why a convex lens is called a converging lens with a ray diagram.

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9. An object is placed at 30 cm from a convex lens of focal length 20 cm. Calculate the image position using the lens formula.

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**Long Answer Question**

10. (a) Derive the mirror formula for a concave mirror.  
(b) An object 4 cm tall is placed 15 cm from a concave mirror of focal length 10 cm. Calculate the image position, size, and nature. Draw the ray diagram.



# Answer Key

## MCQs

1. c) Refraction
2. c) 20 cm ( $R = 2f$ )
3. b) Bends towards the normal
4. b) convex mirror
5. b) convex lens (Positive power indicates converging lens)

## Very Short Answers

6. Laws of Reflection:  
Incident ray, reflected ray, and normal lie in the same plane.  
Angle of incidence = Angle of reflection.
7. 1 Dioptre: Power of a lens with focal length 1 metre.

## Short Answers

8. Convex lens as converging:  
Parallel rays converge at focus after refraction.  
Diagram should show: Parallel rays  $\rightarrow$  converge at F (focal point).
9. Lens formula calculation:  
Given:  $u = -30$  cm,  $f = +20$  cm  
Using  $1/v - 1/u = 1/f \rightarrow v = +60$  cm (real image on opposite side).

## Long Answer

10. (a) Mirror formula derivation:  
Start with ray diagram showing object ( $u$ ), image ( $v$ ), and focal point ( $f$ ).  
Use similar triangles to derive  $1/v + 1/u = 1/f$ .
- (b) Numerical solution:  
Given:  $u = -15$  cm,  $f = -10$  cm,  $h_o = 4$  cm  
Mirror formula  $\rightarrow v = -30$  cm (real, inverted image).  
Magnification ( $m$ ) =  $-v/u = -2 \rightarrow$  Image height = 8 cm (enlarged).  
Ray diagram: Show F, C, parallel ray  $\rightarrow$  F, central ray  $\rightarrow$  C, focal ray  $\rightarrow$  parallel.

**Level 3:** Solves problems independently

[illegible]

## Chapter 10 : Human Eye and The Colourful World

### Activity 1 How Lenses Work



35 mins

#### Materials Required

Concave and convex lenses (borrowed from old spectacles or magnifying glasses), sheet with large and small text

#### Instructions

- Give students a convex lens and ask them to place it in front of a printed sheet.
- Ask them to slowly move the lens closer and farther from the sheet and observe when the text appears clear or blurry.
- Now, repeat the activity with a concave lens and ask students to observe any differences in image formation.
- Explain to them that a convex lens converges light rays—it focuses them to form a sharper image at a particular distance and add that it is like how the eye lens focuses light to form a clear image on the retina.
- Further describe how a concave lens diverges light rays, making the image appear smaller and spread out and that this mimics how myopia (near-sightedness) affects vision, where the image forms in front of the retina instead of at the correct position.
- Conclude by discussing:

**Myopia (near-sightedness)** occurs when the image forms in front of the retina. Concave lenses are used to diverge the light rays slightly so the image moves backward onto the retina.

**Hypermetropia (far-sightedness)** occurs when the image forms behind the retina. Convex lenses are used to converge the light rays more strongly so the image shifts forward onto the retina.

## Activity 2 Bending Light



35 mins

### Materials Required

A transparent water-filled glass or clear plastic bottle, sheet of white paper, torch or phone flashlight, pencil to trace observations

### Instructions

- Begin by asking students:
  - *"Have you ever noticed how objects look distorted underwater?"*
  - *"Why does a pencil dipped in water appear bent?"*
- Explain that this happens due to refraction, or the bending of light when it moves from one material (air) into another (water or glass).
- Now, fill a transparent glass or plastic bottle with clean water and place a white sheet of paper behind it on a table. Turn on a torch or phone flashlight and shine the light at the glass from one side.
- Encourage students to see how light bends as it passes through the curved surface of the glass. Move the light source to different angles and ask them to observe how the bending changes.
- Now, draw an arrow or simple shape on the white paper behind the glass, and ask students to look at the drawing through the water-filled glass.
- Discuss with the students how the image looks different—if it looks shifted, enlarged, or flipped?
- Explain that this happens because light rays bend when they enter water and again when they exit and that similar bending occurs in a prism, but in a sharper way due to its angled surfaces.

Guide them to understand that light travels faster in air and slower in water and when light enters a denser material (like water), it changes speed and direction, causing refraction. Add that this is why objects underwater or behind curved glass surfaces appear distorted or shifted.

## Activity 3 Scattering of Light



35 mins

### Materials Required

A transparent glass or plastic bottle filled with clear water, a small amount of milk or detergent, torch or phone flashlight, dark room or shaded area

### Instructions

- In a dark room or shaded area, fill a transparent glass or plastic bottle with clean water and add a few drops of milk or a pinch of detergent and stir.
- Turn on a torch or phone flashlight and shine the beam through the side of the bottle.
- Encourage students to observe how the light path becomes visible inside the milky water and discuss why the beam of light is now visible, relating it to how small particles scatter light.
- Ask students to try different angles of light and observe changes in scattering effects.
- Compare this scattering to phenomena in the environment like the blue sky, red sunsets, or sunlight filtering through mist and explain how smaller particles scatter shorter wavelengths like blue, while larger particles scatter longer wavelengths like red.

# Assessment



35 mins

## Multiple-Choice Questions (MCQs)

- What is the least distance of distinct vision for a young adult with normal vision?
  - 10 cm
  - 25 cm
  - 50 cm
  - 100 cm
- Myopia is a defect of vision where:
  - Distant objects appear clear but nearby objects are blurry
  - Nearby objects appear clear but distant objects are blurry
  - Both distant and nearby objects appear blurry
  - The eye loses its ability to adjust focal length
- Hypermetropia is corrected using:
  - Concave lens
  - Convex lens
  - Cylindrical lens
  - Bifocal lens
- What causes the blue colour of the sky?
  - Dispersion of light
  - Reflection of light
  - Scattering of light
  - Refraction of light
- The splitting of white light into its component colours is called:
  - Refraction
  - Scattering
  - Dispersion
  - Reflection

## Very Short Answer Questions

- Define accommodation of the eye.

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- What is presbyopia?

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## Short Answer Questions

- The Sun is visible to us about 2 minutes before the actual sunrise. Why?

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- Why does the sky appear blue?

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## Long Answer Question

- Describe the various refractive defects of vision and their corrections.

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# Answer Key

1. b) 25 cm
2. b) Nearby objects appear clear but distant objects are blurry
3. b) Convex lens
4. c) Scattering of light
5. c) Dispersion
2. The ability of the eye to focus on both near and distant objects by adjusting its focal length.
3. Presbyopia is a condition where the eye loses its power of accommodation, typically due to aging.
4. The atmosphere bends the light from the Sun, letting us see it a few minutes before it actually rises above the horizon.
5. The sky appears blue due to the scattering of shorter wavelengths of light by the atmosphere.
6. Myopia (short-sightedness) occurs when distant objects appear blurry as their images focus before the retina. It is corrected using a concave lens, which helps diverge light rays for proper focus. Hypermetropia (far-sightedness) causes nearby objects to appear blurry because their images focus beyond the retina; a convex lens is used to converge light rays and bring the focus to the correct position. Presbyopia, common in aging individuals, results from the weakening of the eye's ability to adjust focal length, affecting both near and distant vision. It is corrected using bifocal or progressive lenses that combine concave and convex properties to aid clear vision at different distances

**Level 3: Solves problems independently**

[illegible]



## Chapter 3 : Metals and Non-Metals

### Activity 1 Acids and Metals



35 mins

#### Materials Required

Metal Samples (iron nails, aluminium foil, zinc strips), Vinegar, 3 cups

#### Instructions

- Prepare separate clear cups or bowls and fill them halfway with vinegar and place a small piece of each metal sample into its respective cup of vinegar.
- Ask the students to observe the reactions closely and encourage students to pay attention to whether bubbles form around the metal pieces.
- Explain that the bubbles are hydrogen gas being released during a chemical reaction between the metal and the vinegar (acid), guiding the students to understand that the presence or absence of bubbles indicates how reactive the metal is with the acid.
- Discuss and compare the intensity of reactions. Some metals, like aluminium and zinc, will likely produce more bubbles, showing greater reactivity. Other metals, like copper, may not react visibly at all.
- Ask students to arrange the metals in decreasing order of their reactivity based on the observations they made during the activity.
- Conclude by discussing why some metals are more reactive than others and relate this to real-world applications, like using reactive metals in certain industrial processes while using less reactive metals for making coins and jewellery.

## Activity 2 Cold, Hot or Steam



35 mins

### Materials Required

Metal samples (calcium chalk, iron nail, aluminium foil), 3 bowls, lid and water,

### Instructions

- Divide the metal samples into three tests: cold water, hot water, and steam.
- Place each metal sample in separate bowls filled with cold water and observe if bubbles form, indicating hydrogen gas release.
- For metals that do not react with cold water, gently heat a second set of bowls containing water and place the metal samples inside. Observe again for bubbles or floating due to hydrogen gas.
- For metals that show no reaction with hot water, set up a steam apparatus. Boil water and expose the metals to steam by suspending them above the boiling water. Check for reactions and gas production.
- Discuss the observations and highlight metals like potassium and sodium that react most vigorously with cold water, producing hydrogen gas and heat so rapidly that it ignites and point out how calcium reacts less violently, with the hydrogen gas forming bubbles that make the metal float.
- Explain the difference between metals like magnesium, which react only with hot water, and others like aluminium, iron, and zinc, which require steam to show a reaction. Explain how metals such as lead, copper, silver, and gold do not react with water under any conditions during this experiment.
- Relate this to the importance of storing reactive metals like potassium and sodium in kerosene to prevent accidental fires, and why metals like copper and gold are often chosen for plumbing and jewellery due to their lack of reactivity.
- Conclude the activity by discussing the observations. Highlight that ionic compounds are hard and brittle due to strong inter-ionic forces and have high melting points because significant energy is needed to break these bonds. Explain their solubility in water, where water molecules separate the ions, while non-polar solvents like kerosene cannot. Relate these properties to real-world uses, such as water purification, industrial processes, and high-temperature applications, making the connection between their structure and their practical importance clear.

## Activity 3 Salt and Soda



35 mins

### Materials Required

Common Salt, Baking Soda and Bowls

### Instructions

- Divide students into small groups for this activity and explain to them that an ionic compound is a substance formed when a metal and a non-metal chemically bond by transferring electrons.
- Provide each group with a small amount of salt or baking soda.
- Understanding Physical Nature
  - Ask them to gently press the sample with a spoon or fingertip and observe that these compounds are hard and brittle, breaking into smaller pieces when pressure is applied.
- Solubility Test
  - Place water in one bowl and kerosene or vegetable oil in another and add a small amount of the ionic compound to both liquids and stir.
  - Observe that the compound dissolves readily in water but remains insoluble in kerosene or oil.
- Heating Test
  - Heat a small amount of the ionic compound in a metal spoon over a candle or burner flame (with teacher supervision).
  - Ask the students to observe whether the compound melts or changes colour and explain that ionic compounds have high melting points because their strong inter-ionic attractions require a significant amount of energy to break.
- Conclude the activity by explaining that baking soda and common salt dissolve well in water but not in kerosene, highlighting their ionic nature. Both are hard solids, with baking soda decomposing when heated and salt remaining brittle, reflecting typical properties of ionic compounds and their behaviour in different settings.

# Assessment



35 mins

## Multiple-Choice Questions (MCQs)

- Which of the following is an exception among metals by being a liquid at room temperature?
  - Zinc
  - Aluminium
  - Mercury
  - Copper
- Amphoteric oxides exhibit properties of both acidic and basic oxides. Which of the following is an amphoteric oxide?
  - Magnesium oxide
  - Zinc oxide
  - Sodium oxide
  - Calcium oxide
- In the reactivity series, which metal can displace zinc from zinc sulphate solution?
  - Copper
  - Iron
  - Magnesium
  - Silver
- What happens when a more reactive metal is added to a salt solution of a less reactive metal?
  - The reactive metal dissolves
  - The less reactive metal is displaced
  - No reaction occurs
  - The solution evaporates
- Which of the following is a good conductor of electricity despite being a non-metal?
  - Sulphur
  - Graphite
  - Phosphorus
  - Carbon dioxide

## Very Short Answer Questions

- Define an alloy.

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- What is corrosion?

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## Short Answer Questions

- How do metals react with oxygen, and what are amphoteric oxides?

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- What is metallurgy?

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## Long Answer Question

- Explain the differences between metals and non-metals in terms of physical properties, chemical behaviour, and conductivity.

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# Answer Key

1. c) Mercury
2. b) Zinc oxide
3. c) Magnesium
4. b) The less reactive metal is displaced
5. b) Graphite
3. An alloy is a homogeneous mixture of two or more metals, or a metal and a non-metal.
4. Corrosion is the process in which the surface of some metals, such as iron, is degraded due to prolonged exposure to moist air.
5. Metals react with oxygen to form basic oxides, while amphoteric oxides, such as aluminium oxide and zinc oxide, show both acidic and basic properties.
6. Metallurgy is the process of extracting metals from ores and refining them into pure, usable forms through steps like ore concentration and reduction of metal compounds.
7. Metals are generally lustrous, malleable, ductile, and good conductors of heat and electricity, while non-metals lack these properties. Metals tend to form positive ions by losing electrons, whereas non-metals typically gain electrons to form negative ions. Metals combine with oxygen to form basic oxides, while non-metals form acidic oxides. Conductivity differs, with most metals being good conductors of electricity, whereas non-metals are generally poor conductors—except graphite, which conducts electricity.

**Level 3: Solves problems independently**

[illegible]

## Chapter 4 : Carbon and its Compounds

### Activity 1 All-Rounder Carbon



35 mins

### Materials Required

Pencil, Charcoal, Candle, Bulb and Battery

### Instructions

- Divide the class into small groups of three or four and provide each group with a pencil, a small piece of charcoal, and a candle.
- Have students examine the texture, appearance, and feel of each material. Ask them to rub graphite and charcoal on paper to compare the smooth, clear marks made by graphite with the rough, smudged marks left by charcoal.
- Set up a simple circuit using a battery and a bulb, with a graphite pencil lead completing the connection. Observe that the bulb lights up, demonstrating graphite's ability to conduct electricity, unlike charcoal or wax, which do not.
- Light a candle and observe how the wax burns, producing heat and light due to its carbon-based compounds. In contrast, charcoal burns slowly without melting, forming ash, while graphite resists burning and requires extremely high temperatures to react.
- Ask students to fill out the observations in a table comparing graphite, charcoal, and candle wax based on their physical properties, electrical conductivity, and behaviour when exposed to heat:

| Property                | Graphite (Pencil Lead) | Charcoal               | Candle Wax        |
|-------------------------|------------------------|------------------------|-------------------|
| Appearance              | Gray, shiny surface    | Black, dull, powdery   | Translucent, soft |
| Texture                 | Smooth and slippery    | Rough and brittle      | Soft and waxy     |
| Electrical Conductivity | Conducts electricity   | Does not conduct       | Does not conduct  |
| Reaction to Heat        | Does not melt easily   | Burns and turns to ash | Melts and burns   |

- Discuss the observations and explain that all three substances are made of carbon atoms but arranged differently, giving them distinct physical and chemical properties.
- Highlight how carbon exists in many forms, from soft graphite used in pencils to hard diamonds, to fuels like charcoal and candle wax, making it one of the most versatile elements in nature.

## Activity 2 The Naming Game



35 mins

### Materials Required

Paper Slips, Marker, Chart with functional groups and naming conventions

### Instructions

- Write the basic carbon chains (methane, ethane, propane, butane) on separate paper slips and ensure students understand that the number of carbon atoms determines the base name of the compound.
- Write functional groups (such as alcohol, aldehyde, ketone, carboxylic acid) on another set of slips and explain that functional groups define the properties and chemical behaviour of the compounds.
- Divide students into small groups and distribute a set of carbon chain cards and functional group cards to each group.
- Draw the following table on the board to help students reference naming conventions:

| Class of Compounds | Prefix/Suffix           |
|--------------------|-------------------------|
| Haloalkane         | Prefix: chloro-, bromo- |
| Alcohol            | Suffix: -ol             |
| Aldehyde           | Suffix: -al             |
| Ketone             | Suffix: -one            |
| Carboxylic Acid    | Suffix: -oic acid       |
| Alkene             | Suffix: -ene            |
| Alkyne             | Suffix: -yne            |

- Instruct students to combine a carbon chain with a functional group following nomenclature rules. If the functional group's suffix starts with a vowel (like -one or -oic acid), students should remove the final 'e' from the base name before adding the suffix (e.g., propane → propanone, butane → butanol).
- Ask each group to write down their named compounds, ensuring correct spelling and modifications according to the naming rules.
- Have students present their named compounds to the class, explaining their reasoning behind the nomenclature.
- Encourage groups to identify naming patterns, such as prefixes for halogen compounds (chloropropane) and suffixes for other functional groups (propanal for aldehydes).
- Conclude the activity by discussing the importance of systematic naming in chemistry, emphasising how organic compound names allow chemists to identify and communicate molecular structures and



## Activity 3 Cleaning Action



35 mins

### Materials Required

Two transparent glasses or bowls, Water, Cooking oil, Liquid detergent, Cotton swabs

### Instructions

- Fill two glasses with water.
- Add a few drops of cooking oil to both glasses and ask students to observe what happens. Guide them to notice that the oil floats on the surface and does not mix, showing that oil is hydrophobic (water-repelling).
- Explain that oily dirt behaves similarly—it doesn't dissolve in water easily, making it difficult to wash away without soap or detergent.
- Effect of Soap or Detergent
  - In one glass, add a few drops of liquid detergent or soap solution and gently stir.
  - Ask students to observe how the oil breaks into tiny droplets and starts mixing with water, demonstrating how soap emulsifies oily dirt.
  - Explain that soap molecules have two parts:
    - A hydrophobic tail, which attaches to oil and grease.
    - A hydrophilic head, which interacts with water, allowing the oil to be washed away.
- Relate this to how soaps and detergents help remove grease and stains from clothes, dishes, and skin and compare the glass with detergent to the other glass with only water, where the oil remains floating.
- Have students discuss and record their observations, noting how soap changes the interaction between oil and water.
- Relate this experiment to practical applications, such as how detergents help remove stains from clothes and how soaps cleanse the skin by breaking down oils and dirt and explain why detergents are often more effective in hard water, since they do not form scum with minerals like soap does.

# Assessment



35 mins

## Multiple-Choice Questions (MCQs)

1. What property of carbon allows it to form a large variety of compounds?
  - a. Low reactivity
  - b. Catenation and tetravalency
  - c. High melting point
  - d. Ability to dissolve in water
2. Covalent bonds are formed by:
  - a. Transfer of electrons
  - b. Sharing of electrons
  - c. Loss of protons
  - d. Gain of neutrons
3. Which of the following is **not** a functional group in organic compounds?
  - a. Alcohol
  - b. Aldehyde
  - c. Ketone
  - d. Sodium chloride
4. Carbon compounds are widely used as:
  - a. Structural elements in metals
  - b. Sources of fuels
  - c. Components in ceramics
  - d. Conductors in electrical circuits
5. How do soaps and detergents remove oily dirt?
  - a. By dissolving oil in water directly
  - b. By using hydrophobic and hydrophilic groups to emulsify dirt
  - c. By reacting chemically with oil to degrade it
  - d. By absorbing oil particles into their solid structure

## Very Short Answer Questions

6. What is catenation?  
\_\_\_\_\_
7. Name any two carbon compounds important in daily life.  
\_\_\_\_\_

## Short Answer Questions

8. Explain the difference between single, double, and triple bonds in carbon compounds.  
\_\_\_\_\_  
\_\_\_\_\_
9. What is a homologous series?  
\_\_\_\_\_  
\_\_\_\_\_

## Long Answer Question

10. Discuss the significance of functional groups in organic compounds and their role in determining chemical properties.  
\_\_\_\_\_  
\_\_\_\_\_

# Answer Key

1. b) Catenation and tetravalency
2. b) Sharing of electrons
3. d) Sodium chloride
4. b) Sources of fuels
5. b) By using hydrophobic and hydrophilic groups to emulsify dirt
2. Catenation is the ability of carbon to form long chains by bonding with itself.
3. Ethanol and ethanoic acid are important carbon compounds in daily life.
4. A single bond involves sharing **one** pair of electrons, a double bond involves sharing **two** pairs, and a triple bond involves sharing **three** pairs.
5. A homologous series is a group of organic compounds with the same functional group but varying chain lengths, following a uniform pattern of chemical properties.
6. Functional groups such as alcohols, aldehydes, ketones, and carboxylic acids play a crucial role in determining the chemical properties and behaviour of carbon compounds. These groups influence how a compound reacts with other substances, its solubility in different solvents, and the types of chemical transformations it can undergo. For example, alcohols are known for their ability to form hydrogen bonds, affecting their solubility in water, while carboxylic acids exhibit acidic properties due to the presence of a carboxyl group. The presence of these functional groups helps in classifying organic compounds into distinct categories and allows chemists to predict their behaviour in various chemical reactions, making them fundamental to understanding organic chemistry.

**Level 3:** Solves problems independently

[illegible]

## Chapter 7 : How Organisms Reproduce

### Activity 1 How Potatoes Propagate



35 mins

#### Materials Required

Potatoes, Knife, Tray, Moist Cotton or Tissue

#### Instructions

- Divide the students into small groups and begin by explaining that potatoes reproduce through vegetative propagation, a form of asexual reproduction where new plants grow from existing plant parts rather than from seeds.
- Distribute whole potatoes to each group and instruct them to carefully observe the surface, noting any small indentations or buds and add that these are the areas where new shoots can develop, asking students to describe what they see and discuss whether all potatoes have buds.
- Cut the potatoes into small pieces for them, ensuring some pieces contain buds while others do not. Have students categorise the pieces based on whether they contain buds and label them accordingly ("With Buds" and "Without Buds").
- Prepare a shallow tray with moist cotton or tissue paper to mimic soil conditions. Place the labelled potato pieces on it, ensuring those with buds are kept separate from those without.
- Keep the cotton moist by spraying it lightly with water daily. Have students observe and record changes, noting which pieces develop green shoots and roots and describing any growth patterns.
- After a week, discuss with the class:
  - Which potato pieces produced shoots and roots?
  - Did the pieces without buds show any signs of growth?
  - Why do only the bud-containing pieces sprout new plants?
- After the discussion, explain that potato buds contain meristematic tissue, which enables them to grow into new shoots and roots. Relate this to farming in Meghalaya, where tubers like potatoes, ginger, and turmeric are commonly propagated this way instead of using seeds, ensuring efficient crop growth in the region's hilly terrain.
- Encourage students to reflect on how a single potato can give rise to multiple new plants, demonstrating the efficiency of vegetative reproduction.

## Activity 2 Flowers and Fruit



35 mins

### Materials Required

Fresh flowers (Hibiscus, mustard, papaya, or any available local flowers), Magnifying glass (if available), Tweezers, White paper sheets, small brush or cotton swab, fruit with dried remnants of flowers

### Instructions

- Divide the class into small groups and provide each group with a plucked flower. Instruct them to carefully identify the parts of the flower—sepals, petals, stamens, and pistil. If available, use a magnifying glass to observe the stamens (male reproductive organ) and pistil (female reproductive organ).
- Ask students to gently pluck the stamens using tweezers and tap them onto white paper to observe the pollen grains (yellowish powder). Explain that these grains contain male germ cells essential for fertilisation.
- Using a small brush or cotton swab, demonstrate the transfer of pollen grains from the stamen to the stigma of the same flower to simulate self-pollination, and then transfer pollen to the stigma of another flower to simulate cross-pollination. Discuss how similar processes occur naturally through wind, water, or pollinators like bees.
- Ask students to examine the fruit and look for remnants of dried flower parts, such as sepals or stigma, to connect the process of fertilisation to seed and fruit formation.
- Conclude the activity by discussing the importance of sexual reproduction in plants and explaining how pollination enables fertilisation, leading to the formation of seeds and fruits. Highlight that seeds ensure plant propagation, while fruits protect seeds and aid in their dispersal, supporting biodiversity and ecological balance.

## Activity 3 Enacting Puberty



35 mins

### Materials Required

Paper Slips for Flash Cards

### Instructions

- Divide the class into small groups and give each group a set of flashcards describing changes that occur during puberty, such as "growth of facial hair," "voice deepening," "appearance of acne," "growth spurt," "getting a pimple" and "emotional changes".
- Explain that these changes are caused by hormones like testosterone and estrogen, which become active during adolescence to prepare the body for sexual maturity and emphasise that puberty is a highly individualised process shaped by genetics, hormones, and biology, and encourage inclusive thinking by avoiding rigid classifications.

- Encourage each group to role-play the change on their flashcard and how the individual might feel and react to these changes around their peers.
- After the role-play, use the accompanying table to guide a discussion on the biological processes behind these changes, such as hormonal activation and physical development. Reinforce that these changes are a normal part of growing up and happen differently for everyone.

| Process   | Explanation  |
|---|--|
| Hormonal Changes                                | The brain's hypothalamus signals the pituitary gland to release hormones (e.g., testosterone, estrogen) that trigger puberty.  |
| Growth Spurt                                    | Rapid increase in height and weight due to the release of growth hormones and sex hormones.  |
| Development of Secondary Sexual Characteristics | Boys develop facial hair, deeper voices, and broader shoulders, while girls develop breasts and wider hips. Both may experience increased body hair and changes in body shape. |
| Changes in Skin                                 | Increased activity of sebaceous (oil) glands and sweat glands can lead to acne and body odour.   |
| Development of Reproductive Organs              | Enlargement of the testes and penis in boys and the uterus and ovaries in girls, preparing them for reproduction.  |
| Onset of Menstruation                           | In girls, the menstrual cycle begins as the ovaries release eggs and the uterus prepares for potential pregnancy.  |
| Sperm Production                                | In boys, the testes begin producing sperm, enabling reproductive capability.   |
| Emotional Changes                               | Hormonal fluctuations can result in mood swings, heightened emotions, and increased self-awareness.  |
| Social and Cognitive Changes                    | Increased focus on identity, independence, and peer relationships, accompanied by cognitive development in critical thinking and decision-making.                              |

- Discuss with the class how the brain initiates puberty through the hypothalamus, which signals the pituitary gland to release hormones like testosterone and estrogen. These hormones cause physical and emotional changes, including mood swings, due to fluctuations in their levels.
- Emphasise the need for self-care during puberty, including hygiene, a balanced diet, and emotional health. Encourage students to seek reliable information about their development and provide a supportive environment for open discussions about their experiences.

# Assessment



35 mins

## Multiple-Choice Questions (MCQs)

1. Which of the following is an example of asexual reproduction?
  - a. Pollination in flowering plants
  - b. Budding in Hydra
  - c. Fertilisation in humans
  - d. Seed formation in plants
2. What is the primary advantage of sexual reproduction over asexual reproduction?
  - a. Faster reproduction rate
  - b. Creation of genetic variations
  - c. Requires only one parent
  - d. No need for fertilisation
3. In human reproduction, fertilisation occurs in the:
  - a. Uterus
  - b. Ovary
  - c. Fallopian tube
  - d. Vagina
4. What is pollination?
  - a. Transfer of sperm to the egg
  - b. Division of a cell into daughter cells
  - c. Transfer of pollen grains from anther to stigma
  - d. Process of budding in Hydra
5. Which of the following is a method of contraception?
  - a. Pollination
  - b. Budding
  - c. Copper-T
  - d. Binary fission

## Very Short Answer Questions

6. Define reproduction.

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7. What is puberty?

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## Short Answer Questions

8. Differentiate between sexual and asexual reproduction.

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9. Explain vegetative propagation with an example.

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## Long Answer Question

10. Describe the male and female reproductive systems in human beings.

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# Answer Key

2. b) Budding in Hydra
3. b) Creation of genetic variations
4. c) Fallopian tube
5. c) Transfer of pollen grains from anther to stigma
6. c) Copper-T
2. Reproduction is the biological process by which organisms produce offspring to ensure the continuation of their species.
3. Puberty is the stage of growth when an individual undergoes physical changes, such as breast development in girls and facial hair growth in boys, signalling sexual maturation.
4. Asexual reproduction involves a single parent and produces identical offspring, while sexual reproduction requires two parents and results in genetic variation.
5. Vegetative propagation is a form of asexual reproduction where new plants grow from roots, stems, or leaves. An example is the growth of new potato plants from tubers.
6. The male reproductive system includes testes, vas deferens, seminal vesicles, prostate gland, and penis, responsible for sperm production and delivery. The female reproductive system consists of ovaries, fallopian tubes, uterus, and vagina, facilitating egg production, fertilisation, and foetal development.

**Level 3:** Solves problems independently

[illegible]

## Chapter 8 : Heredity

### Activity 1 Genes and Beans



35 mins

#### Materials Required

Cups or Bowls, Beans or Grains of different colours

#### Instructions

- Divide the class into small groups and provide each group with cups or bowls labelled for grandparents, parents, and 3 more for 3 children.
- Fill the cups for the grandparents with grains or beans of different colours to represent traits, while leaving the cups for parents and children empty at the beginning of the activity.
- Have each "grandparent" randomly select two grains from their cups to represent traits they pass to their "child." For example, Grandfather 1 might pass one green grain and one black grain to Father. Repeat this process for all grandparents until the cups for Father and Mother are filled with traits inherited from their respective parents.
- Next, each "parent" closes their eyes and randomly picks two grains from their cup to pass traits to one child at a time, starting with. Repeat this process for each sibling, ensuring the grains are returned to the parents' cups after each child's traits have been assigned.
- Guide the students to create a chart documenting the grains passed to each individual in their group. The chart should highlight traits inherited from grandparents and parents, and the unique combinations that appear in each sibling.
- Wrap up the activity with a discussion on how traits are passed down through generations and why the process is random. Explain how dominant traits tend to appear more frequently, while recessive traits only manifest if inherited from both parents. Highlight the role of probability in genetic inheritance.
- Ask students to reflect on the absence of certain traits in grandchildren despite being present in grandparents and emphasise how genetic combinations vary with each new generation, showcasing the dynamic nature of inheritance

## Activity 2 Acquired or Inherited?



35 mins

### Materials Required

Paper Slips or Cards, Pen or Marker

### Instructions

- Write the following features and characteristics on different cards:

| Eye colour                   | Speaking multiple languages |
|------------------------------|-----------------------------|
| Riding a bicycle             | Height                      |
| Hair texture                 | Cooking                     |
| Playing a musical instrument | Curly or straight hair      |
| Freckles                     | Solving puzzles             |
| Swimming                     | Skin tone                   |
| Dimples                      | Drawing or painting         |
| Driving a car                | Facial features             |

- Draw a table on the board with two columns, **Inherited Traits** and **Acquired Skills**, and map the traits based on where students have positioned themselves. Once all traits are placed, review the table and correct any misclassified traits to ensure accurate understanding.

| Inherited Traits       | Acquired Skills              |
|------------------------|------------------------------|
| Eye colour             | Riding a bicycle             |
| Hair texture           | Playing a musical instrument |
| Freckles               | Swimming                     |
| Dimples                | Speaking multiple languages  |
| Height                 | Cooking                      |
| Curly or straight hair | Solving puzzles              |
| Skin tone              | Drawing or painting          |
| Facial features        | Driving a car                |

- After everyone has chosen a spot, lead a discussion where students explain their choices. The teacher provides clarification by reinforcing why some traits are inherited genetically while others are learned through experience.
- Have students create a Trait & Skill Map, listing their own inherited traits and acquired skills and ask them to compare their maps with classmates to explore similarities and differences.
- Wrap up the activity with a class discussion on how genetics influence inherited traits while environment and experience shape acquired skills and encourage students to reflect on traits that appear later in life, such as height or voice changes, and how they might observe these patterns in their own families.

## Activity 3 Chromosome Pair-up!



35 mins

### Materials Required

Two sets of paper slips marked as X and Y chromosomes, two labelled bowls and whiteboard or chart for recording results

### Instructions

- Label one bowl as "Maternal" and fill it with only X chromosomes, as mothers always contribute an X chromosome. Label the other bowl as "Paternal" and fill it with an equal number of X and Y chromosomes to represent the father's possible contributions.
- Ask students take turns selecting one chromosome from the maternal bowl and one from the paternal bowl to form a genetic pair and after each selection, guide them to record the pair on the board: XX = female, XY = male.
- After multiple rounds, students encourage the students to analyse the results and calculate the ratio of male (XY) and female (XX) outcomes.
- Discuss how the father's contribution determines the sex of the child, as the paternal chromosome can either be X (resulting in a girl) or Y (resulting in a boy), while the mother always provides an X chromosome and highlight how the sex is entirely dependent on the combination of chromosomes, which is random. The Y chromosome determines male offspring, meaning there's roughly a 50/50 chance of the child being male or female.
- Address how women are often unfairly held responsible for the sex of the child and explain why this belief is scientifically inaccurate and emphasise that women contribute only X chromosomes, leaving the determination of sex to the paternal chromosome.
- Conclude the activity by comparing sex determination in humans to other species, such as reptiles where external factors like temperature influence sex, and birds, which inherit sex differently and reinforce the idea that genetic inheritance follows predictable patterns in humans, and misconceptions should be corrected to promote awareness and equality.

# Assessment



35 mins

## Multiple-Choice Questions (MCQs)

1. Who is known as the father of genetics?
  - a. Charles Darwin
  - b. Gregor Mendel
  - c. Louis Pasteur
  - d. Watson and Crick
2. What determines the sex of a child in human beings?
  - a. The mother's XX chromosome
  - b. The father's XY chromosome
  - c. The environment
  - d. The amount of DNA
3. If an individual inherits two different copies of a gene for a trait, the trait that gets expressed is called the:
  - a. Recessive trait
  - b. Co-dominant trait
  - c. Dominant trait
  - d. Mutated trait
4. What process leads to variations in sexually reproducing organisms?
  - a. DNA replication
  - b. Natural selection
  - c. Genetic recombination
  - d. Binary fission
5. In a monohybrid cross between two heterozygous (Tt) pea plants, what is the expected genotypic ratio of the offspring?
  - a. 1:1
  - b. 1:2:1
  - c. 3:1
  - d. 2:1

## Very Short Answer Questions

6. What is heredity?

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7. Who was Gregor Mendel, and what did he study?

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**Short Answer Questions**

8. Explain the difference between dominant and recessive traits.

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9. How does Mendel's work help in understanding inheritance?

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**Long Answer Question**

10. Explain how sex is determined in humans. Discuss the role of chromosomes in this process and clarify common misconceptions related to sex determination.

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# Answer Key

1. b) Gregor Mendel
2. b) The father's XY chromosome
3. c) Dominant trait
4. c) Genetic recombination
5. b) 1:2:1
6. Heredity is the passing of genetic traits from parents to offspring.
7. Gregor Mendel was an Austrian scientist who studied inheritance patterns in pea plants, leading to the foundation of modern genetics.
8. Dominant traits are expressed when at least one dominant allele is present, while recessive traits only appear if two recessive alleles are inherited.
9. Mendel's experiments with pea plants established laws of inheritance, showing how traits are passed from one generation to another through dominant and recessive genes.
10. Sex determination in humans is controlled by chromosomes inherited from the parents. Humans have 23 pairs of chromosomes, including one pair of sex chromosomes. The mother always contributes an **X chromosome**, while the father can contribute either an **X** or a **Y** chromosome. If the sperm carrying an X chromosome fertilises the egg, the child will be female (**XX**). If the sperm carries a Y chromosome, the child will be male (**XY**).  
This process is entirely genetic and random, meaning parents have roughly a **50/50 chance** of having a male or female child. However, misconceptions persist in some societies, especially in India, where women are often wrongly blamed for the sex of a child. Since the mother only provides an X chromosome, it is actually **the father's contribution** that determines whether the child is male or female.



## Learning Level Tracker

Keep a record of unit/chapter assessment results in the tracker.

**As you conduct assessments based on the activities suggested, put a tick mark as per the following:**

**Level 1:** Not able to solve problems and having difficulty comprehending the problem

**Level 2:** Solves most of the problems with external support

**Level 3:** Solves problems independently

[illegible]







Government of Meghalaya  
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