CONTINUOUS AND COMPREHENSIVE EVALUATION

MATHEMATICS

TEACHER’S MANUAL

IX STANDARD

PREPARED BY
STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING,
CHENNAI – 600 006,
TAMIL NADU
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      | SCERT, Chennai – 600 006. |

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Preface

The Government of Tamil Nadu, in a pioneering initiative to reach the goal of quality in education, introduced Continuous and Comprehensive Evaluation (CCE) and Trimester Pattern in 2012-13 for class I to VIII. Subsequently, CCE is being introduced in Std IX from the year 2013-14 in all the High and Higher Secondary Schools of Tamil Nadu.

This strategic combination of CCE with Trimester has been implemented only in the State of Tamil Nadu in India with the intention of reducing the book load, learning load and subsequently the load of miscomprehension. This has impacted not only the learning styles of the students but also enthused the teachers to assess students for learning. Incidentally the teachers have become co-learners in the process of administering CCE to students. This transformation has inspired the teachers to become reflective practitioners and students enthusiastic constructors of knowledge from their own past experiences, peers, teachers, elders, community, library and digital resources. CCE has opened the avenues for student community to seek knowledge from diverse resources and learn to stand on their own legs.

SCERT has prepared Training Manuals on General Guidelines for CCE and Subject-Specific Guidelines to help teachers implement the student-friendly - CCE and Trimester system effectively. SCERT proposes to train all the teachers at the secondary level to assimilate the strategies involved in the implementation of both Formative and Summative Assessments. The assessment Activities have been designed so meticulously that teachers would naturally find it easy to use, adopt or create their own activities to witness and assess the miracle of learning happening in the class room in a fear-free, friendly and enabling environment.

The manuals deal with Scholastic and Co-Scholastic activities and also assessment of values, attitudes and life skills in each subject including Physical Education which has now been brought under curricular subjects.
Formative and Summative Assessments are carried out while learning and after learning respectively. The former assesses for learning and remedial activities are given for ensuring relearning and the latter is of learning and it has no scope for remedial measures.

In this radical method of assessment, Teachers assess not only the learning and achievement but also the students’ social graces, their knowledge and application of social skills through Co-Scholastic assessment activities.

This assessment method facilitates the identification and nurturing of the innate potential of students. Teachers get to know the all-round development of students. Besides, the Training Manuals have included strategic suggestions to develop assessment activities for the differently-abled learners appropriate to their level of understanding and learning capacity.

Teachers are hereby requested to undergo the training earnestly and assimilate the ideas and strategies discussed in a positive way and implement CCE and Trimester effectively in their respective classrooms. Then only the teachers can ensure the transformation of the younger generation into well-rounded personalities and responsible citizens of this country capable of shaping the future destiny of this country. Teachers shall take into consideration the fact that destiny of a country is shaped inside the four walls of a class room. Hence SCERT and the manual development team expect the teachers to realize their precious responsibilities to the students and to the Society and implement CCE and Trimester in all academic seriousness and involvement in their Schools.

SCERT
Chennai
<table>
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<th>Page Number</th>
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<td>Practical Geometry)</td>
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<td>Summative Assessment – Model Question Paper</td>
<td>63-66</td>
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</tbody>
</table>
Continuous and Comprehensive Evaluation

Continuous and Comprehensive Evaluation (CCE) enables the students to be evaluated throughout the year besides enabling them to develop their physical, mental, attitudinal skills by which they attain holistic personality and become responsible citizens. This includes Formative Assessment (a), Laboratory activities, Formative Assessment (b) and Summative Assessment. In this method of assessment, teachers need to design an evaluation activity by which individual talents of each student is expressed. Formative Assessment (a) is done by involving students in activities while teaching the concepts. Mathematics Laboratory Activities help students learn mathematical concepts easily and apply them in real life situations. Formative Assessment (b) helps to assess understanding of concepts by administering students small tests. Teachers can understand the extent of concept attainment of students and the lacunae in this process can be resolved by adopting remedial activities for enhancing concept attainment.

Skills developed by learning Mathematics

- Numerical Ability
- Mathematical Problem Solving
- Estimation of Quantities
- Approximation
- Visualisation & Representation
- Identification of Pattern
- Data Handling
- Investigation
- Thinking Skill
- Mathematical Communication
- Application of Mathematical concepts in real life situations.
**Guidelines for using Teacher’s Manual**

Teacher has to keep the following in mind while implementing CCE in classroom.

- The objective of CCE is to understand difficult areas with reference to students understanding and adopt remedial activities for enhancing concept attainment. This guideline further helps teachers and learners understand their status in the teaching-learning process.

- The assessment activities given in the manual are only suggestive. The teachers can use them as such or they can modify based on the classroom/students/local needs without affecting the objective of CCE.

- This manual has many evaluation strategies and activities for undertaking assessment activities. Based on learning objectives, expected learning outcomes, time duration, students’ strength and available resources the suggested activities may be implemented.

- Teacher has to take special care in order that students are not stressed while Formative Assessment is used in classroom for assessment.

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**Continuous Comprehensive Evaluation**

- **Formative Assessment (40 Marks) (Throughout the Term)**
  - Formative Assessment (a)-two best out of four Activities (2 x 10 = 20Marks)
  - Laboratory Activity-Average of four Activities (10Marks)
  - Formative Assessment (b)-one best out of two Tests (1 x 10 = 10Marks)

- **Summative Assessment (60 Marks) (End of the Term)**
**Formative Assessment (a)**

FA (a) is an assessment done based on activities, while teaching a concept for the formation of the concept as well as to strengthening the concept.

**Salient Features of Formative Assessment (a)**

- Even though all the students are involved in the activities conducted to strengthen the learning process, the teacher has to assess only five students by closely monitoring them.
- It is a yardstick for students for self assessment.
- Guidelines for teachers to diagnose the problems and take remedial activities to resolve them.
- Development of life skills like decision making, problem solving, building relationship, critical thinking and effective communication through group activities.
- Designing activities according to the learning pace of the students.
- Each FA (a) model activity is supplemented with descriptors for assessment. Teachers can develop their own descriptive indicators for the additional activities designed by them.
- Each student has to be involved in at least 4 activities in a term out of which the best 2 activities are to be taken into consideration for recording. (2 activities x 10 marks) = 20 marks

**Some Activities for FA (a)**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Activity</th>
<th>S.No.</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Group Activity</td>
<td>2.</td>
<td>Learning by doing</td>
</tr>
<tr>
<td>3.</td>
<td>Investigation</td>
<td>4.</td>
<td>Assignments</td>
</tr>
<tr>
<td>5.</td>
<td>Group Game</td>
<td>6.</td>
<td>Games</td>
</tr>
<tr>
<td>9.</td>
<td>Interpretation</td>
<td>10.</td>
<td>sequencing the concepts</td>
</tr>
<tr>
<td>11.</td>
<td>Puzzle</td>
<td>12.</td>
<td>Mathematical Communication</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Activity</td>
<td>Sl. No.</td>
<td>Activity</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------</td>
<td>--------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>13.</td>
<td>Role play</td>
<td>14.</td>
<td>Flow Chart</td>
</tr>
<tr>
<td>15.</td>
<td>Concept Mapping</td>
<td>16.</td>
<td>Project Work</td>
</tr>
<tr>
<td>17.</td>
<td>Problem Solving</td>
<td>18.</td>
<td>Visualization</td>
</tr>
<tr>
<td>21.</td>
<td>Albums</td>
<td>22.</td>
<td>Group Discussion</td>
</tr>
<tr>
<td>25.</td>
<td>Presentation through digital means or through</td>
<td>26.</td>
<td>Compare and contrast</td>
</tr>
<tr>
<td></td>
<td>Graphs, diagrams etc.,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Debate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Laboratory Activities**

Mathematics Laboratory Activities help students to explore mathematical concepts, theories and theorems, learn and verify them using various materials. Under Formative Assessment, 10 marks is allotted for this activity.

Based on the first term portions, Mathematics Laboratory Activities have been designed. The students need to involve in these activities in groups after the steps of the activities are clearly explained by the teacher. Eight activities are prescribed in this manual for the first term. Among these activities a minimum of four activities are to be undertaken by allotting 10 marks for each activity as given below. The average of these four activities is to be recorded under lab activity.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lab Ethics</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Adopting proper procedure for the lab activity</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>Recording</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>Verifying the solution of the problem</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>Clear explanation for the questions</td>
<td>2</td>
</tr>
</tbody>
</table>
Formative Assessment (b)

Formative Assessment (b) is a small test conducted for all students for a short duration after completing a unit for assessing the understanding of the concept attainment.

Salient Features

1. Ensuring learning attainment of each student through the individual activity.
2. It is a yard stick for students to understand concept attainment by themselves.
3. Guidelines for teachers to diagnose the problems and take remedial activities to resolve them.
4. Development of life skills like self awareness, critical thinking, creativity and problem solving skill as diagnosis is done through individual activity.
5. All the students should take at least 2 tests in a term and the teacher has to take the better performance for recording. (1 small test x 10 marks = 10 marks)

Types of Questions for FA (b)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Types of Questions</th>
<th>S.No.</th>
<th>Types of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Multiple Choice</td>
<td>2.</td>
<td>Sequencing</td>
</tr>
<tr>
<td>3.</td>
<td>Fill in the blanks</td>
<td>4.</td>
<td>Right / Wrong</td>
</tr>
<tr>
<td>5.</td>
<td>yes / No</td>
<td>6.</td>
<td>Very Short Answer Type</td>
</tr>
<tr>
<td>7.</td>
<td>Matrix type</td>
<td>8.</td>
<td>Short Answer Type</td>
</tr>
<tr>
<td>9.</td>
<td>Odd one out</td>
<td>10.</td>
<td>Paragraph Question</td>
</tr>
</tbody>
</table>

Summative Assessment

The examination conducted for 60 marks at the end of each term is Summative Assessment. This test is conducted for a specific duration based on the given blueprint for each term.
• The pattern of question paper and model question papers are annexed in this manual
• Summative Assessment is conducted based on the instructional objectives like knowledge, understanding, application and skills
• Besides sums given in examples and exercises, other sums based on the content can also be asked in this test.

Classroom Activities:

Individual Activity

Individual Activity necessitates each student to involve in activities under CCE. While implementing these activities, teacher has to pay individual attention on each student and ensure learning happens without any hitches.

The learning through individual activity takes the concept to students long term memory and makes learning meaningful.

Paired Activity

Student can be grouped in pairs and the group can be assessed by involving them in activities.

Small Group Activity

• Based on the nature of the assessment activity, teacher can design activities by dividing the students into groups of 5 or more.
• Each group may be assigned a group activity of a selected content.
• The supply of required materials is to be ensured before implementing the activity.
• The participation of each and every student is to be ensured.

Whole Class Activity

Based on the nature of the assessment activity, all students of the class may be involved in a single group and assessment may be undertaken.

For example, for assessing ‘Real Numbers’ all the students can be divided into 5 groups and each group may be involved to perform a role play by depicting one type of number (Natural number, whole number, etc).
Remedial Teaching

The students who are unable to involve totally in FA (a) and FA (b) or such students who require additional help, teacher may design new similar activity or involve them in the same activity with guidance.

The teacher has to repeatedly undertake this process until students attain total concept clarity as expected out of the activity.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>content</th>
<th>No. of periods</th>
<th>Marks (including marks for choices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Theory of Sets</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>2.</td>
<td>Real Number System</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>Algebra</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>4.</td>
<td>Geometry</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>5.</td>
<td>Coordinate Geometry</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>6.</td>
<td>Practical Geometry</td>
<td>09</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>99</strong></td>
<td><strong>96</strong></td>
</tr>
</tbody>
</table>
Suggestive Activities for Formative Assessment (a)

Unit 1: Theory of Sets

Activity 1: Well defined, not well defined sets
Unit: Theory of Sets
Content: Definition of Set
Learning Objective: To develop the skill of defining sets
Assessment: Awarding marks based on the given descriptive indicators through group activity
Duration: 30 mts.

Procedure:
The entire class is to be divided into two groups. While one group gives a statement on a collection of objects, the other group has to say whether it is well defined or not. Besides, their answer has to be reasoned out.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Statement</th>
<th>Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>No. of students studying in our school</td>
<td>Well defined</td>
</tr>
<tr>
<td>2.</td>
<td>No. of good students in our class</td>
<td>Not well defined</td>
</tr>
<tr>
<td>3.</td>
<td>No. of prime numbers less than 10</td>
<td>Well defined</td>
</tr>
<tr>
<td>4.</td>
<td>No. of Districts in Tamil Nadu</td>
<td>Well defined</td>
</tr>
<tr>
<td>5.</td>
<td>No. of bright stars seen in the sky</td>
<td>Not well defined</td>
</tr>
</tbody>
</table>

Similarly, the activity may be done vice-versa. The teacher has to give equal opportunity for all the students and assess based on the descriptive indicators. Students may be given chance to give more examples.

Descriptive Indicators

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Expressing the Statement Correctly</th>
<th>Reflecting Upon the Answer</th>
<th>Giving Reasons for the Result</th>
<th>Adding 1 more example &amp; Defining it</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

8
Activity 2 : Group Activity

Unit : Theory of Sets

Content : Three ways of representing a set

Learning Objective : To represent the set in 3 different ways

Assessment : Awarding marks based on the given descriptive indicators through group activity

Duration : 30 mts.

Procedure:

The students of the class can be divided into 3 groups. One group may be named as 'Descriptive Form', the second group as, 'Set Builder Form' and the third as 'Roster Form'. While one group states a set on his own according to the name of his/her group, the other two groups convert the given set into their respective forms. Instead of giving chance for the same team, all the three groups may be given equal chance to initiate the process.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Descriptive Form</th>
<th>Set Builder Form</th>
<th>Roster Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A set of even numbers less than 20</td>
<td>$A = {x : x \leq 20, x \in \text{even numbers}}$</td>
<td>$A = {2, 4, 6, 8, \ldots, 18}$</td>
</tr>
<tr>
<td>2.</td>
<td>A set of odd numbers less than 10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>-</td>
<td>$B = {x : x &lt; 50, x \in \text{square numbers}}$</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>-</td>
<td>-</td>
<td>$A = {4, 6, 8, 9, 10, 12, 14, 15, 16, 18}$</td>
</tr>
<tr>
<td>5.</td>
<td>A set of English months starting with the letters 'A' and 'J'</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Descriptive Indicators:

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Framing questions Appropriate to initiate the Process</th>
<th>Giving correct answer</th>
<th>Participation in the Team</th>
<th>Creating a new set</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Activity 3: Group Activity

Unit: Theory of Sets

Content: To identify the kinds of sets

Learning Objective: To develop the skill to create different kinds of sets

Assessment: Awarding marks based on the given descriptive indicators through group activity

Duration: 45 mts.

Procedure:

Teacher divides the class into 2 groups and presents the flash cards carrying the names of sets to one group and the flash cards carrying the examples to the second group. When one student of the first group reads the kind of the set from the cards, the student from the second group has to match the card with the appropriate example.

For example, a student from the first group says “Equal Sets”, the student from the second group has to match it with cards containing “A set of Std IX students studying Maths” “A set of Std IX students studying Science”. This activity is to be continued. A few examples are given below:
<table>
<thead>
<tr>
<th>Sets</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Set</td>
<td>All students of the High / Higher Secondary School</td>
</tr>
<tr>
<td>Sub set</td>
<td>Students studying in Std VI</td>
</tr>
<tr>
<td>Null set</td>
<td>Students studying in Std V</td>
</tr>
<tr>
<td>Equal sets</td>
<td>Students studying Maths in Std IX</td>
</tr>
<tr>
<td></td>
<td>Students studying Science in Std IX</td>
</tr>
<tr>
<td>Equivalent sets</td>
<td>Students of Std IX and their overall grades</td>
</tr>
<tr>
<td>Singleton set</td>
<td>School Pupil leader of the school</td>
</tr>
</tbody>
</table>

Then, the students of one group may form sets from their real life situations and the second group has to decipher the kinds of sets. Each group is to be awarded 5 marks for stating 5 sets and 5 marks for giving the correct kind of sets.

**Activity 4**
: Mathematical Scrap Book

**Unit**
: Theory of Sets

**Content**
: Set Operations

**Learning Objective**
: To depict set operations by drawing Venn Diagrams

**Assessment**
: Awarding marks based on the given descriptive indicators

**Duration**
: 45 mts.

**Materials Required**
: A4 sheet, colour papers, a pair of scissors

**Procedure:**

**Step-1**
Teacher explains universal set, complement of a set, union of two sets (A∪B), intersection of two sets (A∩B), disjoint sets (A∩B=∅), difference between 2 sets (A-B, B-A), symmetric difference between two sets (A Δ B) and
then assigns the students to prepare a scrapbook based on the above said set operations.

**Step-2**

The students may be encouraged to use colour papers to show the set operations.

**Step-3**

Find the cardinal numbers of the sets framed and prove the following:

\[ n(A \cup B) = n(A) + n(B) - (A \cap B) \]

**Step-4**

The objects used in real life situations can be used to form sets and the set operations may be done.

**Descriptive Indicators**

<table>
<thead>
<tr>
<th>Understanding of set operations</th>
<th>Designing sets using objects from real life situations</th>
<th>Drawing correct Venn diagrams</th>
<th>Finding correct Cardinal numbers &amp; proving the result</th>
<th>Explaining the process correctly</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Activity 5**

**Unit**: Theory of Sets

**Content**: Kinds of Sets

**Learning Objective**: To understand set language clearly

**Assessment**: Awarding marks based on the given descriptive indicators

**Duration**: 45 mts.

**Materials Required**: Separate Cards having the following:

A, B, C, D, P, Q, R, S, a, b, c, \( \cap, \cup, \Delta, \in, \notin, \subset, \supset, \neq, =, \cdot \)

and flannel board

**Procedure:**

**Step 1**: Divide the class into groups

**Step 2**: Each group should be given a set of the following cards

A, B, C, D, P, Q, R, S, a, b, c, d, \( \cap, \cup, \Delta, \in, \notin, \subset, \supset, \neq, =, \cdot \)

**Step 3**: Students of the group have to form acceptable Mathematical statement
For example:

1. \( A = \{a, b, \} \)
2. \( B = \{c, d, \} \)
3. \( A \cup B = \{a, b, c, d, \} \)
4. \( a, b \in A \)
5. \( a \notin B. \)

Make them frame a few more statements.

**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Making use of all symbols</th>
<th>Creating correct sets</th>
<th>Creating maximum Mathematical Statements</th>
<th>Involvement in the team</th>
<th>Answering correctly for the question asked by the teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Activity 6** : Flow Chart  
**Unit** : Theory of Sets  
**Content** : Kinds of Sets. Rewriting the sets from roster form to set builder form  

**Learning Objective** : To develop the skill of rewriting the set from roster form to set builder form  

**Assessment** : Awarding marks based on the given descriptive indicators  
**Duration** : 20 mts.  
**Procedure:**

- Divide the entire class into 5 groups. Each group is to be given sets of 5 numbers of a definite pattern (odd numbers, even numbers, multiples of 3, multiples of 4, etc., in roster form)  
- The groups have to follow the steps given in the flow chart:

**Step 1** : Consider the given set of 5 numbers \( A = \{1, 2, 3, 4, 5\} \)

**Step 2** : \( 1 \in A, 2 \in A, 3 \in A, 4 \in A, 5 \in A \)

**Step 3** : \( x \in A \)

**Step 4** : \( x \in \mathbb{N}, x \leq 5 \)

**Step 5** : \( \{x: x \in \mathbb{N}, x \leq 5\} \)
Step : 1
List out a set of 5 numbers in roster form

Step : 2
Using the given 5 numbers and the symbol ‘∈’ create 5 Mathematical statements

Step : 3 Write the generalised statement

Step : 4
To verify if the given Mathematical statement satisfies the given set of numbers

Step : 5
Write the numbers in set builder form

Step : 5
Create more Mathematical statements to define the given numbers completely
Descriptive Indicators

<table>
<thead>
<tr>
<th>Creating a correct set</th>
<th>Creating Mathematical statement for each element</th>
<th>Generalisation of Mathematical statement</th>
<th>Developing Additional Mathematical statements for given set</th>
<th>Converting Roster form into set builder form correctly</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Unit 2 - Real Number System

Activity 1: Role Play

Unit: Real Number System

Content: Formation of real numbers

Learning Objective: Understanding the subsets of real numbers and their usage

Assessment: Awarding marks based on the given descriptive indicators for role play

Duration: 45 mts.

Procedure:

Step 1:
Students are divided into 6 groups and the groups are named as N, W, Z, Q, T₁ & R respectively.

Step 2:
'N' group has to introduce themselves as natural numbers. Another member of the group has to say the elements of the set of natural numbers.

\[ N = \{1, 2, 3, \ldots\} \]

The third member of the group has to say that the sum of 2 natural numbers is a natural number only. He says, can I get a natural number when I subtract one natural number from another. Yes, for example, 5-4=1, 6-3=3. But, when I subtract 2 from 2, the answer does not belong to my family, natural numbers. Where can I find it? Will anyone help me?
Step 3:

One member of group W comes forward and says that the answer for your question is ‘O’ and it is found in the set of whole numbers.

The second member of this group has to list out the set of whole numbers. W = {0, 1, 2, 3...}

The third member of the group says that the sum of two whole numbers is a whole number only. He further adds that if he subtracts one whole number from another, he gets only a whole number.
7-3=4, 6-6=0. But, if 5 is subtracted from 2, the answer is –3. 2-5=-3. It is not found in my family. Where do I find it?

Step 4:

One member of the group Z comes forward and says that I have the answer ‘-3’ for your question (2)-(5). The second member of the group has to list out the set of integers.

Z = {---, -2, -1, 0, 1, 2, ---}. The third member says that when you add two integers, the result is also an integer. What do you get when you divide two integers? He adds that when 3 is divided by 2, the answer does not belong to my family. Where do I find it?

Step 5:

One of the members of the group Q says, ‘When we are here why do you worry?’ Introduce Q as mentioned above.

Step 6:

One of the members of the set of irrational numbers (T’) says that we are entirely different from the other sets.

Step 7:

One member of the group R says that we are very generous to include all of them in our set. He calls all of them to form a larger circle. Then he talks about the properties of real numbers.

After the completion of role play, the teacher gets ready with the flash cards and the questions written on it.
Questions
1. All natural numbers are whole numbers
2. All whole numbers are natural numbers
3. All integers are whole numbers
4. All whole numbers are integers
5. Every rational number is an integer
6. All integers are rational numbers
7. Every natural number is a rational number
8. Every rational number is an irrational number
9. Zero is a rational
10. Zero is a natural number
11. When zero is divided by itself we get 1
12. 1, 3---- are irrational numbers

When the first statement, ‘All natural numbers are whole numbers’ is read out, the members of natural numbers and whole numbers have join together and give the answer as ‘yes’. As the teacher reads the above mentioned statements, the students have to join in their groups and give the correct answer. Marks will be awarded based on the descriptive indicators given below.

Descriptive Indicators

<table>
<thead>
<tr>
<th>Skill of expressing the concepts through role play</th>
<th>Giving the properties based on the character</th>
<th>Skill of expressing the concepts clearly</th>
<th>Involvement in the team</th>
<th>Skill of expressing the important concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Activity 2 : Group Game
Unit : Real Number System
Content : Different Number Systems
Learning Objective : Identifying different number systems
Assessment : Awarding marks based on group game activity
Duration : 30 mts.

Procedure :
Step 1 :
Divide the students into 6 groups. Teacher shuffles 30 cards containing natural numbers, whole numbers, integers, rational numbers, irrational numbers, real numbers and places them on the table.

Step 2 :
The teacher calls each group and asks one of the students from the group to choose a particular number card. Match the sets related to the number in the card and present it within 2 minutes.
**Example:**

If a student selects number 5 from the number cards given above, the student then has to say number 5 is a natural number (N), whole number (W), integers (Z), rational number (Q), real number (R).

**Step 3 :**

Thus the teacher makes all the students participate in the activity and observes them and corrects their mistakes.

**Descriptive Indicators**

<table>
<thead>
<tr>
<th>Skill of identifying the numbers</th>
<th>Skill of understanding different kinds of numbers</th>
<th>Skill of differentiating one number from the other</th>
<th>Involvement in the group</th>
<th>Differentiating all kinds of numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Activity 3** : Exploration

**Unit** : Real Number System

**Content** : Rational Numbers

**Learning Objective** : To understand that there are innumerable rational numbers between two rational numbers

**Assessment** : Awarding marks based on the given descriptive indicators

**Duration** : 45 mts.

**Procedure** :

In order to represent the rational number 3.7284 in a number line, the number line inbetween the two rational number is magnified continuously step by step.

In fig. 1, 3.7 is marked between 3 and 4. Then, 3.72 marked between 3.7 and 3.8. Similarly, the above process can be continued to mark the rational numbers with 3 decimal places as well as 4 decimal places exactly on the number line.
Similarly students may be given different sums and asked to represent the number with 5 decimal places on the number line.

**Step 1**:  
On a number line mark two consecutive numbers. For example, there are 10 equal divisions in between 3 and 4. Mark 3.7 on this number line.

**Step 2**:  
There are 10 equal divisions in-between 3.7 and 3.8 mark 3.72 on this number line.

**Step 3 and Step 4**:  
Similarly proceed further and mark 3.7284 on the number line.

**Descriptive Indicators**

<table>
<thead>
<tr>
<th>Constructing number lines</th>
<th>Marking correct numbers</th>
<th>Extending the no line between the two numbers</th>
<th>Constructing number line sequentially</th>
<th>Completing the task properly</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
**Activity 4**: Finding the value of $\pi$

**Unit**: Real Number System

**Content**: To find the value of $\pi$ (irrational number)

**Learning Objectives**: To make them understand that $\pi$ is an irrational number and to make them know the value of $\pi$

**Assessment**: Awarding marks based on the descriptive indicators

**Duration**: 20 mts.

**Materials Required**: Compass, scale & pencil

**Procedure**:

Students are made to draw circles of different radii in a chart paper. They measure the diameter and the circumference (using thread) of each circle and tabulate it. Then, they divide the circumference by the diameter and enter it in the tabular column. They find that all the values are almost equal to 3.414... This leads to the conclusion that $\pi$ is the constant obtained by dividing circumference by diameter of the same circle.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Radius of the Circle (r)</th>
<th>Circumference (c)</th>
<th>Diameter (d)</th>
<th>c/d</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\pi = \frac{c}{d} (\text{circumference}) \div \text{d (diameter)}$

= 3.414 (constant)

= irrational no

**Descriptive Indicators**

<table>
<thead>
<tr>
<th>Drawing circles of given radii</th>
<th>Finding d and c of the circles</th>
<th>Dividing circumference by the diameter and finding the correct answer</th>
<th>Generalising the result</th>
<th>Explaining that the value of $\pi$ is an irrational number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
**Activity 5** : Assignment

**Unit** : Real Number System

**Content** : Set Operations based on natural numbers, Whole numbers, Integers, Rational numbers, Irrational numbers

**Learning Objective** : To make students understand the properties of set operations (∪, ∩) and identify subsets using Real numbers system.

**Assessment** : Awarding marks based on the descriptive indicators given for assignment.

**Durations** : 20mts.

**Procedure:**

Using the above said Real numbers, assign students to do set operations (Union and intersection), identify whether they are the sub set or not and fill up the blanks given below: (N – Natural numbers W- Whole numbers Q- Rational numbers Z – Integers, T – Irrational numbers).

**Fill in the Blanks:**

1. N _____ W = N
2. N _____ Z
3. T _____ R
4. T _____ Q = R
5. N _____ R = R
6. Q _____ T = R
7. Z _____ R = Z

**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Expressing the properties of real number system clearly</th>
<th>Performing the set operations correctly</th>
<th>Explaining the relationship between of sets of real numbers using set operations</th>
<th>Deducing the correct answer</th>
<th>Explaining the method of finding the right answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

22
**Activity 6** : Worksheet  
**Unit** : Real Number System  
**Content** : Rational numbers, Irrational numbers  
**Learning Objective** : Making students understand rational & Irrational numbers and the difference between the two numbers.  
**Assessment** : Awarding marks based on the descriptors for 'worksheet'  
**Durations** : 20 Minutes  

**Procedure:**

Students are asked to fill the answers for the questions given in the worksheet within 10 minutes. They are asked to exchange and evaluate themselves with the teacher's guidance.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Question / Statement</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A Rational number between 3&amp;4</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>2.010010001 is an irrational number. Yes/No</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>The value of (-1)+(2) lies in the negative integers of the number line True/False</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>There are only 100 numbers between 1 and 101. True/False</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>There are only 2 irrational numbers between 5/7 and 9/11 True/False</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>There are 2 irrational numbers between 1 and 2 True/False</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>There are 100 rational numbers between 2 and 7. Explain the statement.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>2 and 3 are twin prime numbers</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>1.010010001 is an irrational numbers True/False</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>2/3 is an irrational numbers. True/False.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>The number which is a whole number but not a natural number</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Find the numbers between 2 and 3 from 1+5, 3+2, 1+2, 3-1</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>$\sqrt{7.29}$ is a ________ number</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>The number of rational numbers between 5 and 3</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>$\sqrt{n}$ is a rational number, the value of $n$ is ...............</td>
<td></td>
</tr>
</tbody>
</table>
16. Every rational no is an irrational number  True / False

17. All integers are rational numbers True / False

18. 0.142857 is a non-terminating recurring decimal number True / False

19. The rational form of 0.6 is _________

20. The sum of 2 rational numbers is a rational number True / False

Descriptive Indicators

<table>
<thead>
<tr>
<th>To understand the questions correctly</th>
<th>Finding the correct answers</th>
<th>Explaining the reason for the result</th>
<th>Generalising the concept</th>
<th>Defining irrational numbers clearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Unit 3- ALGEBRA

Activity 1 : Quiz
Unit : Algebra
Content : Polynomials
Learning Objective : To develop the skill to identify the polynomials.
Assessment : Awarding marks based on the descriptive indicators for quiz
Duration : 45 Minutes

Procedure:

Divide the students of a class into 4 groups and name them as Ramanujam, Bhaskara, Aryabhatta, Bhramagupta.

Rules of The Quiz :

1. This competition would be held in four rounds-namely.
   i. Rapid fire round
   ii. Think and Answer round
   iii. calculation round
   iv. framing questions

2. The time limit for each question in the first round is 10 seconds only.
3. The answer can be given after discussion in the group each right answer will be awarded 1 mark.

4. In the ‘Think and Answer round’, each group will be given 3 questions.

5. For this round, the time limit for each question is 2 minutes.

6. 2 marks will be awarded for the group that gives the right answer and 1 mark for the passed question.

7. In the calculation round all the groups will be given the same questions. Marks will be awarded based on their speed as well as precision as 5,4,3,2.

8. In the framing of question round, each group has to frame 5 questions based on the selected topic.

**Score Board:**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Rounds</th>
<th>Ramanujam</th>
<th>Bhaskara</th>
<th>Aryabhatta</th>
<th>Brahmagupta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Rapid fire round</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Think and Answer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Calculation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Framing questions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Rapid fire round:**

1. 2x is a monomial (True/False)
2. The constant term in the polynomial x-2 is ___________

3. A binomial of degree 5 is possible (True/False)

4. The root of x-6=0 is _________________

5. The remainder when x^2 -1 is divided by x-1 is _________________

6. A Polynomial with 3 term is called a ______________

7. The degree of the polynomial x^5 + 3x^4 -7x is _________________

8. A Polynomial of degree one is called a ________________ Polynomial.

9. The coefficient of x^2 in the Polynomial 2x^3 - 3x^2 -2x is _________________

10. The Zero of the Polynomial 2x-5 is _________________

11. 20 is a Polynomial (True / False)

12. A polynomial of degree 1 is called ______________

Think and Answer round (group 1):

1. One of the factors of x^2 - 3x -10

2. If p(x) = 5x^3 - 3x^2 + 7x-9, what is the value of p(2) ?

3. What is the root of 2x + 1=0 ?

   Similarly, questions can be prepared and distributed to all the four groups.

Calculation round:

Find the quotient and remainder when 12x^3 - 13x^2 - 5x +1 is divided by 3x+2

Framing questions Round:

Students have to frame questions on Polynomial on their own and solve them.
**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Participation in the team</th>
<th>Time Management</th>
<th>Team Effort</th>
<th>Solving Problem</th>
<th>Giving correct answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Activity 2**  
*Unit*: Algebra  
*Content*: Polynomial  
*Learning Objective*: To Develop The Skill Of Creating Polynomial  
*Assessment*: Awarding Marks Based On The Descriptive Indicators  
*Duration*: 20 Minutes

**Procedure:**

Students are to be given a box of cards / tiles in which a term is written in each of the card /tile. Students need to follow the steps given below:

The students are to be divided into two groups and each group is to be given box containing a heap of cards / tiles.

**Step 1:**  
The students are to be divided into two groups and each group is to be given box containing a heap of cards / tiles. They need to create as many monomials as possible within two minutes and the same is to be recorded.
Step 2:
Using the cards, the students need to create binomials and record the same.

Step 3:
Similarly, trinomials and Polynomials need to be created and recorded.

Step 4:
The team which creates more number of Polynomials need to be appreciated. Colour Cards, Tiles, Shapes can be used for the same activity. This activity is to be commenced at the same time by both the groups.

Descriptive Indicators:

<table>
<thead>
<tr>
<th>Using the term cards appropriately</th>
<th>Creating polynomials correctly</th>
<th>Completing the activity correctly</th>
<th>Completing the activity in time</th>
<th>Creating more number of polynomials</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Unit 4 - Theoretical Geometry

Activity: 1 : Angles of parallelogram
Unit : Parallelogram
Content : Properties of A Parallelogram
Learning Objective : To understand that in a parallelogram
  i. opposite angles are equal
  ii. sum of adjacent angles is 180°
  iii. sum of all the 4 angles is 360°
Materials Required : chart paper, scale, protractor, colour pencils and pair of scissors
Assessment : awarding marks based on the descriptive indicators
Duration : 40 Minutes

Procedure:
Step 1 :
  Draw a parallelogram in a chart paper and name it as ABCD.
Step 2 :
  Colour the four angles of a parallelogram using different colours as shown in the given figure.

Step 3 :
  Cut the four angles and take them separately.

Step 4: 
  Paste the four angles as shown in the figure given below
Step 5:
Teacher has to write the following questions on the black board.
Looking at figure formed in step 4, students need to answer the following questions:

i. \( \angle A = \) 

ii. \( \angle B = \) 

iii. Opposite angles of a parallelogram are 

iv. \( \angle A + \angle B = \) 

v. \( \angle C + \angle D = \) 

vi. In a parallelogram, the sum of the adjacent angles is 

vii. \( \angle A + \angle B + \angle C + \angle D = \) 

viii. In a parallelogram sum of all the 4 angles is .

Descriptive Indicators:

<table>
<thead>
<tr>
<th>Interest, Involvement of students</th>
<th>Drawing the required figure properly</th>
<th>Cutting the angles and pasting</th>
<th>Observing the figure carefully and finding the correct answers</th>
<th>Generalising the properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

30
Activity: Creating a problem & solving it
Unit: Parallelogram
Content: Properties of a Parallelogram
Learning Objective: Developing the skill of framing questions using the properties of parallelogram – Finding solutions for the questions.
Duration: 40 Minutes
Assessment: Awarding marks based on the descriptive indicators

Procedure:

Step 1:
Divide the entire class into 5 groups.

Step 2:
Help the students frame a question based on the angles of a Parallelogram. For example if one angle is twice of that of the other in a Parallelogram, find the angles of the Parallelogram.

Step 3:
The students need to draw the Parallelogram and name it.

Step 4:
Mark one angle as $x^\circ$ and the another as $2x^\circ$ in the Parallelogram.

Step 5:
Express the relation between the angles in an equation.
Step 6:
Find the solution for the equation.

Step 7:
Identify the four angles of the Parallelogram and mark them.

Step 8:
Present the activity.

Descriptive Indicators:

<table>
<thead>
<tr>
<th>Framing the right question based on the properties of a Parallelogram</th>
<th>Identifying the property of parallelogram correctly</th>
<th>Drawing a suitable figure and framing the equation</th>
<th>Solving equation</th>
<th>Clear Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Activity 3: Paper folding
Unit: Theoretical Geometry
Content: Angles based on parallel lines
Learning Objective: Knowing about the angles formed when a transversal intersects the parallel lines.
Materials: Paper, Pair of Scissors
Assessment: Awarding marks based on the descriptive indicators
Duration: 40 Minutes

Procedure:
Step 1: Ask the students to take 2 papers of the same size.
Step 2: Place one paper over the other in such a way that they fit exactly.
Step 3: Ask the students to fold the papers twice horizontally to get 2 parallel lines as shown in figure (1).
Step 4: Ask the students to fold the paper to get a slanting line as shown in figure (2).

Step 5: Tell them to name the angles from 1 to 8 as shown in the figure.
Step 6: From the first paper cut angles $\angle 1$ & $\angle 2$

Step 7: Keep $\angle 1$ on all other angles on paper $\angle 2$ and write the equal angles.
Step 8: Do the same for $\angle 2$ also.
Step 9: Answer the questions based on the position of the angles:

<table>
<thead>
<tr>
<th>Fill in the Corresponding angles</th>
<th>Fill in the vertically opposite angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\angle 1$ = .........................</td>
<td>$\angle 1$ = ...........................</td>
</tr>
<tr>
<td>$\angle 2$ = .........................</td>
<td>$\angle 2$ = ...........................</td>
</tr>
<tr>
<td>$\angle 4$ = .........................</td>
<td>$\angle 7$ = ...........................</td>
</tr>
<tr>
<td>$\angle 7$ = .........................</td>
<td>$\angle 8$ = ...........................</td>
</tr>
</tbody>
</table>

Fill in the alternate interior Angles: Fill in the alternate exterior Angles

| $\angle 4$ = ......................... | $\angle 1$ = ........................... |
| $\angle 5$ = ......................... | $\angle 2$ = ........................... |

Descriptive Indicators:

<table>
<thead>
<tr>
<th>Folding the paper properly to get the parallel lines</th>
<th>Cutting the angles properly</th>
<th>Finding the equal angles</th>
<th>Identify the corresponding as well as alternate interior angles</th>
<th>Presenting the properties of parallel lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Activity 4 : Group Discussion

Unit : Theoretical Geometry

Content : Parallel lines

Learning Objectives : Knowing the properties of angles formed by the angles when the transversal intersects given for group discussion.

Assessment : Awarding marks based on the descriptive indicators given for group discussion

Duration : 20 Minutes

Procedure:

Divide the class into 5 groups. The teacher gives a set of 5 questions with diagrams as given in the example. Give the properties that help to solve the problems in separate papers. Through group discussion, the students match the given questions with the properties that help to solve them. Find the answer and the reason after discussing in the group and explain.

Example.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
</tbody>
</table>
Vertically opposite angles are equal.

Exterior Alternate angles are equal.

Sum of adjacent angles is 180°.

Interior Alternate angles are equal.

Corresponding angles are equal.

**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Knowing the properties of parallel lines</th>
<th>Using the appropriate properties</th>
<th>Matching the right property &amp; solving</th>
<th>Giving the right reason for the answer</th>
<th>Listing the properties of angles based on parallel lines with examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

36
Activity 5 : Worksheet
Unit : Theoretical Geometry
Content : Quadrilaterals
Learning Objectives : Developing the skill of problem solving using the properties of quadrilaterals
Assessment : Awarding marks for correct answer
Duration : 20 mts.

Procedure:

Worksheet

Match the pictures with the properties and solve them.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Quadrilateral</th>
<th>Properties</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td>x = 110°</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>The sum of the adjacent angles in a parallelogram is 180°.</td>
<td>y = ...........</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Descriptive Indicators:

<table>
<thead>
<tr>
<th>To understand properties of quadrilaterals</th>
<th>Using the suitable properties</th>
<th>Matching &amp; Solving</th>
<th>Explaining the correct with reasons</th>
<th>Tabulating the properties of quadrilaterals with examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

AC = 10 cm.
OD= ................

\[ \angle DCA = 30^\circ \]

4.

5.

```
Divide the class into two groups, and name one group X and another Y.

- The X group has to stand horizontally.
• The Y group has to stand vertically.
• The point at which X-axis and Y-axis cut is said to be the origin (0,0).
• The students standing on the right side of the origin would say that they are positive (+) integers and those on the left as negative (-) integers.
• Similarly, students standing above the origin on the Y’ axis and those below the origin on the Y-axis would say positive and negative integers respectively.
• The students would say their ordered pair for X and Y axis (1,0), (2,0), ...

**Descriptive Indicators**

<table>
<thead>
<tr>
<th>Standing correctly on X-axis</th>
<th>Standing correctly on Y-axis</th>
<th>Explaining the importance of origin</th>
<th>Giving correct ordered pair</th>
<th>Involvement in the group</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Activity 2**

**Unit**
Coordinate Geometry

**Content**
Making quadrants on graph sheets using Cartesian co-ordinate axes

**Learning Objectives**
Making students understand Cartesian Co-ordinate axes using quadrants

**Assessment**
30 mts.

**Duration**
Awarding marks using descriptive indicators through group activity
**Procedure:**
- Students stand as described in activity-1
- The pairs of students would move to the respective set of numbers given by the teacher.

(e.g) For (+2, +3) the student standing on +2 at X axis would move 3 steps forward and the student on +3 in Y axis would move 2 steps towards +2 on X axis. They should jointly tell the position of their number pair.

**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Standing at correct position in the axis</th>
<th>Understanding the number pair correctly</th>
<th>Reaching the destination point correctly</th>
<th>Explaining their position and number of steps taken to reach the position</th>
<th>Evincing Interest in the activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

41
**Activity 3**: Group Activity  
**Unit**: Coordinate Geometry  
**Content**: Formation of patterns formed by plotting the ordered pairs  

**Learning Objectives**
- To make students understand the following concepts using number on rows and columns.  
- Making students understand that the ordered pairs (a,b) is different from (b,a) and the ordered pairs (b,a) is different from (a,b).  
- To make students understand that if the ordered pairs are same in X axis and Y axis then it forms a diagonal.  
- To make students understand that if the x coordinate is one greater than that the Y coordinate, then the position of the ordered pairs would move towards right.

**Assessment**: Awarding marks based on the Descriptive indicators for group activity.

**Duration**: 45 Minutes

**Procedure:**
- Make students to stand in rectangular array.  
- Each student must have an ordered pair  
- The students must hold X coordinate card in his right hand and Y coordinate card in his left hand  
- When a student says an ordered pair as given below, the student who possess this ordered pair should sit down. After sitting down, he should explain the position of the ordered pair. Every time the students must listen carefully and answer.  
  a) (2,3) and (3,2)  
  b) (5,2) and (2,5)  
  c) (1,2) and (2,1) further such ordered pairs are to be formed.  
  d) Similar to (1,1),(2,2),(3,3),(4,4) and (5,5) form ordered pair as the number of X and Y available in the class.  
  e) Form ordered pairs as (2,1),(3,2),(4,3),(5,4) and (6,5)(increase one unit in X-axis of the previous activity).
The teacher observes the students’ activity and awards marks based on the description indicators.

**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Identifying the concept expressed through group activity</th>
<th>Identifying the correct ordered pairs through activities</th>
<th>Identifying the position of ordered pairs</th>
<th>Explaining the observed number pattern</th>
<th>Involvement with interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Unit 6 - Practical Geometry**

**Activity 1**: Sequencing

**Unit**: Practical Geometry

**Content**: Construction of perpendicular line

**Learning Objectives**: To learn the method of constructing perpendicular line to the given line segment from a point outside it.

**Assessment**: Awarding marks based on the descriptive indicators

**Duration**: 30 mts.

**Materials required**: Chart, Paper, Marker

**Procedure:**

Write each step of the construction of a perpendicular line in different chart papers and give it to the students. The steps of construction are given below:

1. Draw a line segment AB and mark a point C outside AB
2. The line joining the points C and E is the perpendicular line.
3. With P and Q as centres and more than half of PQ as radius, draw arcs on the opposite side of C to cut each other at E.

4. With C as centre and any radius draw two arcs to cut AB at P and Q

**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Choosing the correct chart for the first step in the construction</th>
<th>Choosing the correct chart for the second step in construction</th>
<th>Choosing the correct chart for the third step in construction</th>
<th>Choosing the correct chart for the fourth step in construction</th>
<th>Explaining the steps of construction of perpendicular line with reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Activity 2**

**Unit** : Practical Geometry

**Content** : Construction of attitudes

**Learning Objectives** : to construct steps involved in drawing attitude.

**Assessment** : Awarding marks based on the Descriptive indicators for this activity

**Duration** : 45 mts.

**Materials required** : Compos, pencil, scale, protractor, eraser

**Procedure:**

To find orthocentre
**Step -1**
Construct a triangle ABC whose sides are:
(AB = 8 cm, B = 7 cm, AC = 5 cm)

**Step -2**
From vertex C, draw an altitude CD to its opposite side AB

**Step -3**
Similarly from the vertex B draw an altitude BE to the opposite side AC

**Step -4**
Locate the orthocentre.
Then make each student to draw a flow chart and locate the orthocentre.
**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Constructing a triangle with the given measures</th>
<th>Constructing altitudes to the triangle</th>
<th>Marking the orthocentre correctly</th>
<th>Following the step correctly</th>
<th>Neat and accurate work</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Activity 3**

**Unit** : Practical Geometry

**Content** : Finding the circumcentre

**Learning Objectives** : location of circumcentre of different triangle

**Assessment** : Awarding marks based on the description indicators for the activity

**Duration** :

**Materials required** : A4 sheet, scale, compass, protractor, pencil, eraser

**Procedure**:

**Step-1**: Make the students draw triangles using the three following measurements

i. \( PQ = 7 \text{ cm} \) \( QR = 8 \text{ cm} \) \( \angle Q = 60^\circ \)

ii. \( AB = 4 \text{ cm} \) \( AC = 5 \text{ cm} \) \( \angle B = 90^\circ \)

iii. \( LM = 6 \text{ cm} \) \( MN = 7 \text{ cm} \) \( \angle M = 120^\circ \)

**Step-2**: Locating the circumcentre for the above triangles.

**Step-3**: Make the students fill the table given below by observing the circumcentre of the PQR, ABC, LMN Triangles
<table>
<thead>
<tr>
<th>Triangles</th>
<th>Type</th>
<th>Position of the circum centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔPQR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔLMN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔABC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step-4:**
Observing and concluding that the position of the circum centre changes according to the kind of triangle

**Descriptive Indicators:**

<table>
<thead>
<tr>
<th>Constructing the triangles of given measurements</th>
<th>classifying the kinds of triangles</th>
<th>Observing and explaining the change in the position of circum centre</th>
<th>Reason for the change of position of circum centre</th>
<th>Generalising the reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Laboratory Activities**

**Activity 1**

- **Unit**: Sets
- **Content**: To depict Set operations through Venn diagrams
- **Learning Objectives**: To familiarise the students on set operations through pictures and to verify them.
- **Assessment**: Access the student using the assessment descriptors given for Laboratory Activities
- **Duration**: 45 mts.
- **Materials required**: Chart, Paper, Marker

**Procedure:**

**Step -1:**
1. Divide the students into four groups. The collected information is distributed to each of the four groups. For example, the required two
sets may be formed using names of students who play foot ball and the names of students who play cricket in their class.

**Step -2:**

After forming the two sets A and B the students find \( n(A) \), \( n(B) \), \( n(A \cup B) \), \( n(A \cap B) \) and then verify the equation by substituting the values.

\[ n(A \cup B) = n(A) + n(B) - n(A \cap B) \]

**Step -3:**

In the same way the second group should find \( n(A) \), \( n(A-B) + n(A \cap B) \) and verify the equation by substituting the values in

\[ n(A) = n(A-B) + n(A \cap B) \]

**Step -4**

Following the instructions given above, the other groups may find out the sets given in then result and then verify by substituting values in the following equations:

\[ n(B) = n(B-A) + n(A \cap B) \]
\[ n(A \cup B) = n(A-B) + n(A \cap B) + n(B-A) \]
\[ n(A) + n(A^1) = n(U) \]

**Activity 2**

**Unit** : Real Number System

**Content** : Irrational Number

**Learning Objectives** : Representation of Irrational Number on number line

**Assessment** : The Assessment Descriptors given for laboratory activities is used for assessment

**Duration** : 45 mts.

**Materials required** : Graph sheet, pencil, scale.
**Procedure:**

Divided the whole class into groups to make students represent the irrational Numbers such $\sqrt{2}, \sqrt{3}, \sqrt{5} ...$ on the number line

**Step 1:**

Divide the students into groups.

**Step 2:**

Students follow the instructions given in the I-term Maths book page 53 and do the activity

**Activity 3**

**Unit** : Geometry  
**Content** : Quadrilateral  
**Learning Objectives** : To know the properties of trapeziums, parallelogram and rhombus  
**Assessment** : The Assessment Descriptors given for laboratory activities is used for assessment  
**Duration** : 45 mts.  
**Materials required** : 7 pieces of paper to form trapezium, parallelogram and Rhombus paste, scale, maths kit box and pencil

**Procedure:**

**Step 1:**

Divide students into 3 groups.

**Step 2:**

Trapeziums, Parallelogram and Rhombus are made by each group using the 7 pieces of paper.

**Step 3:**

The shape made by joining the given paper pieces is identified as trapezium or parallelogram or Rhombus.

**Step 4:**

The side, angle and diagonals of the created shapes are measured and listed.
Step 5:
Find the sum of the four angles by measuring it.
Mark the angles. Join the 4 angular regions and verify whether they form an angle of $360^\circ$.

Step 6:
Tabulate the properties of shapes after measuring them.

Activity 4
Unit : Coordinate Geometry
Content : Plotting points in the Cartesian Coordinate system.
Learning Objectives : Knows to plot points in the Cartesian coordinate system
Assessment : Assessment using the Assessment description given for laboratory activities.
Duration : 45 mts.
Materials required : Graph sheet with a picture drawn on it

Procedure:

Step 1:
Divide students into groups.

Step 2:
Graph sheet with different pictures shall be distributed to each group.
Step 3:
Identify the 10 meeting points of the line which form the picture.

Step 4:
Draw the picture on second, third and fourth quadrants.

Step 5:
Write the 10 meeting points of the picture drawn in each of the quadrants.

Activity 5 : 
Unit : Co-ordinate Geometry 
Content : Distance between any two points.
Learning Objectives : To verify that the distance found by using the distance formula and by actually measuring them are the same.
Assessment : Assessment the students using the Assessment description given for laboratory Activities.
Duration : 45 mts.
Materials required : Graph sheet, scale and pencil.

Procedure:

Step 1:
Divide the students into six groups.

Step 2:
Name the groups as A1, A2, B1, B2, C1 and C2.

Step 3:
Give the same set of ordered pains to each of the groups A1 and A2.

Step 4:
The Group A1 has to find the distance between the given ordered pairs using the formula. The group A2 should plot the ordered pair on the graph sheet and measure the distance using a scale.

Step 5:
Similarly, different set of points are given to other groups and they verify the distance between them.
Step 6:

Groups (A₁, A₂), (B₁, B₂) and (C₁, C₂) compare their answer and verify whether the distances are the same.

Activity 6

Unit: Co-ordinate Geometry
Content: Three points lie on a straight line.
Learning Objectives: To do and verify that the three points lie on a straight line.
Assessment: Assessment the students using the assessment descriptors given for Laboratory Activities
Duration: 45 mts.
Materials required: Graph sheet, scale and pencil.

Procedure:

Step 1:

Divide the students into four groups.

Step 2:

Each group should locate the given three points on the graph sheet and join them.

Step 3:

For the same set of three points use the formula to verify whether they lie on the straight line.

\[ AB = \sqrt{(x₂ - x₁)^2 + (y₂ - y₁)^2} \]

\[ AB + BC = AC \]
Activity 7
Unit : Geometry
Content : Congruent Triangles
Learning Objectives : To verify that two triangles will be Congruent if their sides and angles are based on the axiom AAS, SAS, ASA, SSS and RHS and they will not be Congruent if their sides and angles are based on the axiom AAA, SSA
Assessment : Assessment the students using the Assessment descriptors given for laboratory Activities.
Duration : 45 mts.
Materials required : Colour pencil, protractor, compass and pencil.

Procedure:
Step 1:
Divide the students into 7 groups.

Step 2:
Two triangles based on the axioms AAS, SAS, ASA, SSS and RHS are drawn and verified whether that they are congruent. For example: If consecutive two angles and their successive sides are given and the two triangles drawn based on these axioms are congruent to each other.

Step 3:
Drawing two triangles based on the axiom AAA and SSA and their non-congruence is verified.

For example:
The two triangles, drawn using the axiom AAA is not – congruent to each other.

Activity 7
Unit : Geometry
Content : Real Number System
Learning Objectives : To represent irrational number in spiral form.
Assessment : Assessment the students using the Assessment descriptors given for laboratory Activities.
Duration : 45 mts.
Materials required : Graph sheet, scale and pencil.
Procedure:
Step 1:
Divide the students into groups and provide graph sheet to each group.
Step 2:
Draw a number line. Marks points O and A such that O represents the number 0 and A represents the number 1. i.e., OA=1 unit. Draw AB \perp OA such that AB = 1 unit. Join OB.
In right triangle OAB, by Pythagorean theorem
\[ OB^2 = OA^2 + AB^2 \]
\[ = 1^2 + 1^2 \]
\[ OB^2 = 2 \]
\[ OB = \sqrt{2} \]
Step 3:
Draw BD of one unit perpendicular to OB.
Join OD
In right triangle OBD, by Pythagorean there
\[ OD^2 = OB^2 + BD^2 \]
\[ = (\sqrt{2})^2 + 1^2 = 3 \quad \therefore OD = 3 \]
In the same way proceed to get the irrational number spiral which contains rational numbers also.
Model Questions for FA(b) (Unit-wise)

UNIT 1 : THEORY OF SETS

Max Marks : 50
Max Time: 80 mts.

I. Answer the following: 10 x 1 = 10

1. Let $A = \{1, 2, 3, 4, 5, 6\}$ Fill in the blanks with $\in$ or $\notin$
   
   i) $0 \quad \in A$
   
   ii) $6 \quad \in A$
   
   iii) $8 \quad \notin A$
   
   iv) $1 \quad \in A$

2. Write the set of $A = \{x: x \in \mathbb{Z} \text{ and } -1 \leq x \leq 5\}$ in Roster form.

3. Is the set $\{0\}$ an empty set?

4. Give an example for $X \subseteq Y$ and $X \subseteq Y$.

5. If $A = \{-2, 4\}$, find $P(A)$

6. If $A = \{1, 2, 3, 4, 5\}$, $B = \{3, 4, 5, 6, 7\}$, find $A \cap B$


8. Let $U = \{a, b, c, d, e, f, g, h\}$, $A = \{a, b, c, d\}$ and $B = \{b, d, f, g\}$ find $(A \cap B)'$

9. From the given Venn diagram, find $n(A \cup B)$

10. Shade the Venn diagram to represent $(A \cup B)'$

II. Short Answer 10 x 2 = 20

1. Let $A = \{-2, -1, 0, 4, 6\}$ find $n(A)$

2. Let $A = \{p, q, r, s\}$, $B = \{s, r, q, p\}$ Are these equal sets? or equivalent sets.

3. Write any two subjects of $A \{a, b, c\}$

4. Draw the Venn diagram to represent $(A \cup B)'$
5. From the given figure find $A \cap B$

6. Write the formula to find $A \Delta B$

7. Draw the Venn diagram to represent $A'$

8. Let $A = \{5, 6, 7, 8\}$ then find $n(p(A))$

9. Write the power set of $A = \{x, y\}$

10. If $n(P(A))=32$, find $n(A)$

III. **Descriptive Questions**

1. Let $A = \{x : x$ is a composite number less than 13\}$
   $B = \{x : x$ is an even prime number and $3 \leq x \leq 15\}$
   $C = \{x : x$ is an integer and $4 \leq x \leq 16\}$
   i) List the elements of the sets $A$, $B$, $C$
   ii) Find $n(A)$, $n(B)$ and $n(C)$
   iii) Find $A \cap B$, $A \cap C$ and $B \cap C$

2. If $A = \{1, 4, 9, 16, 25\}$ $B = \{2, 4, 8, 16, 32\}$ $C = \{1, 3, 8, 16, 24\}$
   $D = \{8, 10, 12, 14, 16\}$ then find i) $A-B$ ii) $B-C$ iii) $C-D$ iv) $A-C$
   v) $A-D$

3. If $n(A-B)=40$, $n(B-A)=25$, $n(A \cup B)=150$, $n(A \cap B)=50$
   find i) $n(A)$ ii) $n(B)$

4. The total population of a village is 4000. Out of these, 2700 persons
   read Tamil newspaper, 1500 read English newspaper. 1000 of them
   read both the papers. Find the number of persons who read neither
   of the two papers.
UNIT : 2  REAL NUMBER SYSTEM

Time : 15 mts.  
Marks: 10 x 1 = 10

Answer all the questions:

1. Every natural number is a whole number (True / False)
2. Every fraction number is a rational number.
3. Convert 9/16 in to a decimal number
4. Convert 0.80 into a fraction.
5. What is the name of the set containing rational and irrational numbers?
6. Write two rational numbers between 1/7 and 2/7
7. Which is the first number in the set of natural numbers?
8. Do the set of integers have a first number. yes/No Give reasons for your answer?
9. How many rational numbers are there between 2 and 7?
10. Write any 5 rational numbers and 5 irrational numbers?

UNIT: 3  ALGEBRA
Maximum marks : 30  
Time : 90 minutes.  
5 x 1 = 5

I. Choose the correct answer:

1. Which of the following is a Polynomial in one variable?
   a) x-1/x   b) x+2y   c) y^3+2√3   d) 4
2. The degree of the polynomial 3x+1 is
   a) ½   b) 0   c) 2   d) 1
3. The zero of the polynomial 3x+7 is
   a) -3   b) -7/3   c) 3/7   d) -21/3
4. The remainder when the polynomial 3x^3+4x^2-5x+8 is divided by x-1
   a) 8   b) 7   c) 10   d) 12
5. A farmer sells 20 bananas out of x bananas, then the polynomial which represents the unsold bananas is

a) \( x + 20 \)  

b) \( 20 - x \)  

c) \( x - 20 \)  

d) \( 20/x \)

II Fill in the blanks:  
5 \times 1 = 5

1. An example for a polynomial of degree 2 is ___________

2. The coefficient of \( x^2 \) in the polynomial \( x^3 + x^2 + 7x + 9 \) is ___________

3. One of the roots of the equation \( x^2 + 5x + 6 = 0 \) is ___________

4. When \( 5x^2 \) is divided by \( 7x^6 \), we get ___________

5. \( (x^2 + 2x + 1) / (x + 1) \) ___________

III. Match the Following:  
5 \times 1 = 5

1. Degree of \( 7x^2 + x + 1 \)  

2. \( (7x^2 + x) - (x + 1) \)  

3. Coefficient of \( t \) in \( 12t^2 - 8t + 7 \) is \( 7x^2 - 1 \)

4. Monomial  

5. One of the roots of the equation \( 6x^2 + x = 0 \) is \( -2x \)

IV. Short questions:  
5 \times 2 = 10

1. Determine whether \( (x - 2) \) is a factor of the polynomial \( 2x^3 - 4x^2 + 3x - 6 \) ?

2. Simplify \( [(x - 1)^2 + 2x - 2] / x + 1 \)

3. If the side of a square field is \( (2x + 1) \) cm and the perimeter is 13 cm then find the value of \( x \).

4. The difference between two polynomials is \( x^2 + 6x \). One of them is \( 7x^2 - 5x + 4 \). Find the other polynomial.

5. Identify the correct statements from the following:
   \( 6/7 \times 14/7 = 1 + (5 \times 2) \)
   \( 70 \times 5 = (65 + 5) \times 5 \)
   \( (41 \times 78) + 16 = 16 + (41 \times 78) \)
   \( 43 + 15 + 57 = 16 + 10 + 99 \)
V. **Descriptive Questions:**
Find the quotient and remainder when $3+5x+6x^2+7x^3$ is divided by $5+x$.

(or)

Find the value of ‘a’ if the polynomial $x^3+5x+ax-6$ leaves a remainder 16 when it is divided by $x+4$.

**UNIT : 4**

**Theoretical Geometry**

**I. Match the Following:**

1. Complementary angle of $45^\circ$  
2. Supplementary angle of $45^\circ$
3.  
4.  
5.  

**II. Find out who was I ?**

1. If my diagonals were equal, I would be a rectangle?
2. My diagonals bisect each other at right angles. If they were equal, I would be a square.
3. If the opposite sides are parallel, I am a parallelogram
4. If the sides are equal, I am a square.
5. If the sides are equal, I am a rhombus
III. **Answer the Following:**

1. PQRS is a parallelogram \( \angle QSP = 47^0, \angle QSR = 24^0 \), PST is a straight line then find x and y

\[ \begin{align*}
\angle QSP & = 47^0 \\
\angle QSR & = 24^0 \\
\end{align*} \]

2. In the given figure, if \( \angle B : \angle C = 4:2 \), then find the value of \( \angle B \).

\[ \begin{align*}
\angle B & = \angle C \\
\angle B & = 2 \times (\angle C) \\
\end{align*} \]

3. Compare the properties of parallelogram and rhombus.

4. Represent the types of Quadrilateral using a Venn diagram

5. From the given figure find \( \angle BCD \) and \( \angle BDC \).

\[ \begin{align*}
\angle BCD & = \angle BDC \\
\angle BCD & = \angle BDC \\
\end{align*} \]

IV. Marks are awarded for the right answer to the above questions. Questions number 4 and 8 will carry 2 marks where as all other questions will carry 1 mark each.

Find \( \angle a, \angle b, \angle c \) from the given figure.

1. Find all the angles of a \( \triangle ABC \) it \( \angle A + \angle B = 130^0 \) and \( \angle B + \angle C = 95^0 \)
In the figure given above AB is parallel to CD, AC is parallel to BD. Making use of the properties of the angles formed when a transversal intersects the parallel line, answer the following:

1. \( \angle 6 = \angle 14 \) (Reason .......)
2. \( \angle 14 = \angle 12 \) (Reason .......)
3. Hence \( \angle 6 = \) ________
4. _________ angles of a parallelogram ABCD are equal.
5. CD is parallel to ________
6. AC is the ____________ of the parallel line AB and CD.
7. \( \angle 12 + \angle 13 = 180^\circ \) (Reason _________________________________)
8. The sum of __________ angles of a parallelogram is \( 180^\circ \)
**BLUE PRINT**

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Summative Assessment – Model Question Paper

Std : IX

Time: 2 ½ hrs

Max Marks= 60

Part-A

I. Choose the correct answer for the given questions: 10 x 1= 10

1. The set of letters in the word ‘Coffee’
   a) {c,o,f,e,e}  b) {c,o,f,e,e}  c) { o}  d) { c,o,f,f,e,e}

2. The value of $A \cap \emptyset$ is
   a) A  b) $\emptyset$  c) $A'$  d) { 0}

3. A number in the form of $p/q$, $q \neq 0$ $p,q \in \mathbb{Z}$ is called ________________
   a) Irrational number  b) Rational number  c) Whole number  d) Natural number

4. An irrational number from the given numbers is ________________
   a) $\pi$  b) $\sqrt{9}$  c) $\frac{1}{4}$  d) 0/5

5. Degree of the Polynomial $12-x+4x^3$ is ________________
   a) 0  b) 4  c) 3  d) -1

6. The root of the equation $x-3=0$ is ________________
   a) 3  b) -3  c) 0  d) $\pm 3$

7. The quadrant in which the point (-2,7) lies
   a) I  b) II  c) III  d) IV

8. The distance between the points (0,8) and (0,2) is ________________
   a) 6  b) 100  c) 36  d) 10

9. In the parallelogram ABCD, if $\angle B : \angle C = 2:3$, then the value of $\angle B$ is
   a) $36^\circ$  b) $72^\circ$  c) $108^\circ$  d) $54^\circ$

10. If the sum of two angles is $180^\circ$, then the two angles are
    a) perpendicular to each  b) supplementary  c) complementary  d) acute other
PART – B

Answer any 10 out of 12 questions in 1 or 2 steps

11. Define a set with example:

12. If $A = \{3,6,9,12,15,18\}$, $B= \{4,8,12,16,20\}$ find $A-B$, $B-A$.

13. If $n(A \cap B) = 10$, $n(A \cup B) = 40$, $n(A)=15$, then find $n(B)$

14. Draw Venn diagram to represent $A'$, $B'$ $(A \cup B)^1$

15. Define a rational number with example.

16. Find any two irrational numbers between 5 and 5.5

17. Find the zero of the Polynomial $3x+5$

18. If $(x-2)$ is a factor of $x^3+5x^2+mx+4$, then find the value of m

19. In the given parallelogram $ABCD$ if, $A = 65^0$ then find $\angle B$, $\angle C$ and $\angle D$

20. Find the distance between $(6,0)$ and $(-2, 4)$

21. If the distance between the two points $(x,6)$ and $(2,5)$ is 10, then find the value of $x$.

22. If the three angles of a quadrilateral are $110^0$, $75^0$, $84^0$, then find the fourth angle.
PART-C

Answer the questions in about 4 or 5 steps: 9\times3=27

23. A) If \( U = \{1,2,3,4,5,6\} \) \( A = \{1,2,5\} \) \( B = \{3,4,5\} \) compare the answers of \((A\cup B)^1\) and \(A^1 \cap B^1\)  
(OR)
B) Let \( U = \{5,6,7,8,9,10,11,12,13\} \) \(, M=\{5,8,10,11\} \) \(, N=\{5,6,7,9,10\}\) Determine \(M \cup N, M \cap N, M' \cup N'\) using Venn diagram.

24. A) In a school, the students who participated in the oratorical and drawing competitions are 55% and 45% respectively. If 20% of the students participated in both, then  
   i) find the number of students who participated only in oratorical competition  
   ii) find the number of students who participated only in drawing competition.  
   iii) Percentage of students who have not participated in any of the competitions.  
(OR)
B) Draw the Venn diagram to represent  
   i) \( A \cap B^1\)  
   ii) \(A^1 \cap B^1\)

25. A) Find any 3 irrational numbers between \( \sqrt{5}\) and \( \sqrt{7}\)  
(OR)
B) Prove \( 0.9 = 1\)

26. A) Verify whether \( x = -1,2\) are the roots of the polynomial equation \(x^3-2x^2-x+2=0\).  
(OR)
B) Find the quotient and remainder when \(4x^3+6x^2-23x-15\) is divided by \((3 + x)\)

27. A) Find the value of \( m \) if \(x^3-6x^2+mx+60\) leaves a remainder 2 when it is divided by \((x+2)\).  
(OR)
B) Using Factor theorem, prove that \((x-1)\) is a factor of \(4x^3-6x^2+9x-7\).

28. A) In the rhombus ABCD, if \( \angle A = 76^0\) find \( \angle CDB\).
(OR)
B) (a) Write the properties of parallelogram.

\[
\begin{align*}
\angle A &= \frac{2x + 20^\circ}{(3x - 10)^\circ} \\
\end{align*}
\]

(b) In the given figure, find the value of x and also find the angles.

29. A) In \( \triangle ABC \), if \( \angle A + \angle B = 70^\circ \) and \( \angle B + \angle C = 135^\circ \) find the angles.

(OR)
B) If three angles in a quadrilateral are \( 100^\circ, 84^\circ \) and \( 76^\circ \) then find the fourth angle.

30. A) Determine whether the points (12, 9), (20, -6), (5, -14) and (-3, 1) are the vertices of a square.

(OR)
B) Determine whether the points (6, 2), (2, -3) and (-2, -8) lie on a straight line.

31. A) If the points A (6, 1), B(8, 2), C(9, 4), D (p, 3) taken in order form the vertices of a parallelogram, then find the value of p.

(OR)
B) Show that the points (a, a), (-a, -a) and (-a√3, a√3) form an equilateral triangle.

PART-D

1 x 5 = 5

Do the construction with the help of a rough figure and write the steps of construction.

32. A) Construct \( \triangle ABC \) with \( AB = 7 \text{ cm}, \ BC = 8 \text{ cm} \) and \( \angle B = 60^\circ \) and locate its circum centre.

(OR)
B) Construct an equilateral triangle of sides 6 cm and locate its Orthocenter.