

MATHEMATICS

Grade 7

TEACHER'S GUIDE

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First Edition, 2014 E.C.



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Introduction

Mathematics is one of the school disciplines that focus on the enhancement of student's mathematical power and proficiency that lead to purposeful and worthwhile mathematical work. As a science of patterns and relationships, mathematics relies on logic, reasoning, problem solving and creativity. It is characterized by a cycle of learning that includes representation, manipulation and validation. Nowadays learning mathematics is becoming helpful in almost every kind of human endeavor. It serves as a basic precise language for the other field of studies such as science and technology. All sciences use the language of mathematics to describe objects and events, to characterize relationships between variables, and to argue logically. It can be said that learning mathematics is essential in everyday life.

Mathematics involves certain interrelated learning elements such as: -

- Comprehensions of mathematical terms, concepts, operations and relationships
- Skills in carrying out procedures flexibly, accurately, efficiently and appropriately
- Ability to formulate, represent and solve mathematical problems.
- Logical thought, reflection, explanation and justification.

The need to develop continuous assessment implementation teacher's guide rise from the following basic assumptions: -

- Effective mathematics instruction requires periodic and constant flow of information about students learning progress or learning deficiencies.
- Repeated and regular assessment of students provides better picture of the instructional process for mathematics teacher.
- A system of continuous assessment in mathematics helps to measure a wide range of mathematical skills (such as problem solving and critical thinking) that cannot easily be assessed by time-limit in terminal examinations.
- Implementation of continuous assessment improves the motivation of students to work hard and helps to get involved in.
- The other support systems such as teacher's resource materials (Syllabus, text books, teachers guide) and refreshment courses should be in place to effectively implement.
- Finally, it is possible to implement a system of continuous assessment in mathematics in spite of the increased effort time and energy it demands from both teachers and students.

Organization of this teacher's Guide

This teacher's guide is organized unit by unit. It contains the following major themes:

- i. **Introduction:** - includes the role, rationale and special Characteristics of learning the subject matter, guidelines on how to use the teacher's guide and the nature of continuous assessment.
- ii. **Competencies of each unit:** - drawn from mathematics syllabus of grade 7.
- iii. Suggested teaching aids.
- iv. Sub-unit competencies of each unit.
- v. Sub-unit introduction of each unit.

- vi. Teaching notes of each unit.
- vii. Answers to Activities and Exercises.
- viii. Continuous assessment.
- ix. Answers to Miscellaneous Exercises for each unit.
- x. Topics, period allotment and location chart.
- xi. Syllabus

The Concept of Active learning and Continuous Assessment

What is Active Learning?

Active learning: - as the name suggests, it is a process where students are actively engaged in the learning process, rather than “Passively” absorbing lectures. Students are rather encouraged to think, solve problems, do activities carefully selected by the teacher, answer questions, formulate questions of their own, discuss, explain, debate on brain storm question, explore and discover, work cooperatively in group to solve problems and work out projects.

Teachers' are strongly advised to discuss and work out difficult questions. As far as possible the class should not be teacher centered. Attention should be given to the following points in motivating students to participate in the lesson through activities, class work, homework, Group work and reading the text book independently.

- Give students a chance to express theorems, definitions, properties and rules in their own for each unit.
- Make students work the activities in class either individually, in pair or in small groups:
- Make the lesson lively related with real examples from the students' environment.
- Use order to methods in teaching i.e. from simple to complex methods in teaching.
- In order to evaluate students and find out individual weakness and help them, regular tests should be prepared carefully by referring to the unit out comes in the syllabus.
- Use different types of teaching aids based on each unit.

What is Assessment?

Assessment: - is a process by which information is obtained relative to some known objective or goal. The teachers assess at the end of a lesson, a unit or at the end of a school year through testing. Generally, assessment is defined as collecting information on the progress of students learning using varieties of procedures (Example checklist, formal tests, self- assessment, creative writing, and portfolios).

Purposes of Assessment

Teachers have many purposes for assessment of students. Some of the main reasons are:

1. **Improving instructional materials:** - Teachers need information regarding how effective teaching procedures, activities, the text book and other materials are in teaching.

2. Improving students learning: Both teachers and students need to know how students are doing.

3. Determining content mastery: Teachers evaluate students to determine either they have mastered the subject matter or not.

4. Teaching and Evaluation activities, if appropriately planned and used powerful learning activities.

5. Grading Students: - Parents, administrators, and sometimes employees need evidence of pupil progress.

Forms of Assessment

There are two forms of assessment. These are **continuous assessment** and **summative assessment**.

Continuous Assessment: - of learners' progress could be defined as a mechanism whereby the final grading of learners in the **cognitive, affective** and psycho motor domains of learning systematically take account of all their performances during a given period of schooling. Continuous assessment is an assessment approach that involves the use of a variety of assessment so as to assess various components of learning:

- The thinking processes (cognitive skills),
- Behaviors, personality traits (affective characteristics) and
- Manual dexterity (psychomotor domain)

Summative Assessment

This is a summary assessment of the extent to which learners have mastered the intended objectives. It normally occurs at the end or at the completion of a semester teaching. The Need for Continuous Assessment as a method of evaluating the progress and achievement of students on a day – to – day basis is relevant to get a clear picture of every student's performance.

Most importantly, planning a continuous assessment system at school level is useful to gather adequate and reliable information about: -

- The present status of every students
- The student's motivation to participate actively in the teaching – learning process;
- Students' progress in his/her learning;
- Students learning difficulties for diagnosing problems and to take remedial measures;
- Students preferences, interests and attitudes; and
- The effectiveness of teaching methods, techniques, and learning material used by teachers.

Steps in the Continuous Assessment

The following are the major steps to be followed in Continuous Assessment:

Step i: - Overview the unit outcomes, contents, methods and tools of the unit.

Step ii: - Produce a schedule of assessment for the unit.

Step iii. Determine the items for the suggested assessments of the unit.

Step iv: - Construct questions for the types of assessments suggested for the unit based on the determined items.

Step v: - Administer the suggested assessment tools constructed specifically on the bases of the schedule.

Step vi: - Grade or mark what was done by students.

Step vii: - Record the assessed results. Teachers should have format (s) for recording the assessment results of students. The format (s) may be centrally or regionally designed or individually formulated by the teachers themselves. In any case, the recording format has to include at least, the names of students, grade level, subject type, and the marks allotted for each assessment task.

Step viii: - Report the recorded results.

Methods /Strategies of continuous Assessment

The methods of continuous assessment enable you to assess a wide range of learning competencies and behaviors using a variety of instruments some of which are: -

- Tests (quizzes)
- Classroom discussions, exercises, assignment or group works
- Project
- Observations
- Interview
- Group discussions
- Questionnaires

Different competencies may require different assessment techniques and instruments. For example, oral questions and interviews may serve to assess listening and speaking abilities. Below is a description of these methods of continuous assessment used and their possible uses.

Tests

These usually consist of a range of questions covering almost all of the objectives of a unit. Students are required to respond to questions within a specified time, not more than half an hour. Tests could be phrased in different ways:

Close – ended (selection type such as true – false, multiple – choice, matching type) and **open – ended** (short – answer, essays, completion type).

Group Projects

A Project: - is an exercise on a single objective or topic that requires investigation in with the time constraints more investigation in with the time constraints more relaxed than assignments. Moreover, projects require much more information than assignments and require the involvement of a group of learners working together.

Marking

Marking or grading: - is the process of offering different types of symbols to academic progress or achievement of students. The marks given to students' academic achievement are usually reported to the school administration in general and parents in particular. Designing a good marking scheme can help to be uniformly fair to all students. The following are some suggestions on how to mark a semester's achievement.

1. One final semester examination 30%
2. Mid examination 20%
3. Tests 15%
4. Quizzed 10%
5. Homework 5%
6. Class activities, class work and presentation 10%
7. Project work, in groups or individually 10%

Recording and Reporting Students' progress and Achievement

Recording Students' achievement is an important aspect of continuous assessment. The reports on students' progress and performance may be miss-leading and incomprehensible unless records are properly kept. The major records to be kept are teacher's records, student's cumulative report card and transcript.

a) **The teacher's record book:** - is a permanent record book which every teacher must keep in his/her class. The teacher's record book is expected to contain a detailed scheme of work, an accurate diary or daily record of work and progress report.

b) **The student's cumulative record card:** - this contains the most available information of students' development throughout the primary school course.

The following main information should be including in the students' cumulative record card.

- Personal information about the students
- Weekly or periodic report of academic performance Report on his/her character.
- Report on the terminal tests
- Report on the summary of progress in all areas of the school curriculum.

c) **The transcript:** - This includes the results of continuous and Summative assessments add up to 100%. Below is a record format of assessment.

| Students | Continuous assessment | | | | | | | |
|----------|-----------------------|-----------|---------|--------------------|--------|--------|----------|------------|
| | Class Work Activities | Home Work | Quizzes | Project Group Work | Test 1 | Test 2 | Mid-Exam | Final Exam |
| 10% | 5% | 10% | 10% | 5% | 10% | 20% | 30% | 100 % |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| - | | | | | | | | |
| - | | | | | | | | |
| - | | | | | | | | |

UNIT 1

Basic Concepts of Sets

Total allotted period: 12 Periods

Introduction

The concept of set is one of the most familiar concepts of mathematics. In order to make students have an intensive understanding about the concepts of set, this unit presents a lot of interesting idea about the topic. The unit mainly focuses on relation among sets and operations.

There are exercises and activities in each sub-topic given so as to encourage students.

Unit Outcomes:

After completing this unit, students should be able to:

- Understand the concept of set.
- Describe the relation between two sets
- Perform two operations (intersection & union) on sets.

Suggested teaching Aids in Unit 1

You can present Venn diagrams that show the relationship between different sets and operations on sets.

1.1 Introduction to sets

Period allotted: 3 periods

Competencies:

At the end of this sub unit, students should be able to:

- Explain what is meant by "set" & "element"

Introduction:

This sub-topic begins with discussing the introduction of the notion of set.

Teaching notes:

- Encourage students to give their own examples of set (like the set of female students in the class)
- Guide students to come to an idea of empty set and its symbol by using eg. like The set of students in your class who are 100 years old.
- Assist students to use the appropriate symbols and terms related to a set.

Answer for exercise1.1

1. b, c, and d are sets.
a, is not set
2. a. True b. True c. False d. True e. False

Answer for exercise1.2

1. .
a. {5,7,11,13,17,19,23}
- b. {Hawassa, Adama, B.Dar, Asosa, Harar, Jigjiga, Gambela, Mekelle}
- c. {Integrated science, Maths, English, Amharic, ICT, HPE, Mother Tongue}
- d. {2,4,6,8,10,12,14,.....}

2. .
- The set of whole numbers between 0 and 101.
 - The set of odd natural numbers.
 - The set of months in a year.
 - The set of prime natural numbers.

Answer for exercise1.3

- Infinite set
- Empty set
- Empty set
- Finite set

1.2 Relations among Sets

Period allotted: 4 periods

Competencies:

At the end of this sub unit, students should be able to:

- Describe relationship among sets such as proper subset, subset, equal and equivalent sets.

Introduction:

This sub-unit begins with discussing the notions of the concepts such as subset, proper subset, power set, equal set, and equivalent set.

Teaching notes:

- Let students identify and practice the notion of sub-set, proper subset, equal and equivalent sets using several illustrative examples.

(The number of elements may not be greater than 3).

Example - let $A = \{a, b\}$, determine the proper sub set and subsets of sets $A, \{a\}, \{b\}, \{a, b\}, \emptyset$, are subsets of set A, $\{a\}, \{b\}, \emptyset$ are the proper sub sets of set A.

Answer for exercise1.4

- . a. True b. False c. False d. True e. False
- .
 - $\emptyset, \{0\}, \{1\}, \{2\}, \{0,1\}, \{0,2\}, \{1,2\}, \{0,1,2\}$
 - $\emptyset, \{0\}, \{1\}, \{2\}, \{0,1\}, \{0,2\}, \{1,2\}$
 - $\{\emptyset, \{0\}, \{1\}, \{2\}, \{0,1\}, \{0,2\}, \{1,2\}, \{0,1,2\}\}$
- .
 - $\emptyset, \{\{1,2\}\}, \{\emptyset, \{1,2\}\}$
 - $\emptyset, \{\{1,2\}\}$

4. .

- i. Equivalent set
- ii. Neither equal nor equivalent set
- iii. Equivalent and equal set

1.3. Operations on Sets

Period allotted: 5 periods

Competencies:

At the end of this sub unit, students should be able to:

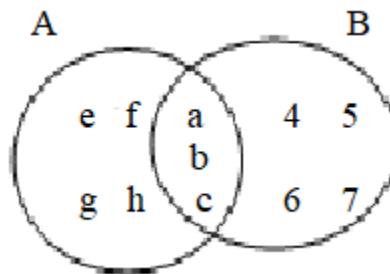
- Determine the intersection of two given sets.
- Determine the union of two given sets.
- Use Venn diagram to represent union and intersection of two set.

Introduction:

This sub topic discusses the two operations on set. In addition, the topic illustrates the operations using Venn diagram.

Teaching notes:

- Let students practice to determine intersection and union of two sets.
- Assist students to represent the intersection and union of two sets by using Venn diagram.
- Help students to solve problems of intersection and union of sets from a given diagram you may use examples like:



Find $A = \underline{\hspace{2cm}}$

$B = \underline{\hspace{2cm}}$

$A \cap B = \underline{\hspace{2cm}}$ and vise - versa.

$A \cup B = \underline{\hspace{2cm}}$ and vise - versa.

- Assist students to practice in solving simple word problems. You may use examples like:

In a certain school member of Mathematics club are Obang, Kebede, Aster, Halchayye and Chaltu and the members of English club are Ahmed, Obang, Wolango and Kebede then use Venn diagram to represent the situation.

Answer for exercise1.5

1. .a. $\{b\}$, b. $\{\{c\}\}$, c. \emptyset d. \emptyset
2. .a. $\{1,2,3,\{3\}\}$, b. $\{2,3,4,\{3\}\}$, c. $\{1,2,\{3\},4\}$, d. $\{1,2,\{3\},4,\}$, e. $\{1,2,3,4,\{3\}\}$.
3. .a. True b. False c. True d. True e. True f. True g. True h. True
i. True
4. i. $\{2,3\}$, ii. $\{2,6\}$ iii. $\{2\}$
5. .a. $\{6\}$, b. $\{1,2,3,5,6,c,d,e,f\}$ c. $\{5,6\}$ d. $\{1,2,3,5,6,a,b,c,e\}$
e. $\{1,2,3,5,6,c,e\}$ f. $\{6,c\}$

Answer for Review Exercise

1. .a, c, and e are not set
.b and d are sets
 2. A and F are equal set
B and V are equal set
.a. $A = \{1,2,3,4,5\}$
.b. $6 \notin A$
$$W = \{x \in N \mid 3 < x < \sqrt{21}\}$$
 3. .a. equivalent b. not equivalent
 4. .a. $\{b,d,f,h\}$ b. $\{b,d,f,h\}$ c. $\{a,b,d,e,f,g,h\}$ d. $\{a,b,d,e,f,g,h\}$
e. $\{a,b,c,d,e,f,g,h,i,j\}$ f. $\{b,f,h\}$
6. a. Infinite set b. Finite set c. Finite set/empty set

UNIT 2**Integers*****Total allotted period: 34 Periods*****Introduction**

This unit requires affirm understanding of numbers. The unit gives much emphasis to the definition of integers, opposite of integers, comparing and ordering integers. The four operations on integers are also discussed one after the other.

The activities and exercises given in each sub-unit are designed to encourage students to think critically about the lessons presented and to explore the key concept in more details.

Unit Outcomes:

After completing this unit, students should be able to:

- Understand the concept of integers
- Represent integers on a number line
- Identify the commutative, associative and distributive properties of operation of integers
- Perform the operations addition and subtraction on integers.
- Apply integers in the real-life situation

Suggested teaching Aids in Unit 2

You can present Venn diagrams that show the relationship between natural numbers, whole numbers and integers. You can use number line to represent integers and use flash cards that displays the rules to add or subtract integers.

2.1. Revision on whole and natural numbers***Period allotted: 3 periods*****Competencies:**

At the end of this sub unit, students should be able to:

- Describe relationship among sets such as proper subset, subset, equal and equivalent sets.

Introduction:

This unit begins with discussing the concepts:

- Introduction of the concepts of set.

- Revision of the relationship between whole and natural numbers

- Revision of the four operations on whole and natural numbers

Teaching notes:

Students have some background on the concepts of natural numbers and whole numbers. For the purpose of revision, you can ask students questions like

1. What is the smallest natural number?
2. What is the smallest whole number?
3. Describe natural number.
4. Describe whole number.
5. Give examples of numbers that are not natural number.

The purpose of activity 2.1.1 is to help students revise about natural and whole numbers.

Answer Activity 2.1.1

1. 1, 2, 3,
 2. 0, 1, 2, 3, 4,
 3. Smallest natural number is 1 but the greatest natural number is unknown
 4. Smallest whole number is 0 but the greatest whole number is unknown
- a. Natural number is the set of numbers is denoted \mathbb{N} and described by
 $\mathbb{N} = \{1, 2, 3, \dots\}$, Natural numbers are also known as counting numbers
- b. Whole numbers are numbers contains natural number and zero is denoted by \mathbb{W} and described by $\mathbb{W} = \{0, 1, 2, 3, \dots\}$

Answer for exercise 2.1.1

1. a. 1237
- b. 777
- c. 6309
- d. 332
- e. 603
- f. 117,990

2.2. Introduction to integers

Period allotted: 4 periods

Competencies:

At the end of this sub unit, students should be able to:

- Apply real-life applications of integers in terms of temperature, altitude and money to express positive and negative numbers
- Define the set of integers
- Indicate integers on the number line.
- Describe the relations, among natural numbers, whole numbers and integers

$$\mathbb{N} \subset \mathbb{W} \subset \mathbb{Z}$$

Introduction:

This sub unit begins by introducing negative numbers and integers. Opposite of an integer and locating integers on number line will also be discussed in this sub unit

Teaching notes:

Start the lesson by asking questions like

- Is there a number below zero?
- What is the difference between temperatures 5°C above zero and 5°C below zero?

And guide the students so that the temperature above zero is positive and below zero are negatives. Activity questions are very important, so make small group of students to do activity 2.2.1. And give them proper feedback.

Answer for activity 2.2.1

1.a. Monday = $+16^{\circ}\text{C}$

Tuesday = -6°C

Wednesday = -1°C

b. Monday 16 units upward

Tuesday 6 units downward

Wednesday 1 unit downward

c. The coldest temperature was -6°C

d. The hottest temperature was $+16^{\circ}\text{C}$

2. The number comes after zero is 1..

3. There is no any whole number before zero.

After providing short note and examples on integers, you can provide exercises (exercise 2.2.1 and exercise 2.2.2) as class work or homework and provide proper feedback.

Answer for Exercise 2.2.1

1. A = -8, B = -6, C = -4, D = -2, E = 3 F = 6 and G = 9



3. a. negative three
b. Positive twenty one or twenty one C. negative one

hundred thirty two

d. ninety-nine
4. a. +4 or 4
b. -20
c. -53
d. 101
5. a .- 100

b. +10

c. +7
d. -5
e. -6
f. +21
6. Natural number and positive integers are the same
7. 0
8. a, b, e, and h are integers

Answer for exercise 2.2.2

1. a. -70
b. 23
c. 170
d. 0
2. a. -120
b. -15
c. 5
3. a. $9^{\circ}C$
4. b. $-9^{\circ}C$

Assessment

Give students various exercises, to list integers and non-integer numbers and to write the opposite of a given number

2.3 comparing and ordering integers

Period allotted: 5 periods

Competencies:

At the end of this sub unit, students should be able to:

- Compare and order integers using a number line.
- Determine the predecessor and successor of a given integer.

Introduction:

This sub unit focuses on comparing and ordering integers using number line.

Teaching notes:

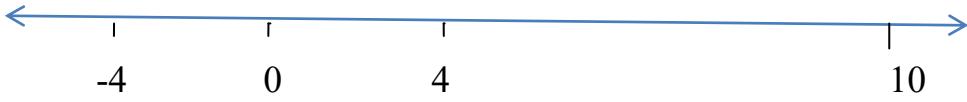
Start the lesson by providing activity 2.3.1 forming small groups. Guide the students to use number line in comparing integers. Ask students questions like

- Which number is to the right of the other?
- What is the successor of -5 ?
- What is the predecessor of 0?
- Arrange the numbers $7, 0, -6$ in increasing order.

Answer for Activity 2.3.1

1.a. DebreBerhan

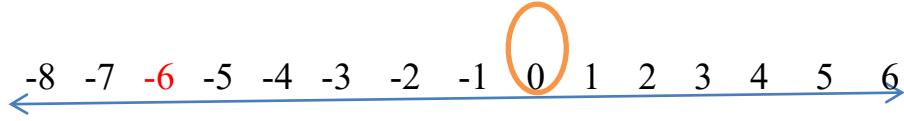
b. Adama



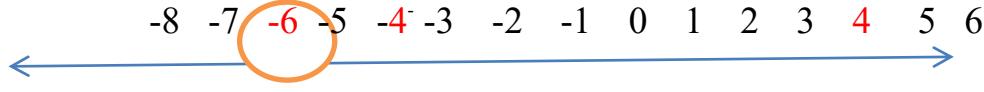
2.



b.



c.



d



3. a. the bigger number is 6 the bigger number is 0

b. the bigger number is -4

c. the bigger number is 6

After providing a short note and examples on comparing integers, you can provide exercise 1.3.1 as class work or homework and provide proper feedback.

Answer for exercise 2.3.1

1.a. $-150 < 0$

b. $0 > -300$

c. $-1200 < -74$

d. $-34 < 34$

e. $65 > -20$

f. $-340 > -341$

g. $-23 = -23$

h. $-8 < 2$

i. $-120 < -80$

j. $-360 < 185$

k. $0 < 13$

l. $14 > 0$

2. a. 6 is the right 3

b. -3 is the right -6

c. 10 is the right 5

d. -105 is the right of -1005

e. -87 is the right -99

f. -1 is the right -360

g. 35 is the right -45

h. 0 is the right -12

3. a. -1, 0, 1, 2

b. only 0

- c. -97 and -96,
- d. there is no any integers between -10 and -9
4. a. $a < z$
- b. $m < x$
- c. $z < n$
- d. $0 > z$
5. a. -1
- b. 1
- c. Integer has no greatest number
- d. Integer has no smallest number

Next to exercise 2.3.1, give a short note on successor and predecessor of an integer and arranging integers in ascending or descending order through examples. And provide Exercise 2.3.2 as class work or homework and provide them proper feedback.

Answer for Exercise 2.3.2

- 1.a. 21 c. 1000
 b. -15 d. -998
- 2.a. 999 c. -1000
 b. -78 d. -1001
- 3.a. -78, -24, 0, 17, 71
 b. -400, -350, -230, -157, 50
- 4.a. 69, 59, -9, -89, -99
 b. 400, 200, -300, -445, -757

5a.

| | First play | Second play | Final result |
|---------|---------------------|---------------------|--------------------|
| Abebe | Loss 5 basket balls | Won 7 basket balls | Won 2 baskets (+2) |
| Almaz | Won 5 basket balls | Loss 5 basket balls | No won no loss (0) |
| Hailu | Loss 3 basket balls | Loss 2 basket balls | Loss 5 basket (-5) |
| Derartu | Won 1 basket balls | Won 2 basket balls | Won 3 basket (+3) |

- b. Derartu
 c. Hailu

d. 3, 2, 0, -5

Project work: the answer depends on the temperature recorded on the given day

Assessment

Give students various exercises, to compare and order integers, and to find successor and predecessor of a given integer. You can also provide them project work to record temperature of a given city.

2.4. Addition and subtraction of Integers

Period allotted: 8 periods

Competencies:

At the end of this sub unit, students should be able to:

- Find the sum of integers.
- Find the difference between two integers

Introduction:

This sub unit focuses on addition and subtraction of integers using number line and applying the rules. In this sub unit various activities are also designed to help students in understanding addition and subtraction of integers.

Teaching notes:

Start the lesson by providing activity 2.4.1 forming small groups and guide the students how to add integers using number line and give them proper feedback for the activity.

Answer for Activity 2.4.1

1.

| Name | First sell | Second sell | Total profit/ loss |
|---------|----------------|----------------|-----------------------|
| Hussen | Loss Birr 15 | Profit Birr 17 | Profit 2 (+2) |
| Almaz | Profit Birr 15 | Loss Birr 15 | No profit no loss (0) |
| Hailu | Loss Birr 13 | Loss Birr 20 | Loss 33 (-33) |
| Derartu | Profit Birr 10 | Profit Birr 12 | Profit 22 (+22) |

2.a. -4 c. -7

 b. 3 d. -4

3.a. 5 c. -1 e. 0

 b. -20 d. 1

After activity 2.4.1, give students short note on how to add integers without using number line and provide them examples. Explain properties of addition through example and provide Exercise 2.4.1 as class work or homework and provide them proper feedback.

Answer for exercise 2.4.1

1.a.0 c.0

b.0 d.0

2.a. 4 d. 0

b. -9 e. -7

c. 3 f. -3

3. a. 13 f. -33

b. 10 g.-11

c. -610 h.1793

d.167 i. 180

e. -91

4. 17 in debt (-17)

5. 2350meter

Next to Exercise 2.4.1, give students activity 2.4.2 and guide them how to write differences in the form of sum and find the result

Answer for Activity 2.4.2

A. $3 + (-6)$

b. $-3 + (-5)$

c. $4 + (-2)$

d. $-5 + 6$

2. a. $5 + (-6) = -1$

b. $-2 + (-2) = -4$

c. $4 + (-2) = 2$

d. $-7 + 6 = -1$

After activity 2.4.2, give to students' short note on how to subtract integers and provide them examples. Give Exercise 2.4.2 as class work or homework and provide them proper feedback.

Answer for Exercise 1.4.2

1. a. $3 + 10 = 13$
 b. $-5 + 6 = 1$
 c. $9 + (-12) = -3$
 d. $25 + (-17) = 8$
 e. $-178 + (-57) = -235$
 f. $-365 + (-1000) = -1365$
2. a. -3
 b. 15
 c. -90
 d. -789
 d. 1243
 e. -50
3. $109^{\circ}F - (-109^{\circ}F) = 218^{\circ}F$

Assessment

Give students various exercises, to add and subtract integers.

2.5 Multiplication and Division of Integer numbers

Period allotted: 8 periods

Competencies:

At the end of this sub unit, students should be able to:

- Solve problems on multiplication of integers.
- Identify the commutative and associative property of multiplication.
- Identify the distributive property of multiplication over addition.
- Divide integers whose quotient as expressed in decimals (2 decimal places)

Introduction:

This sub unit focuses on multiplication and division of integers. In this sub unit various activities are also designed to help students in understanding multiplication and division of integers.

Teaching notes:

Start the lesson by providing activity 2.5.1 forming small groups and guide the students how to write multiplication in the form of sum and find the result. Give proper feedback for the activity.

Answer for Activity 2.5.1

1. a. $5 + 5 = 10$
b. $9 + 9 + 9 = 27$
c. $-5 + (-5) + (-5) + (-5) = -20$
d. $-6 + (-6) = -12$
2. a. 4×0
b. 3×5
c. $3 \times (-2)$
d. $6 \times (-10)$
- 3 a. 8 c. 153 e. -100
b. 0 d. -20

After activity 2.5.1, give to students' short note on how to multiply integers and provide them examples. Give Exercise 2.5.1 as class work or homework and provide them proper feedback.

Answer for Exercise 1.5.1

- | | |
|--------|----------|
| 1.a.72 | d.-400 |
| b.195 | e. 1751 |
| c. -91 | f. 58650 |

Next to Exercise 2.5.1, give students activity 2.5.2 to help them in understanding properties of multiplication of integers. Give short note and examples on properties of multiplication, and then Exercise 2.5.2.

Answer for Activity 2.5.2

- | | |
|------------|---------|
| 1. a. True | d. True |
| b. True | c. True |

Answer for Exercise 2.5.2

- 1.
- a. Distributive property
- b. commutative property
- c. associative property
- d. property of one

2.

| a | b | c | $a \times b$ | $b \times a$ | $a \times (b \times c)$ | $(a \times b) \times c$ |
|----|----|-----|--------------|--------------|-------------------------|-------------------------|
| -7 | 4 | -3 | -28 | -28 | 84 | 84 |
| 9 | -2 | 5 | -18 | -18 | -90 | -90 |
| -6 | -8 | -12 | 48 | 48 | -576 | -576 |

After providing feedback for exercise 2.5.2, give the students activity 2.5.3 by making small groups

Answer for activity 2.5.3

1. a. -60 b. 60
c. -60 d. 60
2. a. 0 b. 0

From question number 2 above you can conclude that, Product of integers with at least one factor 0 is zero.

Next to activity 2.5.3, give short note and examples on multiplying more than two integers and exercise 2.5.3 and provide students proper feedback.

Answer for exercise 2.5.3

1. a. Positive
b. Negative
c. Negative
d. Negative
2. a. 162
b. -780
c. -120

d. -1944

e. 0

After exercise 2.5.3, give activity 2.5.4 that leads them to division of integers and provide proper feedback.

Answer for activity 2.5.4

1. a. $20 = 5 \times 4$

b. $-36 = -4 \times 9$

c. $84 = -12 \times 7$

d. $-8 = 4 \times (-2)$

2. a. negative

b. negative

c. positive

Next to activity 2.5.4, give short note and examples on division of integers and exercise 2.5.4

Answer for exercise 1.5.4

1.

a. $dividend = -96$

$Divisor = 12$

$Quotient = -8$

b. $dividend = -56420$

$Divisor = -124$

$Quotient = 455$

2.a. $18 = 3 \times 6$

$quotient = 6$

b. $24 = -4 \times -6$

$quotient = -6$

c. $-40 = -5 \times 8$

$quotient = 8$

d. $-44 = 4 \times -11$

$quotient = 6$

3. a. -26
b. 0
c. 1
d. 78
e. undefined f. 178
g. undefined

4. a. 8
b. -78
c. -828
d. -5555
5. a -2.4 b. 18.5
c. 3.25
d. -11.25

Assessment:

Give students various exercises, to multiply and divide integers.

2.6. Even and Odd integers

Period allotted: 6 periods

Competencies:

At the end of this sub unit, students should be able to:

- Describe even and odd integers.
- Identify even and odd integers.
- Identify the property of operations on even and odd integers

Introduction:

This sub unit focuses on even and odd of integers. In this sub unit various activities are also designed to help students in identifying odd and even integers.

Teaching notes:

Start the lesson by providing activity 1.6.1 that help students to identify even and odd integers and give proper feedback to the activity.

Answer for activity 2.6.1

- 1.
- a. the objects group by without remainder
 - b. the objects group by with remainder 1

- c. the objects group by without remainder
- d. the objects group by with remainder 1 2.the objects grouped by two without remainder
- 3. the objects group by two with remainder 1
- 4. even
- 5. odd
- 6. even integers= 4 and 6
odd integers=3and 5

Next to activity 2.6.1, give short note and examples on even and odd integers and exercise 2.6.1

Answer for Exercise 2.6.1

- 1. -36=even
55=odd
0=even
-71=odd
103= odd
-180 =even
- 2. Even=5568, 1034 Odd= $3675, -7109, -1807$
- 3. 144,146,148
- 4. -53,-51,-49
- 5. 0
- 6. 2
- 7. -1
- 8. 999
- 9. -99

Assessment

Dear teacher asses your students based on the following sub-topics:

- Give different exercise, problems on addition of integers and check their progress based on their feedback.
- Give different exercise problems on the use of the commutative associative and distributive properties and follow up the performance of your students.
- Give exercise, problems on subtraction of integers and check the performance of your students.

- Give exercise, problems on multiplication of integers and check their performance and to take remedial measures based on their feedback.
- Give exercise, problems on division of integers and check also their performance and take remedial measures based on their feedback.
- Finally based on the performance of your students -Asking oral questions.
 - Giving class work.
 - Giving your own assignment.
 - Giving quiz, test and project work.

Give comments on their attempts. Generally, give the following exercise problems for fast learners or interested students.

1. Perform the indicated operations

- $(-5 \times 9) + 9$
- $(7 - 11) + (11 - 7)$
- $(-8 \div 4) + 6$
- $(8 - 10) \times (6 - 7)$
- $-8 + 8 - 8 + 8$
- $(7 \times 13) + (-2 \times 5)$
- $$\begin{array}{r} -6+8 \\ \hline 7-11 \end{array}$$
- $$\begin{array}{r} -3\times5 \\ \hline 6-11 \end{array}$$

2. For any even and odd integers

- $even + odd - even = \underline{\hspace{2cm}}$
- $even \times odd + even = \underline{\hspace{2cm}}$
- $odd \times odd \times odd = \underline{\hspace{2cm}}$
- $3 \times even + 2 \times odd = \underline{\hspace{2cm}}$

Answer for Exercise 2.6.2

- | | | |
|------------|---------------|------|
| 1. a. even | e. odd | i. 2 |
| b. odd | f. even | |
| c. even | g. even d odd | h. 2 |

Answer for review exercise

1.

a.

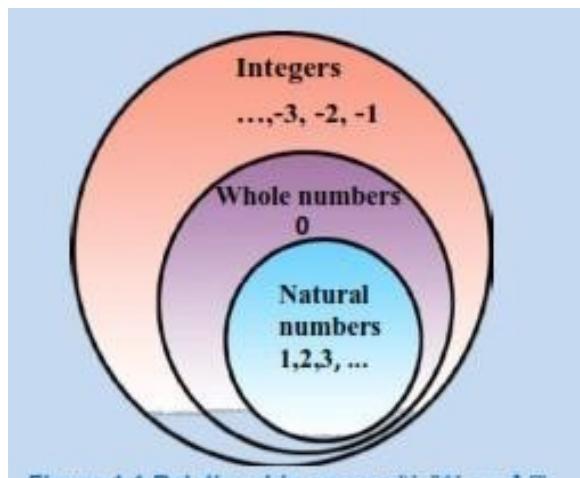


b.



c.

2.



3. $0.2, -0.5, \frac{1}{5},$

4. a. 80 f. -543

b. -34 g. 1020

c. 34 h. 90

d. -1002 i. 768

e. -835

2.a. $-69, -68, -67, -66, -65, -64, -63, -62, -61$

b. there is no integer between -34 and -34 c. there is no integer between -3 and -4 d. -11 e. $1,2,3,4,5,6$ f. $-11, -10, -9, -8, -7, -6, -5, -4, -3, -2, -1$

3.

a. $-65 < 0$

b. $34 > -678$

c. $-34 > -304$

d. $1002 > -1002$

e. $-835 = -835$

f. $543 > -56$

g. $-1020 < 220$

h. $-90 < -65$

i. $-768 < 34$

4. $-9, -8, -7, -6$

5. Descending order,

 $101, 21, 1, -1, -5, -51, -69, -81, -101$

Ascending order,

 $-101, -81, -69, -51, -5, -1, 1, 21, 101$

6.a. -59 f. -169

b. -26 g. -1000

c. 29 h. -264

d. -34 i. 1233

e. -564

7. a. -592 d. 622
b. -30 e. -687

c. -571 f. -761

8. a. -240 d. -1400

b. 540 e. 0

c. 216 f. 1

9. a. commutative property
b. distributive property
c. associative property

- d. property of zero
 - e. property of one
- 10.
- a. 135
 - b. 1
 - c. 19225
 - d. 0
 - e. undefined
 - f. -212
 - g. 0.05
 - h. 5.5,
 - i. -13.5

11. $-10, -8, -6, -4$

12. $-105, -103, -101, -99, -97$

- 13.
- a. even
 - b. even
 - C. even
 - d. odd
 - e. odd
 - f. odd
 - g. even

14. -12, 0 and 12

15. -30 and 30, -103 and 103, -234 and 234

16. He gained 13 = 13

He lost 30 points = -30

Net score

$$= 13 + (-30) = -17$$

Unit 3

Ratio, Proportion and percentage

Total allotted periods: 27 Periods

Introduction:

This unit requires a firm understanding of ratio, proportion and percentage. The pupils will learn the basic mathematical concepts that will be applied in business like profit, loss, simple and compound interest, income tax, VAT, and turn over tax.

Unit outcomes:

After completing this unit, students should be able to:

- Understand the notions of ratio and proportions.
- Solve problems involving ratio and proportion.
- Describe a percentage
- Solve problems involving percentages.
- Relate fractions, decimals and percentages to real life situations.
- Apply the concept of percentage in solving real life problems.

Suggested teaching Aids in Unit 3:

You can use percent bar model, charts displaying formulas, square which is divided in to 100 equal parts.

Teaching notes:

Start the lesson by introducing the new chapter, and make the students eager to learn the basic concepts in the unit such as interest, VAT, turnover tax etc. Give activity 3.1.1 and guide them and give proper feedback. Answer for Activity 3.1.1

1. a. 3:2 b. 2:3:5
2. a. $6:4=3:2$ b. $6:10=3:5$
3. The method of comparing two or more quantities of the same kind and in the same units by division is known as a ratio.
4. The answer depends on the number of students in the class. Next to activity 3.1.1, provide short note and examples on ratio and exercise 3.1.1

Answer for exercise 3.1.1

1. a. 3:5 or $\frac{3}{5}$
- b. 5:1 or $\frac{5}{1}$

- c. 1:2 or $\frac{1}{2}$
- d. 4:3 or $\frac{4}{3}$
- e. 1:4 or $\frac{1}{4}$
- f. 7:4 or $\frac{7}{4}$
2. a. 25:1 or $\frac{25}{1}$ b. 8:9 or $\frac{8}{9}$
- c. 6:5 or $\frac{8}{9}$
- d. 7:6 or $\frac{7}{6}$
- e. 7:13 or $\frac{7}{13}$
- f. 10:1 or $\frac{10}{1}$

3. a. 9:26 or $\frac{9}{26}$
- b. 9:35 or $\frac{9}{35}$
- c. 26:35 or $\frac{26}{35}$

After exercise 3.1.1 give examples on how to divide a given quantity in a given ratio which are listed in the text book. And give exercise 3.1.2 as class work or homework and provide them proper feedback.

Answer for Exercise 3.1.2

1. a. Let $3x$ and $5x$ are the two numbers, then

$$3x + 5x = 192$$

$$8x = 192$$

$$x = 24$$

Therefore, the first number is $3(24) = 72$

The second number is $5(24) = 120$

2. Let $x\text{cm}$, $2x\text{cm}$, $5x\text{cm}$ are the length of piece of wire, then

$$x\text{cm} + 2x\text{cm} + 5x\text{cm} = 240\text{cm}$$

$$8x\text{cm} = 240\text{cm}$$

$$x = 30$$

Therefore, the first piece of length of wire = 30cm

The second piece of length of wire is $2(30)\text{cm} = 60\text{cm}$.

The third piece of length of wire is $5(30)\text{cm} = 150\text{cm}$

3. Let Aster contributed x , Fatuma contributed $3x$

Mohammed contributed $5x$ and Yared contributed $7x$

$$7x = 1050$$

$$x = 150$$

Then, Aster contributed $x = \text{Birr } 150$

Fatuma contributed is $3(150) = \text{Birr } 450$

Mohammed contributed is $5(150) = \text{Birr } 750$

Yared contributed = $\text{Birr } 1050$

4. Let the two numbers are $12x$ and $5x$

$$12x - 5x = 98$$

$$7x = 98$$

$$x = 14$$

Therefore, the larger number is $12(14) = 168$

The second number is $5(14) = 70$

5. let $a = 3x$ and $b = 2x$

$a + b = 3x + 2x$ and $a - b = 3x - 2x$, then

$$\frac{a+b}{a-b} = \frac{3x+2x}{3x-2x} = \frac{5x}{x} = 5$$

6. Area of ABCD = $12\text{cm}(12\text{cm})$

$$= 144 \text{ cm}^2$$

Area of PQRS = $8\text{cm}(8\text{cm})$

$$= 64 \text{ cm}^2$$

Then area of ABCD: area of PQRS

$$= \frac{144\text{cm}^2}{64\text{cm}^2}$$

$$= \frac{9}{4}$$

7. $y = 48, x = 24, z = 96$

Then $x + y + z = 24 + 48 + 96 = 168$

Provide for student's activity 3.1.2, that leads them to the definition of proportion and give them proper feedback.

Answer for Activity 3.1.2

1. a. $4:6 = 6:9$

b. $\frac{3}{6} = \frac{40}{80}$

2. The ratios are equal

3. Proportion

After providing feedback to the students on activity 3.1.2, Give them short note and examples on proportion. Exercise 3.1.3 should be given as class work or homework.

Answer for Exercise 3.1.3

1. only d is in proportion

2. a. $x = 12$

b. $x = 4$

c. $m = 10$

d. $n = 30, y = 30$

3. The product of extreme $(14)(3) = 42$

Then, $14, 21, 2$ and 3 are in order proportion

4. a. 53 c. 73

b. 630 d. 630

5. $\frac{1}{1,000,000} = \frac{3.5\text{ cm}}{x}$

$x = 3,500,000\text{ cm} = 35\text{ km}$

Give short explanation on direct and inverse proportionality through examples and provide exercise 3.1.4 and 3.1.5 that help students to internalize the concepts. Provide them proper feedback at the end of exercises.

Answer for Exercise 3.1.4

1. a. 4 c. 12 b. $y = 4x$ d. 3.75

2. b is directly proportional

3. $m=10.5$

4. As x increases y also increases and the ratio $\frac{y}{x}$ is constant,

$$k = \frac{160}{20} = 8 \text{ then, } y = 8x$$

Therefore: $3.2 = 8(x) = 0.4$

5. Distance \propto time, (since a car moving in constant speed)

$$k = \frac{120}{2} = 60$$

Then distance = $60 \times (\text{time})$

$$330 = 60 \times (\text{time}), \text{time} = 5.6 \text{hrs}$$

Answer for Exercise 3.1.5

1. $k(\text{constant of proportional}) = 24$

2. $k = 200, \text{then } y = \frac{200}{10} = 20$

3. a. inversely proportional

4. $k = 8(35) = 280$

Number of laborers $\propto \frac{1}{\text{time}}$

$$\text{Time} = \frac{280}{20} = 14 \text{ days}$$

5. $k = 15(25) = 375$

$$y = \frac{375}{30} = 12.5$$

6. a. $k=1000$

$$\text{time} = \frac{1000}{50} = 20 \text{ days}$$

b. $\text{time} = \frac{1000}{150} = 6\frac{2}{3} \text{ days}$ or 6 days and 16 hrs.

7. $k=36(12)=432$

$$\text{Time} = \frac{432}{16} = 27 \text{ days}$$

Assessment:

Remember the minimum learning competencies of the students. As part of the assessment technique, let your students define ratio and proportions: Ask them to identify direct and inverse proportions. Always check their answers and give immediate feedback.

Finally; Depending on their level of understanding you may also give additional exercises of the following type:

For slow learners

Write the following ratio in their simplest form:

1. The ratio of the radius of a circle to its diameter.
2. The ratio of the circumference of a circle to its diameter.

For Fast learners

Answer the following questions.

1. Calculate the ratio of the side to the diagonal of the same square of side 50 cm.
2. If $6a^3b$, $12a^2b^2$, k and $48ab^3$ are in proportion, express k in terms of a and b , where $a, b \neq 0$

3.2. A revision on Percentage

Period allotted: 9 periods

Competencies:

At the end of this sub unit, students should be able to:

- Visualizes percent and its relationship to fractions, ratios, and decimal numbers using models.
- Identifies the base, percentage, and rate in a problem.
- Solves routine and non-routine problems involving percentage using appropriate strategies and tools

Introduction

Percent is comparison of a given quantity (or part) with the whole amount (which you call 100). Emphasize that percent means per hundred. Call the pupils' attention to % (percent sign).

Teaching Notes

The teacher should emphasize to the students that there are four basic types of Guidelines of percentage, decimal and fraction. 1.

Guidelines for converting percent to a decimal

To convert percent to a decimal, remove the % symbol and divide by 100(shift the decimal place two steps to the left)

Example1: Convert the percentage to decimals.

- a) 72% b) 0.046%

Solution:

a. $72\% = \frac{72}{100} = 0.72$
 b. $0.046\% = 0.000$

2. Guide lines for converting a percent to fraction

To convert a percent to fraction, remove the % symbol and put 100 as denominator and write the fraction in the lowest term.

Example2: Convert the percentage to fraction

a. $23\frac{1}{3}\%$ b. 99%

solution:

a. $23\frac{1}{3}\% = \frac{70/3}{100} = \frac{70}{3} \times \frac{1}{100} = \frac{7}{30}$
 b. $99\% = \frac{99}{100}$

3. Guidelines for converting a decimal to a percent

To convert a decimal to a percent, multiply by 100% which is 1 (and attach the % symbol on the result) or shift the decimal place two steps to the right.

Example 3: convert the decimal to percentage.

- a) 0.245 b) 0.567

solution: a. $0.245 = 0.245 \times 100\% = 24.5\%$

b. $0.567 = 0.567 \times 100\% = 56.7\%$

4. Guidelines for converting a decimal to a percent

To convert a fraction to a percent, multiply by 100%

Example4: Convert the fractions to percent.

a. $3\frac{4}{5}$ b. $\frac{3}{5}$

solution: a. $3\frac{4}{5} = \frac{19}{5} \times 100\% = 380\%$

b. $\frac{3}{5} = \frac{3}{5} \times 100\% = 60\%$

The teacher should emphasize to the student that, the three basic types of percent problems by taking other additional and simple examples; for example

- i) What number is 5% of 60? Asking (Percentage).

ii) 5% of what number is 2? Asking (base).

iii) What percent of 60 is 3? Asking (rate).

Answer for Activity 3.2.1

1.a. green part=25 and total part=100

b. $25:100 = \frac{1}{4}$

c. 25%

d. percent means per hundred

2.a. 81% b. 2%

c. 75%

d. 20%

Answer for Exercise 3.2.1

1. a. $\frac{3}{5}$

b. $\frac{13}{500}$

C. $\frac{5}{4}$

d. $\frac{3}{400}$

e. $\frac{23}{400}$

f. $\frac{9}{20000}$

2. a. 0.8

b. 0.26

c. 0.12

d. 0.004

e. 0.0525

f. 0.0045

Answer for Exercise 3.2.2

1. a. 60%

b. $16\frac{2}{3}\%$

c. 275%

d. $216\frac{2}{3}\%$

2. a. 12%

b. 750%

c. 365%

d. 0.12%

3. a. 40%

c. $1\frac{2}{3}\%$

- b. 480% d. 100%
4. a. 25% c. $\frac{5}{4}$
5. b. 12.5% d. $\frac{3}{400}$
6. c. 20%

Answer for Activity 3.2.2

1. $200 \times \frac{10}{100} = 20$

2. a. Rate

b. Base

c. Percentage

Answer for Exercise 3.2.3

1. a. $P=R \times B = \frac{10}{100} \times 160 = 16$

b. $P=R \times B = \frac{60}{100} \times 300 = 180$

c. $P=R \times B = \frac{45}{100} \times 9 = 0.45$

d. $P=R \times B = \frac{75}{100} \times 5000 = 37.5$

2. $\text{number of girls} = R \times B = \frac{20}{100} \times 60 = 12$

$\text{number of boys} = R \times B = \frac{80}{100} \times 60 = 48$

3. Number of people $R \times B = \frac{25}{100} \times 5000000 = 1250000$

a. Answer for Exercise 3.2.4

1.

$$\begin{aligned} a. \quad B &= \frac{P}{R} = \frac{\frac{6}{24}}{\frac{100}{100}} \\ &= \frac{6 \times 100}{24} = 25 \end{aligned}$$

b. $B = \frac{P}{R} = \frac{\frac{700}{35}}{\frac{100}{100}}$

$$= \frac{700 \times 100}{35} = 2000$$

c. $B = \frac{P}{R} = \frac{18}{\frac{15}{100}}$

$$= \frac{18 \times 100}{15} = 120$$

d. $B = \frac{P}{R} = \frac{\frac{110}{40}}{100}$

$$= \frac{110 \times 100}{40} = 275$$

2. the man's full salary $= \frac{P}{R} = \frac{6300}{\frac{30}{100}} = \frac{6300 \times 100}{30}$

$$= Birr 21000$$

3. Number of students

$$= \frac{P}{R} = \frac{18}{\frac{36}{100}}$$

$$= \frac{18 \times 100}{36} = 50$$

Answer for Exercise 3.2.5

1.

a. $R = \frac{P}{B} \times 100\%$

$$= \frac{30}{60} \times 100\% = 50\%$$

b. $R = \frac{P}{B} \times 100\%$

$$= \frac{6}{24} \times 100\% = 25\%$$

c. $R = \frac{P}{B} \times 100\%$

$$= \frac{500}{800} \times 100\% = 62.5\%$$

2. percent of woman saving $= \frac{P}{B} \times 100\%$

$$= \frac{300}{7500} \times 100\% = 4\%$$

3. a. 56.25%

b. 43.75%

c. 68.75%

d. 18.75%

4. percent of absent student $= \frac{P}{B} \times 100\%$

$$= \frac{6}{48} \times 100\% = 12.5\%$$

percent of attended student $= \frac{P}{B} \times 100\%$

$$= \frac{42}{48} \times 100\% = 87.5\%$$

Answer for Mixed problem congaing base, rate and percentage

$$1. \text{ score in percent} = \frac{P}{B} \times 100\%$$

$$= \frac{16}{25} \times 100\% = 64\%$$

$$2. \text{ Rate of students present} = 100\% - 8\% = 92\%$$

$$\text{Number of present students} = R \times B = \frac{92}{100} \times 50 = 46\%$$

$$3. \text{ Percent of non-defective oranges} = 100\% - 20\% = 80\%$$

$$\text{total number of oranges} = \frac{P}{R} = \frac{76}{\frac{80}{100}}$$

$$= \frac{76 \times 100}{80} = 95$$

$$4. \text{ percent of sold vegetable} = \frac{P}{B} \times 100\%$$

$$= \frac{220}{400} \times 100\% = 55\%$$

$$5. \text{ Percent of milk left} 100\% - 75\% = 25\%$$

$$\text{amount of milk in liters} = R \times B = \frac{25}{100} \times 24 = 6 \text{ liters}$$

$$6. \text{ Total number of eggs} = \frac{P}{R} = \frac{540}{\frac{36}{100}}$$

$$= \frac{540 \times 100}{36} = 1500$$

Number of egg not sold = total number of eggs - number of sold

$$= 1500 - 540$$

$$= 960$$

$$7. \text{ Number of female workers} = 1500$$

$$\text{percent of female workers} = \frac{P}{B} \times 100\% = \frac{1500}{2400} \times 100\%$$

$$= 62.5$$

Assessment:

Dear teachers, give different activities to your students on basic concepts and terms such as base, rate and percentage. Use oral questions, quiz, test and various exercises that can be given as class work, a project work, a group work and home work to assess the students' progress. For slow learners and fast learners, you can also give the following additional exercise

For Slow learners

Work out the following questions

In an examination, out of 80 marks, Abebe scored 70 marks. What percent of marks did he score?

In a school, two – thirds of the students are boys. What percentage of the students are boy?

For Fast learners

Work out the following questions

1. A basket contains 120 mangoes, 15% of the mangoes are damaged. Find the number of mangoes which are good enough to eat.
2. 60% of the students of a school are boys. Find the number of boys in the school if the total number of students in the school is 1,440.

3.3. Application of Ratio, Proportion and Percentage

Period allotted: 11 periods

Competencies:

At the end of this sub unit, students should be able to:

- Apply the concept of percentage to solve real life problems

Introduction

In this sub – topic, students should be able to calculate or compare quantities in terms of percentage loss or percentage profit. The calculation of profit, loss, interest, VAT, turnover tax and income tax are among the various applications of percentages. At this stage the students are in a position to apply what they have studied about percentages in solving problems. The teacher should first give a formal definition of profit, loss, interest, and different types of tax. And write the formulae used to calculate profit and percent loss, simple and compound interest and show their applications by using different examples as those given in the text. The teacher should also give explanation on tax rate in Ethiopian context (income tax rate, turnover tax rate, VAT) and in examples as listed the text.

Teaching Note:

The teacher should first give a formal definition of profit and loss and write the formulae used to calculate profit and percent loss and show their applications by using different examples similar to student's textbook. The main aim of Activity 3.3.1 is to help students easily compare quantities by means of percent change, i.e. by percent increase or percent decrease. The teachers should also explain how to calculate simple interest, compound interest, turnover tax, VAT and income tax and provide examples listed as in the student's text. Finally, after solving Activity (from Activity 3.3.2 to 3.3.5) give comments for your students.

Answer for Activity 3.3.1

1.

a. $600 - 400 = 200$

b. $200:400 = 1:2$

c. $\frac{1}{2} \times 100\% = 50\%$

d. $\text{percent increase} = \frac{\text{increase amount}}{\text{original amount}} \times 100\%$

2.

a. $500 - 300 = 200$

b. $200:500 = 2:5$

c. $\frac{2}{5} \times 100\% = 40\%$

d. $\frac{\text{decreased amount}}{\text{original amount}} \times 100\%$

Answer for Exercise 3.3.1

1. a. $\text{percent increase} = \frac{100-80}{80} \times 100\% = 25\%$

b. $\text{percent decrease} = \frac{300}{800} \times 100\% = 37.5\%$

c. $\text{percent decrease} = \frac{200}{500} \times 100\% = 40\%$

d. $\text{percent increase} = \frac{3000}{6000} \times 100\% = 50\%$

2. $\text{percent error} = \frac{5.2-5}{5} \times 100\% = 4\%$

3. $\text{percent decrease} = \frac{20-12}{20} \times 100\% = 40\%$

4. let x be current salary

$$\frac{10}{100} = \frac{x-8000}{8000} = 100x - 800000 = 80000$$

$$100x = 880000 \\ x = 8800$$

$$\text{Current salary} = 8000 + 8000 \times 10\% \\ = 8000 + 800 = \text{Birr } 8800$$

5 a. Let x be original price of T-shirt

$$\frac{30}{100} = \frac{x-399}{x} = 100x - 39900 = 30x$$

$$70x = 39900$$

$$x = \text{Birr } 570$$

$$\text{b. Amount of discount} = 570 - 399 = \text{Birr } 171$$

Answer for Activity 3.3.2

- a. Birr 500
 - b. Birr 600
 - c. Birr 100
 - d. $\frac{100}{500} \times 100\% = 20\%$
1. cost price
 2. selling price
 3. Greater
 4. less

Answer for Exercise 3.3.2

1.

- a. $\% \text{loss} = \frac{2500 - 2000}{2500} \times 100\% = 20\%$
- b. $\% \text{profit} = \frac{45000 - 3500}{3500} \times 100\% = 28.57\%$

2.

$$\text{a. } \frac{6}{100} = \frac{7950 - c.p}{c.p} \times 100\%$$

$$6c.p = 795000 - 100c.p$$

$$106c.p = 795000$$

$$\text{Cost price} = \frac{79500}{106} = \text{Birr } 7500$$

$$\text{b. } \frac{12}{100} = \frac{c.p - 880}{c.p} \times 100\%$$

$$12c.p = 100c.p - 88000$$

$$88c.p = 88000$$

$$\text{Cost price} = \frac{88000}{88} = \text{Birr } 1000$$

3. a. $\frac{10}{100} = \frac{s.p - 870}{870} \times 100\%$

$$100s.p = 95700$$

$$100s.p - 87000 = 8700$$

$$\text{selling price} = \frac{95700}{100} = \text{Birr } 957$$

b.. $\frac{15}{100} = \frac{750 - s.p}{750} \times 100\%$

$$75000 - 100s.p = 11250$$

$$100s.p = 63750$$

$$\text{selling price} = \frac{63750}{100} = \text{Birr } 637.5$$

4. $\% \text{profit} = \frac{2200 - 2000}{2000} \times 100\% = 10\%$

5. $\% \text{profit} = \frac{1800 - 1500}{1500} \times 100\% = 20\%$

6. $\frac{12}{100} = \frac{s.p - 5200}{5200} \times 100\%$

$$100s.p - 520000 = 62400$$

$$100s.p = 582400$$

$$\text{selling price} = \frac{582400}{100} = \text{Birr } 58324$$

7. $\frac{4}{100} = \frac{c.p - 24000}{c.p} \times 100\%$

$$4c.p = 100c.p - 24000000$$

$$96c.p = 24000000$$

$$\text{Cost price} = \frac{520000}{96} = \text{Birr } 25000$$

8. $\frac{8}{100} = \frac{2500 - s.p}{2500} \times 100\%$

$$250000 - 100s.p = 20000$$

$$100s.p = 230000$$

$$\text{selling price} = \text{Birr } 2300$$

9. $\% \text{profit} = \frac{1000 - 800}{800} \times 100\% = 25\%$

Answer for Activity 3.3.3

1. a. because the bank pays interest.
b. 1100
c. 1200
2. a. interest is the extra money paid for the use of money
b. simple interest is the interest paid on origin principal only during the whole interest period.

Answer for Exercise 3.3.3

1. simple interest = $PRT = 2000(0.05)(6) = 600$
2. Interest = $PRT = 24000(0.11)(8) = 21120$
Amount = $P+I = 24000+21120 = 45120$

$$\text{Interest} = \text{Amount} - \text{Principal}$$

$$= 300000 - 15000 = 15000$$

$$T = \frac{I}{PR} = \frac{15000}{1500} = 10$$

$$I = 28000 - 20000 = 8000$$

$$\text{Rate} = \frac{I}{PT} = \left(\frac{8000}{400000} \right) 100\% = 2\%$$

$$= \frac{1200}{600} = 2 \text{ years}$$

$$\frac{I}{RT} = \frac{2100}{0.42} = \text{Birr } 5000$$

4. Interest = Amount – Principal

$$I = A - P$$

$$I = PRT$$

$$\Rightarrow R = \frac{I}{PT}$$

$$= \frac{8000}{20,000 \times 4} = 0.1 = 10\%$$

5. Given $I = 1200$,

$$R = 5\% = 0.06,$$

$$P = 12,000$$

Required $T = ?$

$$I = PRT$$

$$\Rightarrow T = \frac{I}{PR} = \frac{1200}{12000 \times 0.05} = 2$$

6. Given $I = 1200, T = 6 \text{ years}$,

$$R = 7\% = 0.07$$

Required $P = ?$

$$I = PRT$$

$$\Rightarrow P = \frac{I}{RT} = \frac{21000}{6 \times 0.07} = 50,000$$

Answer for Activity 3.3.4

1. a. 100
b. 110
c. 121
d. 331
2. Compound interest is the interest on a loan calculated based on the initial principal plus the accumulated interest from previous periods.

Answer for Exercise 3.3.4

1. $A = P(1 + R)^T$

$$A = 8000(1 + 0.05)^2 = 8820$$

$$I = A - P = 8820 - 8000$$

$$= \text{Birr } 820$$

2. $A = P(1 + R)^T$

$$A = 8000(1 + 0.1)^3 = 10648$$

$$I = A - P = 10648 - 8000$$

$$= \text{Birr } 2648$$

3. $\text{Simple interest} = PRT$

$$= 5000(0.06)(2) = 600$$

$$A = P(1 + R)^T$$

$$A = 5000(1 + 0.06)^2 = 5618$$

$$I = A - P = 5618 - 5000 = \text{Birr } 618$$

Then difference between compound interest and simple interest is $618 - 600 = 18$

4. Amount= $P(1 + 0.08)^1 = 250000(1.08)$

$$= 270000 \text{ at the end of first year}$$

Principal second year= $270000 - 50000 = \text{Birr } 220000$

$$\begin{aligned} A &= P(1 + 0.08)^1 \\ &= 220000(1.08) = 237600 \end{aligned}$$

$$A = P(1 + R)^T = 21296(1 + 0.1)^3$$

5. $= 28344.976$

Answer for Activity 3.3.5

1. To generate income for undertaking projects to boost the economy of the country.
2. VAT, turnover tax, income tax, etc.

Answer for Exercise 3.3.5

a. Birr 7500 fallson25%

For interval **0 to 600**, the tax rate is 0%, hence $Tax_1 = 0$

For interval **601 to 1650**, the tax rate is **10%**, hence tax on this in

$$Tax_2 = \frac{10}{100} \times 1050 = \text{Birr } 105$$

For interval **1651 to 3200**, the tax rate is **15%**

$$Tax_3 = \frac{15}{100} \times 1550 = \text{Birr } 232.5$$

For interval **3201 to 5200**, the tax rate is **20%**, hence tax on this

$$Tax_4 = \frac{20}{100} \times 2000 = \text{Birr } 400$$

For interval 5200 to 7500 the tax rate is 25%, hence tax on this

$$Tax_5 = \frac{25}{100} \times 2300 = Birr\ 575$$

Hence tax on this Income

$$\begin{aligned} Tax &= Tax_1 + Tax_2 + Tax_3 + Tax_4 + Tax_5 \\ &= 0 + 105 + 232.5 + 400 + 575 \\ &= Birr\ 1312.5 \end{aligned}$$

Net income

$$= 7500 - 1312.5 = Birr\ 6187.5$$

b. Birr 11600 falls on 35%

For interval 0 to 600, the tax rate is 0% Hence $Tax_1 = 0$.

For interval 601 to 1650, the tax rate is 10%, Hence $Tax_2 = \frac{10}{100} \times 1050 = Birr\ 105$.

For interval 1651 to 3200, the tax rate is 15%, Hence $Tax_3 = \frac{15}{100} \times 1550 = Birr\ 232.5$.

For interval 3201 to 5200, the tax rate is 20%, Hence $Tax_4 = \frac{20}{100} \times 2000 = Birr\ 400$.

For interval 5201 to 7800, the tax rate is 25%, Hence $Tax_5 = \frac{25}{100} \times 2600 = Birr\ 650$.

For interval 7801 to 10900, the tax rate is 30%, Hence $Tax_6 = \frac{30}{100} \times 3100 = Birr\ 930$.

For interval 10901 to 11600, the tax rate is 35%, Hence $Tax_7 = \frac{35}{100} \times 700 = Birr\ 245$

Therefore, the income tax

$$Tax = Tax_1 + Tax_2 + Tax_3 + Tax_4 + Tax_5 + Tax_6 + Tax_7$$

$$Tax = 0 + 105 + 232.5 + 400 + 650 + 930 + 245$$

$$= 2562.50$$

$$2. VAT = 8000(0.15) = 1200$$

$$\text{Amount including VAT} = 8000 + 1200 = 9200$$

He should pay to the company Birr 9200

Assessment

Dear teachers the concept of this unit is a bit hard to grasp at first time, we suggest you give enough time for the students to forward their question and Activities.

Finally give different application problems to the students and check their performance and based on the performance to take remedial measures.

Depending on the level of understanding you may also give additional exercises of the following type:

For Slow learners

Answer the following questions.

1. Find the number such that 182 is the difference between increasing it by 12% and decreasing it by 16%
2. A dining room suite is sold for Birr 1762.50 including VAT at 15%. How much is the cost without VAT?

For Fast learners

Answer the following questions

1. When the mass of a pile of soil is increased by 16% it becomes 1102kg. Find the original mass.
2. At what rate percent per annum simple interest will be a sum of money double itself in 25 years?
3. Birr 50,000 is invested at a simple interest rate 4%. How long will it take for the amount to become Birr 60, 000?

Answer for Review Exercise for unit 3

I. True / False

- | | | | |
|---------|---------|----------|---------|
| 1.False | 2. True | 3. True | 4.True |
| 5.False | 6.True | 7. False | 8.False |

choice II

- | | | | |
|------|-------|------|-------|
| 9.a | 10. B | 11.c | 12. d |
| 13.a | 14.b | 15.b | 16.d |
| 17.b | 18.d | 19.b | 20.c |

III. work out

21. 4900

22 . Per centage= $B(R)=40(0.75) =30$

23. a. $b=ka$ b. $42=\frac{3}{2}a$

$30 = 20k, k = \frac{3}{2}$ $a = 28$

Then $b = \frac{3}{2}a$

24. a. Let b is number of boys and g is number of girls

$g = b + 10 , 5g = 7b$

from ratio of girls to boys

$$b = \frac{5g}{7}, g = \frac{5g}{7} + 10$$

$$2g = 70, \text{ then number of girls} = 35$$

$$\text{b. number of boys} = 35 - 10 = 25$$

$$\text{c. total number of students} = 35 + 25 = 50$$

$$25. \text{ percent of female} = \frac{231}{420} \times 100\% = 55\%$$

$$26. \frac{5}{100} = \frac{22000 - s.p}{22000} \times 100\%$$

$$2200000 - 100s.p = 110000$$

$$100s.p = 2090000$$

$$\text{selling price} = \frac{2090000}{100} = \text{Birr } 20900$$

27. Let x be original salary

$$\frac{6}{100} = \frac{826800 - x}{x} \times 100\%$$

$$6x = 826800 - 100x$$

$$106x = 826800, x = \text{Birr } 7800$$

$$28. \text{ a. } A = P(1 + 0.05)^2 = 6000(1.1025) = 6615$$

$$\text{Interest} = 6615 - 6000$$

$$= \text{Birr } 615$$

perice inculuding VAT

29. a. Price of Car before VAT = $\frac{1.15}{1.15}$

$$= \frac{575000}{1.15} = \text{Birr } 500000$$

$$\text{b. } VAT = 500000(0.15) = \text{Birr } 75000$$

30. Birr 5200 falls on 20%

For interval, 0 – 600 the tax rate is 0%, hence $Tax_1 = 0$

For intervals, 601 – 1650 the tax rate is 10%, hence tax one this interval is

$$Tax_2 = 10\% \text{ of } (1650 - 600)$$

$$Tax_2 = \frac{10}{100} \times 1050 = \text{Birr } 105$$

For interval, 1651–3200, the tax rate is 15% hence tax on this interval is

$$Tax_3 = 15\% \text{ of } (3200 - 1650)$$

$$= 232.5$$

For interval $3201 \text{ to } 5200$, the tax rate is 20%

$$Tax_4 = 20\% \text{ of } (5200 - 3200)$$

$$Tax_4 = \frac{20}{100} \times 2000 = Birr 400$$

$$\begin{aligned}\text{Income tax} &= Tax_1 + Tax_2 + Tax_3 + Tax_4 \\ &= 0 + 105 + 232.5 + 400 = 737.5\end{aligned}$$

Birr x falls on 25%, the tax rate is

$$Tax_5 = 25\% \text{ of } (x - 5200)$$

$$Tax_5 = 25\% \text{ of } (x - 5200)$$

$$Tax_5 = \frac{25}{100} (x - 5200)$$

$$Tax_5 = 0.25x - 1300$$

$$\begin{aligned}\text{Income tax} &= Tax_1 + Tax_2 + Tax_3 + Tax_4 + Tax_5 \\ &= 0 + 105 + 232.5 + 400 + 0.25x - 1300\end{aligned}$$

Therefore, Income tax = $0.25x - 562.5$

UNIT 4**Linear equations*****Total allotted periods (23 periods)*****Introduction:**

This unit is designed to linear equations. The unit gives more emphasis to solve linear equation involving brackets and fractions. It presents how to solve linear equations. In general, the concepts discussed in this unit enable the students to solve linear equations and perform some of their applications.

Unit outcomes:

After completing this unit, students should be able to:

- Identify variables, terms and variables in algebraic expressions
- Simplify algebraic expressions
- Develop their skills on rearranging and solving linear equations. □Apply the rules of transformation of linear equations for solving problems
- Draw a line through the origin whose equation is given.
- Apply real-life situations in solving linear equations

Suggested Teaching Aids in Unit 2:

Although Suggested teaching aids are not excessively exploited for this unit, you can present different simple balances.

4.1.Algebraic Terms and Expressions***Total allotted periods (4 periods)*****Competencies:**

At the end of this sub unit, students should be able to:

- Describe algebraic terms and expressions
- Simplify algebraic expressions with and without brackets.

Introduction:

This sub unit focuses on defining terms like, algebraic expressions, terms, and simplifying algebraic expressions involving brackets.

Teaching notes:

Start the lesson by introducing variables and how to use variables.

Motivate the students by giving or asking questions like;

1. Identify the variables from, 23, x, and 4y
2. Express the following using variable
 - a. A number plus four.
 - b. the product of 3 and a number.
3. From the following, which are terms and which of them are not term?
 - a. $3xy$
 - b. $2x - 5b$
 - c. $\frac{3x}{y}$
4. What is the coefficient of $8x$?
5. Identify each of the following are algebraic expressions or mathematical equations.
 - a. $2x + 8$
 - b. $y - 3 = 10$
6. Identify whether each pair of the following algebraic expressions are like terms or unlike terms.
 - a. $2ab$ and $3ba$
 - b. $3xy^2$ and $2xy^3$

Answer for Activity 4.1.1

1. x, y, z, a and b are variables
2. variable is any letter or a symbol that represent some unknown number or value. Such as $x, y, z, n, m \dots$
3. a. $x + 4$ c. $3x$
 b. $y - 5$ d. $2(x + 8)$
4. a. y b. x c. $2x + 2y$

Answer for Exercise 4.1.1

- | | |
|------------------|----------------|
| 1.a. x | c. y and b |
| b. x | d. x and p |
| 2.a. $4a$ | e. $20z$ |
| b. $\frac{y}{3}$ | f. $x - 5$ |
| c. $x + 10$ | g. $2x + 10$ |
| d. $a + b$ | h. $2b - 6$ |
3. a. one less than a number

- b. Seven times a number
- c. Three more than four times a number
- d. One less than one third of a number
4. a. $y=5$
- b. $y=13$
- c. $y=-5$
- d. $y=\frac{13}{3}$

Answer for Activity 4.1.2

1. c, d, e and f are terms but a and b are not terms
2. a. -3 c. -1
- b. 1 d. $\frac{1}{4}$
3. a and d are unlike terms b and c are like terms

Answer for Exercise 4.1.2

1. a. like terms
- b. unlike terms
- c. unlike terms
- d. like terms
- e. like terms
- f. unlike terms
- g. like terms
- h. like terms
2. b, d, e and f are terms a and c are not terms
3. a. 2 d. $\frac{3}{4}$
- b. 5 e. $\frac{1}{2}$
- c. -4 f. -1

Answer for exercise 4.1.3

1. a. monomial
- b. monomial

- c. binomial
 - d. trinomial
 - e. binomial
 - f. trinomial
 - g. trinomial
 - i. binomial
 - h. monomial
2. a. $-5x + 35y$
- b. $-11b + 18$
 - c. $10x - 4$
 - d. $-45z - 10y + x - 15$
 - e. $3a - x - z - 22$
 - f. $3xy$
 - g. $2x^2 + x + 3$
 - h. $5y^2 - 6y - 1$
 - i. $3x^2 + x + 12$
 - j. $-x^2 + 12y + 10$

Assessment:

Give oral questions and various exercise problems as class work or homework. For fast learners or interested students, you can give the following questions

1. Simplify the following expressions
- a. $6 - 2[3 - 4(x - 5)]$
 - b. $0.5(3 - y) - 0.3(x - y)$

4.2. Solving linear equations

Total allotted periods (7 periods)

Competencies:

At the end of this sub unit, students should be able to:

- Define a linear equation
- Solve linear equations involving brackets
- Solve linear equations involving fractions

Introduction:

This subsection focuses on solving linear equations involving brackets and fractions using rules of transformation.

Teaching Note:

Start the lesson by providing activities as noted in the student text that motivates students towards the lesson. Use beam balance to explain the rules of transformation of equation as in the student text. Provide the exercises as homework or class work and provide the students proper feedback.

Answer for activity 24.2.1

1. a. $2x=2$ b. $3x-1=6$
c. $y+4=5-y$
2. a. $x=10$
b. $x=8$
c. $x=10$
3. a. 2
b. -13
c. 2
d. 0
4. a. Not equation
b. Not equation
c. Not equation
d. equations
5. Two different algebraic expressions connected by equal ($=$) sign is called equation.

Answer for Exercise 4.2.1

- 1.a. linear equation
- b. Linear equation
c. not linear equation
d. linear equation
e. linear equation
f. not linear equation
- 2.a. subtracting 1 from both sides

- b. dividing both sides by -8.
- c. adding 4 from both side
- d. multiplying both sides by 3

$$3.a. \frac{-3}{x=2} \quad b. x=25$$

- c. $x=5$
- d. $x=10$

Answer for Exercise 4.2.2

1. a. $x=-14$
- b. $x=16$
- c. $x=1$
- d. $x=-3$
- e. $x=7$
- f. $x=2$
- g. $x=3$
- h. $x=-9$

Answer for Activity 4.2.2

1. a. $3x+6$
- b. $2x-9$
- c. -2
- d. $2x+14$
2. a. $x=-2$
- b. $x=5$
- c. $\frac{3}{x=4}$
- d. $x=-7$

Answer Exercise 4.2.3

$$\begin{aligned} 1.a. \quad & x=11+1 \\ & x=12 \\ b. \quad & 48y+18 = 28y + 20 \\ & 48y - 28y = 20 - 18 \\ & y = \frac{1}{10} \\ c. \quad & 16y-48 = 15y - 35 \\ & 16y - 15y = -35 + 48 \\ & y = 13 \\ d. \quad & 3-4x - 2 = x - 14 \end{aligned}$$

$$-4x - x = -14 + 2 - 3$$

$$x = 3$$

e. $7 - x - 1 = 9 - 2x + 1$

$$-x + 2x = 9 + 1 + 1 - 7$$

$$x = 4$$

f. $5 - 10a - 12 + 12a = 0$

$$-10a - 12a = 0 + 12 - 5$$

$$-22a = 7$$

$$a = \frac{7}{22}$$

g. $3x + 7 + 3x - 3 = 4x + 12$

$$3x + 3x - 4x = 12 - 7 + 3$$

$$2x = 8$$

$$x = 4$$

h. $10x + 5 + 9x - 12 = 20x - 24$

$$10x + 9x - 20x = -24 - 5 + 12$$

$$-x = -17$$

$$x = 17$$

2.

a. $m x - m = 0$

$$mx = m$$

$$x = 1$$

c. $mx + mn = mn$

$$mx = mn - mn$$

$$mx = 0$$

$$x = 0$$

d. $nx - 2n = m + x$

$$nx - x = m + 2n$$

$$x(n - 1) = m + 2n$$

$$x = \frac{m + 2n}{n - 1}$$

e. $xn - x = 4 - x$

$$nx - x + x = 4$$

$$nx = 4$$

$$x = \frac{4}{n}$$

Answer for Activity 4.2.3

1. a. LCM of 2 and 3=6

b. LCM of 4 and 6 =12

c. LCM of 3, 4 and 6=12

d. LCM of 4 and 8 = 8

2. a. LCM= 2

$$2\left(\frac{x}{2}\right) = 2\left(\frac{5}{2}\right)$$

$$x = 5$$

b. LCM=8

$$8\left(\frac{3}{4}\right) = 8\left(\frac{x}{8}\right)$$

$$x=6$$

c. LCM=3

$$3\left(\frac{x}{3} + 5\right) = 3(7)$$

$$3x+15=21, x=2$$

$$12\left(\frac{3}{4} + \frac{x}{2}\right) = 12\left(\frac{x}{3}\right)$$

$$9 + 6x = 4$$

$$2x = -9$$

$$x = \frac{-9}{2} = -4.5$$

Answer for Exercise 4.2.4

a. LCM=26

$$26\left(\frac{5x}{13} + \frac{5x}{26}\right) = 26(1)$$

$$10x + 5x = 26$$

$$15x = 26$$

$$x = \frac{26}{15}$$

b. LCM=56

$$56\left(\frac{3x}{7} + \frac{35x}{8}\right) = 56(10)$$

$$24x + 245x = 560$$

$$269x = 560$$

$$x = \frac{560}{269}$$

c. LCM=30

$$30\left(\frac{2x}{5} - \frac{2}{3}\right) = 30\left(\frac{x}{2} + 6\right)$$

$$12x - 20 = 15x + 180$$

$$-3x = 200$$

$$x = \frac{-200}{3}$$

d. LCM=10

$$10\left(\frac{-3}{5} + \frac{x}{10}\right) = 10\left(\frac{-1}{5} - \frac{x}{5}\right)$$

$$-6 + x = -2 - 2x$$

$$x + 2x = -2 + 6$$

$$3x = 4$$

$$x = \frac{4}{3}$$

e. LCM=7

$$\left(\frac{9w}{7} - 6\right) = 7\left(\frac{5w}{7} + 12\right)$$

$$9w - 42 = 5w + 84$$

$$9w - 5w = 84 + 42$$

$$4w = 126$$

$$w = \frac{63}{2}$$

f. LCM=10

$$10\left(\frac{7}{10}x + \frac{3}{2}\right) = 10\left(\frac{3}{5}x + 2\right)$$

$$7x + 15 = 6x + 20$$

$$7x - 6x = 20 - 15$$

$$x = 5$$

g. LCM=6

$$6 \times \frac{1}{2}(4x + 6) = 6 \times \frac{1}{3}(9x + 24)$$

$$12x + 18 = 18x + 48$$

$$12x - 18x = 48 - 18$$

$$-6x = 30$$

$$x = -5$$

h. LCM=12

$$12\left(\frac{n+1}{2} + \frac{n+2}{3} + \frac{n+4}{4}\right) = 12(3)$$

$$6n + 6 + 4n + 8 + 3n + 12 = 36$$

$$13n + 26 = 36$$

$$13n = 36 - 26$$

$$13n = 10$$

$$n. = \frac{10}{13}$$

i. LCM=6

$$6 \times \frac{1}{3}(x + 6) - 6 \times \frac{1}{2}(3x - 4) = 6(5)$$

$$2x + 12 - 9x + 12 = 30$$

$$-7x + 24 = 30$$

$$-7x = 30 - 24$$

$$-7x = 6$$

$$x = \frac{-6}{7}$$

- 2. a. equivalent
- b. not equivalent
- c. not equivalent
- d. equivalent

Assessment:

Give various exercise problems on solving linear equation involving brackets and fractions as class work or homework. For fast learners or interested students, you can give the following questions

1. Find the value of the unknown quantity which satisfies each of the following equations, and in each case verify the solution.

- a. $2[9 - (x - 3) + 4x] = 4x - 5(x + 2) - 8$

b. $\frac{x-5}{2} - \frac{3-x}{4} = \frac{x+1}{8}$

c. $x - 2(x - 1) = 1 - 4(x + 1)$

d. $\frac{4+2x}{6x} = \frac{12}{5x} + \frac{2}{15}$

e. $12 - \frac{x-2}{2} = \frac{6-x}{4} + \frac{x-4}{4}$

f. $0.78 - \frac{1}{25}h = \frac{3}{5}h - 0.5$

4.3. Cartesian coordinate system

Total allotted periods (7 periods)

Competencies:

At the end of this sub unit, students should be able to:

- Describe the Cartesian coordinate system.
- Draw the four quadrants of the Cartesian plane and mark the origin, x -axis and y-axis.
- Plot points on the Cartesian coordinate plane given their coordinates.
- Draw graph linear equations like $y = mx$, in a Cartesian coordinate plane using table values manually and computer applications.

Introduction

This subsection focuses on locating points on Cartesian coordinate plane and plotting graph of equation of the form $y = a$, $x = b$ and $y = mx$, where a, b , and m are constants.

Teaching Notes:

In this section first give the activities as noted in the student text that helps to motivate students to learn about cartesian coordinate system, the four quadrants and drawing graphs of equation of the form $y = a$, $x = b$ and $y = mx$

, where a, b , and m are constants. Provide exercises on the student text as class work or home work at the end of the lesson and provide them proper feedback.

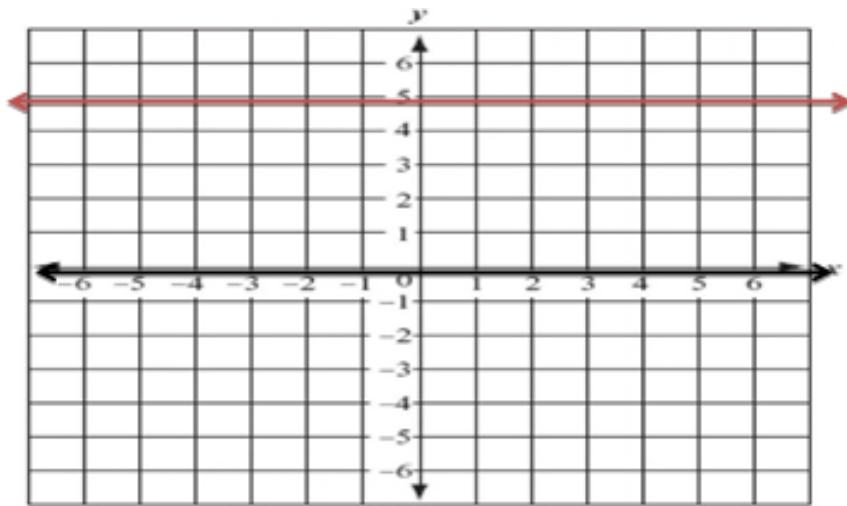
Answer for Activity 4.3.1

For questions 1 up to 3

4.X-axis

5.Y-axis

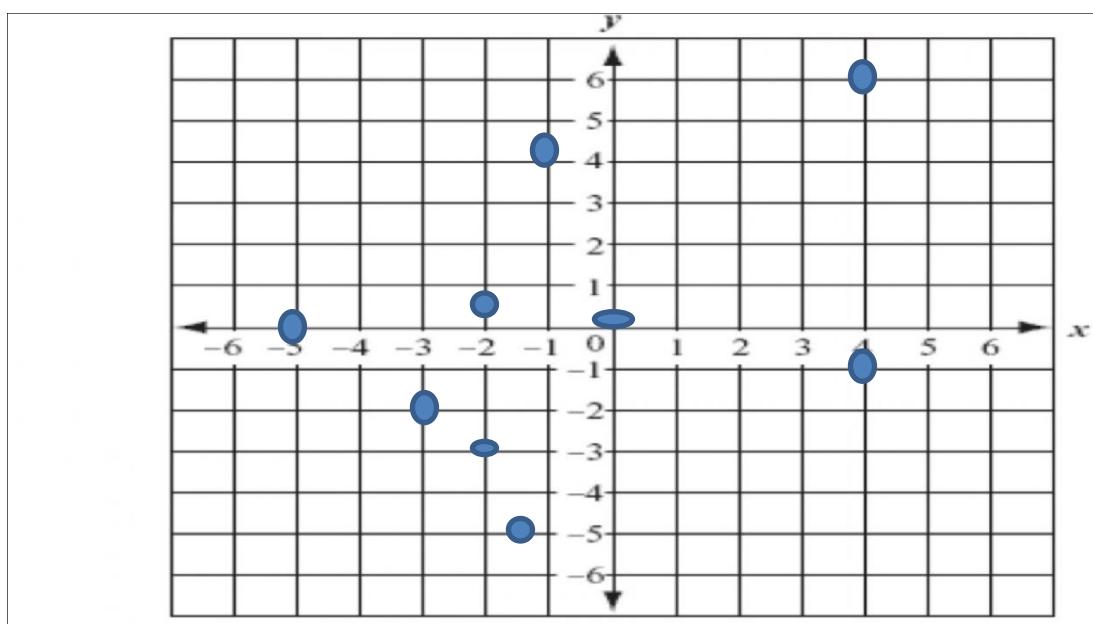
6. Cartesian coordinate plane



2. a, b, d, e and h lie on

Answer for Exercise 4.3.1

1.



2. a. F(0,1), T(-3,-3), P(-3,0), M(2,4), N(-2,5), Q(-2,3), and K (4, 1)

b. Q

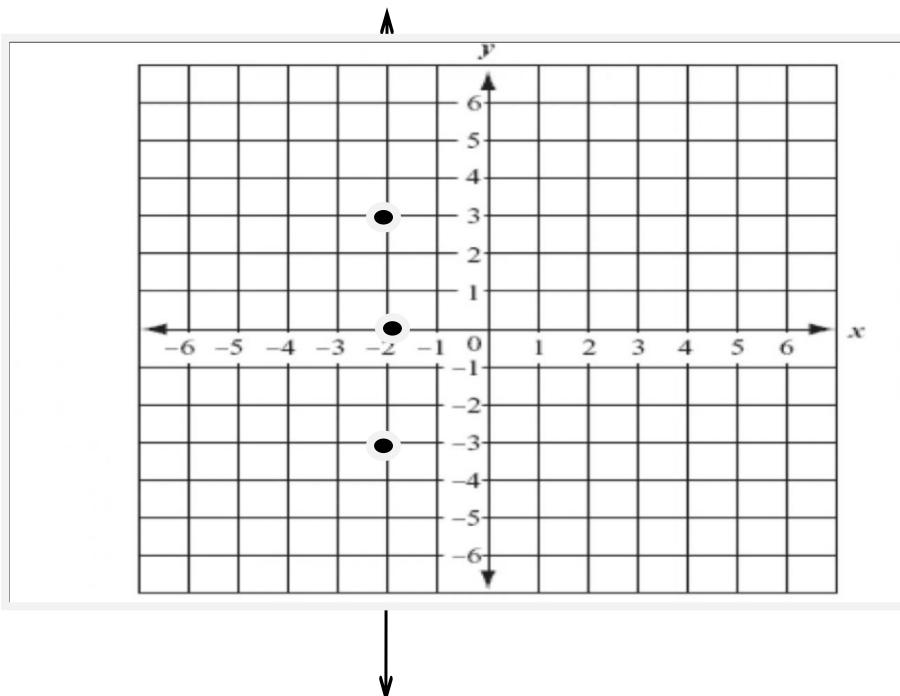
3.

- | | |
|--------------------|-----------------|
| a. quadrant I | b. quadrant II |
| c. negative y-axis | d. quadrant III |
| e. positive x-axis | |
| f. quadrant IV | |
| g. positive x-axis | |
| h. quadrant IV | |
| i. quadrant III | |

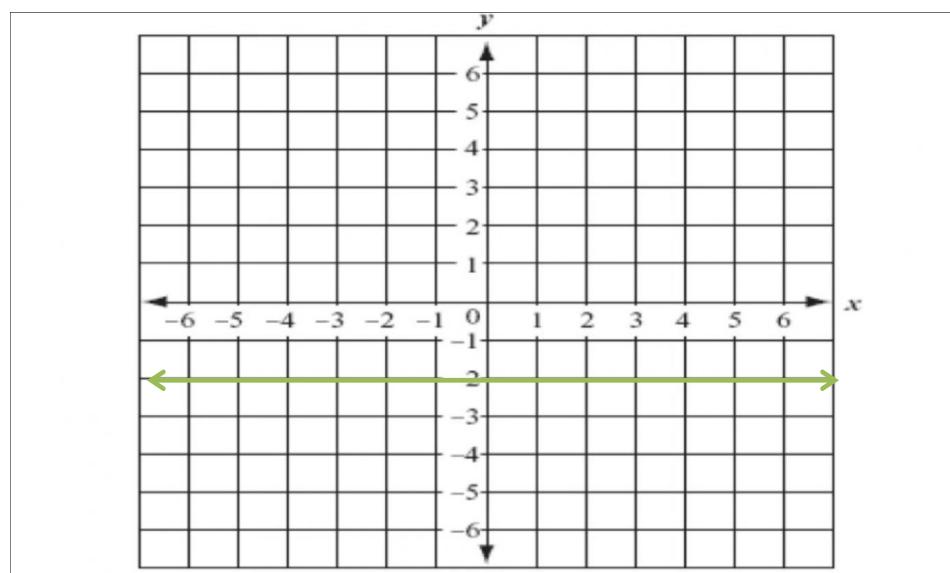
Answer for Activity 4.3.2

1. a. (-5, 5), (-2, 5), (0, 5), (4, 5), (6, 5)
 (4, -10), (4, -5), (4, 0), (4, 5), (4, 10)

2.



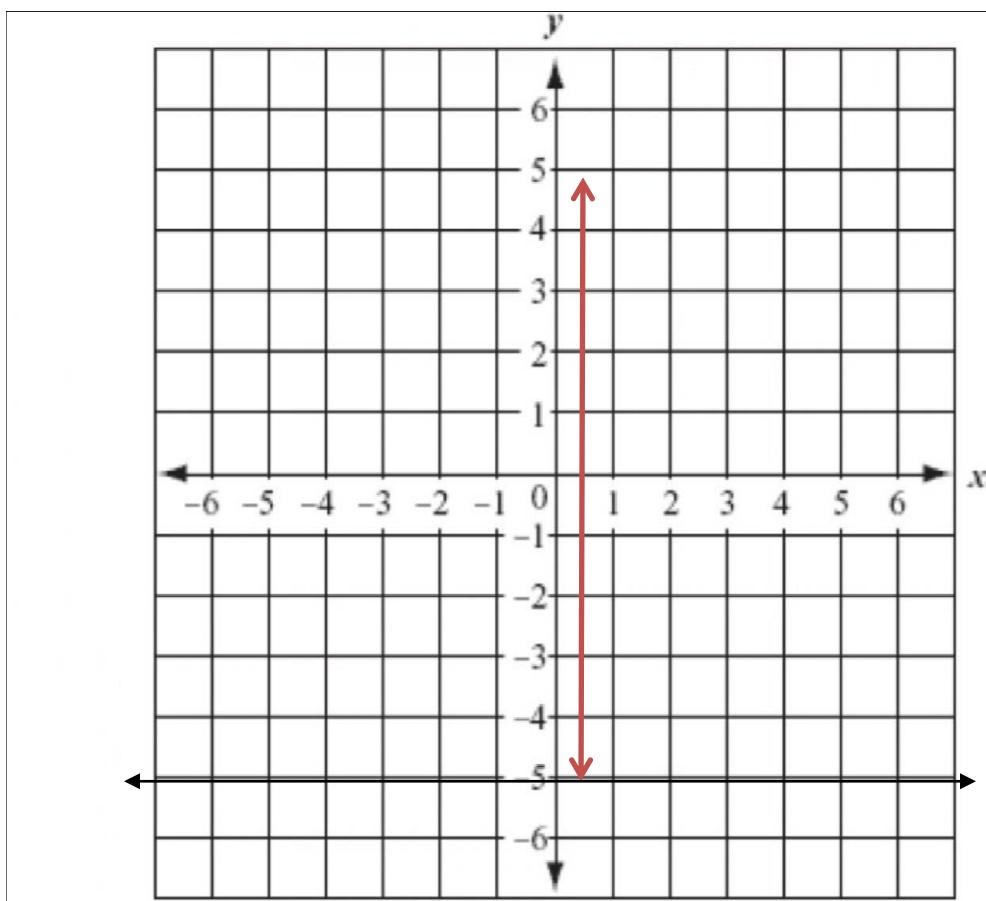
3. $y=-2$



4. $x=-2$

5. $y=-2$

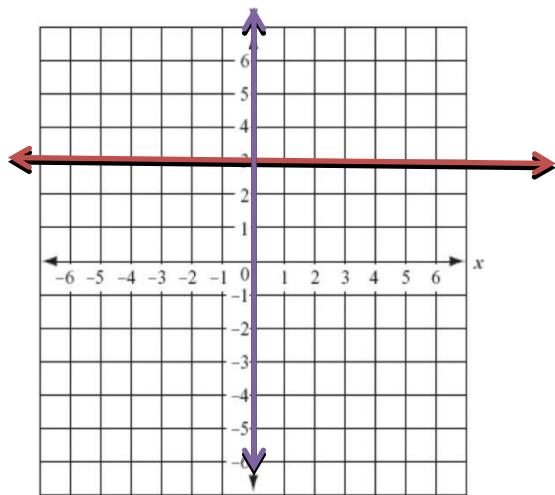
Answer for Exercise 4.3.2



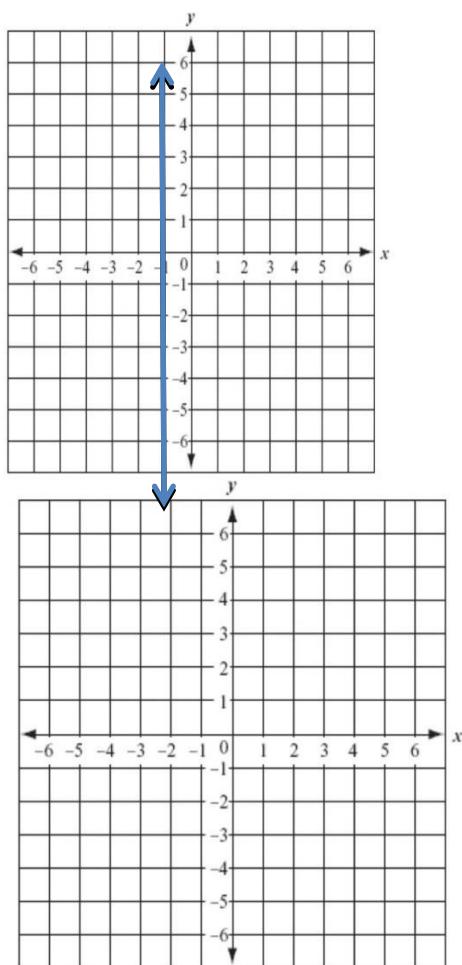
2. a, b, d, h

3. $m=-8$

4. a.



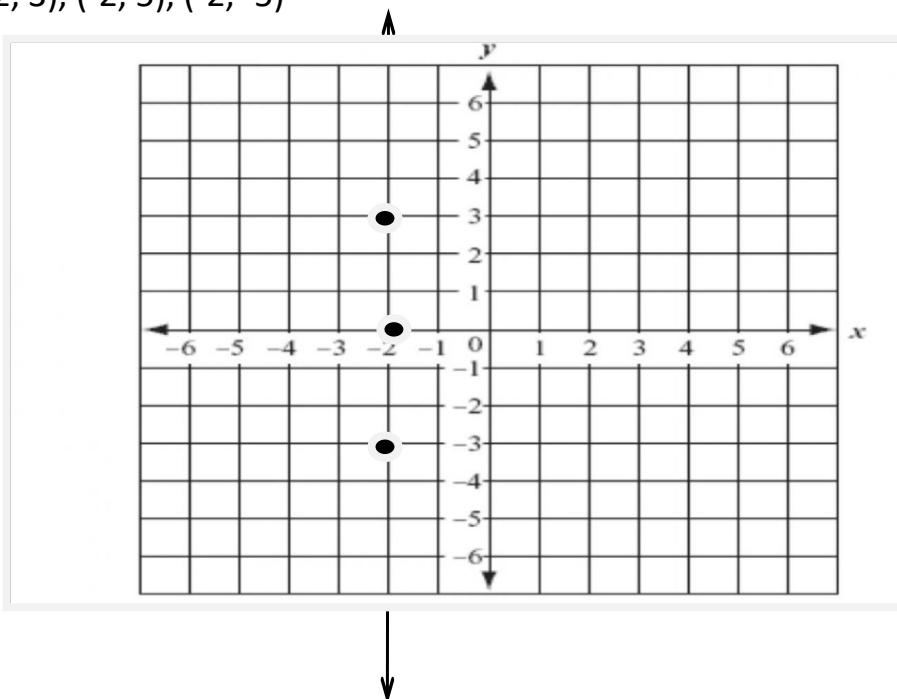
b.



c.



5. $(-2, 3), (-2, 5), (-2, -5)$

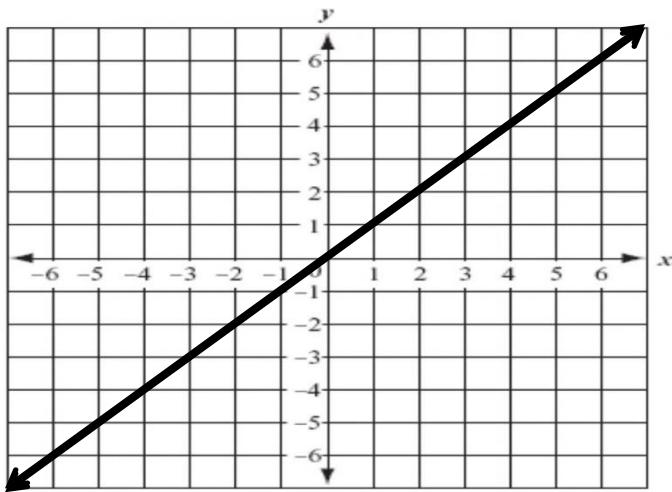


Answer for Activity 4.3.3

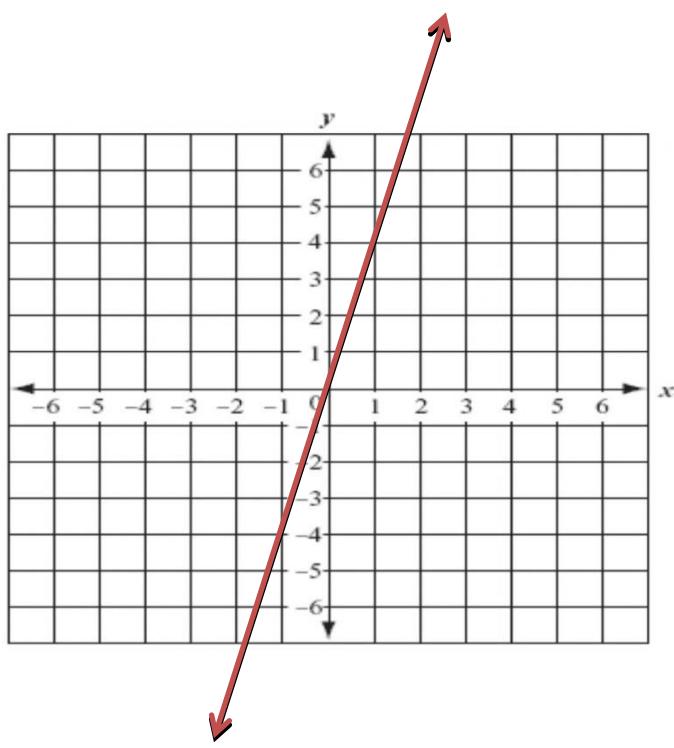
1.

| | | | | | | | |
|--------|----------|----------|----------|--------|--------|--------|--------|
| X | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| Y | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| (x, y) | (-3, -3) | (-2, -2) | (-1, -1) | (0, 0) | (1, 1) | (2, 2) | (3, 3) |

2

**Answer for Exercise 4.3.3**

1.



2. a, c and d

4. $8 = 2m$

$m = 4$

Assessment:

Give various exercise problems on locating points, drawing graphs on the coordinate system as class work or homework. For fast learners or interested students, you can give the following questions

1. Draw the graph of the following

- a. $x = 0$
- b. $y = 0$
- c. $y = 0.5x$
- d. A line passing through the origin and its slope is 3.

4.4. Applications of linear equations

Total allotted periods (5 periods)

Competencies:

At the end of this sub unit, students should be able to:

- Apply linear equations in the real-life situation
- Solve linear equations real-life problems

Introduction

In this sub unit the students will apply linear equations in solving their real-life situation

Teaching Notes:

In this section provide examples how to solve word problems involving linear equation as noted in the student text. At the end of the lesson provide exercise to practice the techniques of solving word problems they may face in their real-life situation and provide them proper feedback

Answer for activity 4.4.1

1.a. $x+5=11$ b. $x-5=11$

c. $5x=30$

d. $A+7=29$

e. $\frac{1}{2}x = 20$

f. $y-10=12$

g. $4z+5=30$

Answer for Exercise 4.4.1

1. $x + 7 = 20$

$$x = 20 - 7$$

$$x = 13$$

2. $y - 3 = 13$

$$y = 13 + 3$$

$$y = 16$$

3. $x - 3 = 21$

$$X = 21 + 3$$

$$x = 24$$

4. $2y + 15 = 37$

$$2y = 37 - 15 \quad 2y = 22$$

$$Y = 11$$

5. $2(x + 7) = 41$

$$2x + 14 = 41$$

$$2x + 14 = 41$$

$$2x = 27$$

$$x = 13.5$$

6. $\frac{x}{4} + 15 = 13$

$$4 \left(\frac{x}{4} + 15 \right) = 4 \times 13$$

$$x + 60 = 52 \quad x = 52 - 60$$

$$x = -8$$

$$7.3a - 8 = 55$$

$$3a = 55 + 8$$

$$3a = 63$$

$$a = 21$$

$$8.2y + 8 = 36$$

$$2y = 36 - 8$$

$$2y = 28$$

$$y = 14$$

Answer for exercise 4.4.2

1. Let x be the smallest integer

$$X + (x + 1) + (x + 2) = 345$$

$$3x = 342$$

$$X = 114$$

Then the numbers are 114, 115 and 116

2. Let a is the smallest even integer

$$a + (a + 2) = 170$$

$$2a = 168$$

$$a = 84$$

then, the two consecutive even integers are 84 and 86

3. Let x is the smallest odd integer

$$x + (x + 2) = 144$$

$$2x = 142$$

$$x = 71$$

then, the two consecutive odd integers are 31 and 33

4. Let age of man's wife = y

$$\text{Age of man} = y + 3$$

$$Y + (y + 3) = 83 \quad 2y = 80$$

$$Y = 40 \text{ and } y + 3 = 43$$

Therefore, the age of man=43 and age of man's wife is 40

5. Let b be number of boys

$$\text{Number of girls} = 1.5b$$

$$b + 1.5b = 45$$

$$2.5b = 45$$

$$b = 18$$

then number of boys=18 and number of

girls=27 6. Number of girls=26 Number of

boys =22

Let x be amount Birr contributed each student

$$26x + 22x = 2400$$

$$48x = 2400$$

$$X = 50$$

- a. Each student=Birr 50
- b. $22(50) = \text{Birr } 1100$
- c. $26(50) = \text{Birr } 1300$

7. Let y be number of years

$$2y = 109 - 87$$

$$2y = 18$$

$$Y = 9$$

8. $\angle A + \angle B + \angle C = 180^\circ$

$$2(C+20) + C + 20 + C = 180^\circ \dots\dots\dots\dots\dots \text{since } B=C+20, A=2B$$

$$4C = 120^\circ$$

$$C = 30^\circ, B = 50^\circ \text{ and } A = 100^\circ$$

Assessment

Dear teachers give different activities to your students in solving application problems involving simple linear equations and check their work. Give quiz, Test and various exercise problems as a class work, a projectwork, a group work and home works. For fast learners or interested students, you can also give the following additional exercise problems.

I. Solve the following word problems

1. A man is 32 years older than his son. Ten years ago, he was three times as old as his son. Find the present age of each.
2. The perimeter of a rectangular field is 628m. The length of the field exceeds its width by 6m. Find the length and width of the rectangle.

Answer for Review exercise for unit 4

Part I True/ False

1. True
2. False

3. False and
4. True
5. False
6. True
7. False
8. True

Part II Choice

9. d
10. a
11. c
12. b
13. b
14. b
15. b

Part III Work out

16 a. $x - 6$ b. $2x + 9$

c. $x + 5$

d. $\frac{x}{2} + 35$

17 a. $-5x - 21x + 4 - 21$

$$-16x - 17$$

b. $5x - 3x + 1 - 42 + 6x$

$$8x - 41$$

c. $12y - 2x - 10y + 2y + 2x$

$$12y - 10y + 2y - 2x + 2x$$

$$4y$$

18. a. $4x + 8x = 86 - 36$

$$12x = 50$$

$$x = \frac{25}{6}$$

b. $12x + 2x - 3x + 8x = 74 - 4 + 8 + 17$

$$19x = 95$$

$$x = 5$$

c. $12y - 36 - 102 = 78 - 18y - 36$

$$12y + 18y = 78 - 36 + 138$$

$$30y = 180$$

$$= 6$$

d. $7x + 182 + 14x = 5x + 35$

$$7x + 14x - 5x = 35 - 182$$

$$16x = -142$$

$$\begin{array}{r} -147 \\ \hline 16 \end{array}$$

e. LCM = 6

$$6\left(\frac{2x+7}{3} - \frac{x-9}{2}\right) = 6\left(\frac{5}{2}\right)$$

$$4x + 14 - 3x + 27 = 15$$

$$4x - 3x = 15 - 27 - 14$$

$$x = -26$$

f. LCM = 24

$$24\left(\frac{x+3}{6} - \frac{x-5}{4}\right) = 24\left(\frac{3}{8}x\right)$$

$$4x + 12 - 6x + 30 = 9x$$

$$4x - 6x - 9x = -42$$

$$-11x = -42$$

$$x = \frac{42}{11}$$

g. LCM = 24

$$24\left(\frac{x-2}{3} + \frac{x+3}{8}\right) = 24\left(\frac{5x}{6} - 6\right)$$

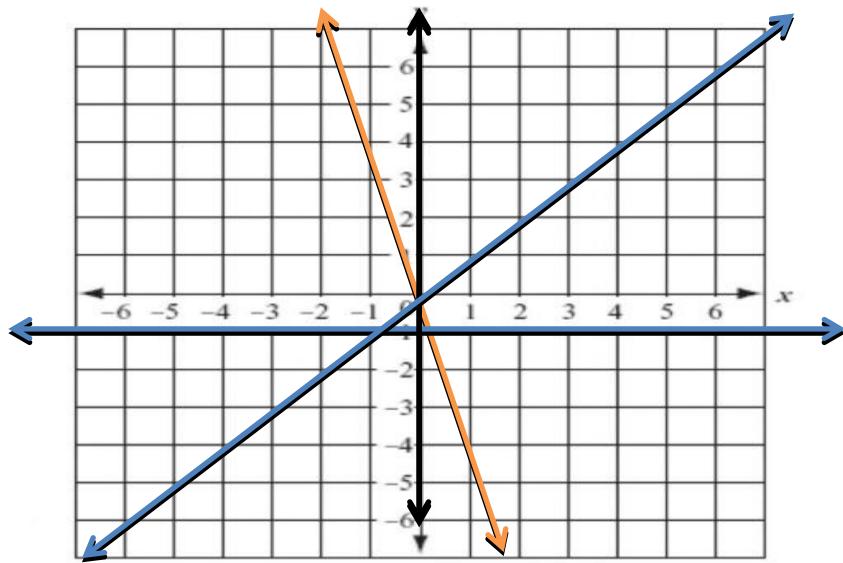
$$8x - 16 + 3x + 9 = 20x - 144$$

$$8x + 3x - 20 = -144 + 7$$

$$-9x = -137$$

$$x = \frac{137}{9}$$

19. a. $y+4x=0$
b. $y+1=0$
c. $x=0$
d. $y=x$



20. $y=4x$

21. $m = \frac{1}{2}$

22. $x=7$

23. $x=90$

24. $x=15$

25. 20 years old

26. lowest score=18

Unit 5

Perimeter and Area of Plane figures

Total allotted periods: 28 Periods

Introduction:

In this unit, students will learn the basic geometric figures like triangles, quadrilaterals such as trapezium, rectangle, square, rhombus, parallelograms and kite. The students are encouraged to list the properties of the different types of quadrilateral using construction. The area and perimeter of these geometric figures is also included in this topic. The students are encouraged to derive the formula to calculate the area and perimeter of the geometric figures using the activities listed in the student's text.

Unit outcomes:

At the end of this unit, students will able to:

- Classifies the different kinds of triangles.
- Constructs and describe properties of four- sided figures

- Find the perimeter of triangle, parallelograms, trapezium, rhombus and composite shapes
- Derive formula for area of triangle, parallelograms, trapezium and rhombus.
- Calculate areas of triangle, parallelograms, trapezium, rhombus and composite shapes
- Apply the concept of area and perimeter of Plane figures in solving real life problems

Suggested Teaching Aids in Unit 5:

In addition to the Student's text book and the teacher's Guide, you are advised to prepare and bring in to the class the following materials whenever the topic requires

Tools: pair of Compasses, ruler, protractor, Scissors etc. if they are available.

Charts: charts containing the different types of quadrilateral, parallelogram, trapezium, and kite. In the chart include the properties of each quadrilateral and the formula to calculate their area and perimeter.

5.1. Revision of triangles

Period allotted: 3 periods

Competencies:

At the end of this sub unit, students should be able to:

- Classifies the different kinds of triangles.

Introduction:

Students have some background knowledge on classification of triangles, so in this section revise the properties and classification of triangles through the activities and exercise as noted on the student text.

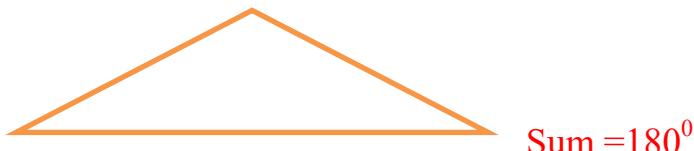
Teaching notes:

Revise the classification and properties of triangles through activity 5.1.1, after the activity provide them short note and exercise 5.1.1. Give proper feedback at the end of each activity and exercise. The answer for exercise and activity is given below.

Answer for Activity 5.1.1

1. A triangle is a simple closed plane figure made of three-line
2. ΔABC
3. a. isosceles triangle
b. equilateral triangle and
c. ΔRPQ is scalene triangle
4. a. acute angle triangle
b. right angle triangle and
c. Obtuse angletriangle

5.



$$\text{Sum} = 180^{\circ}$$

Answer for Exercise 5.1.1

1. a. equilateral triangle
b. scalene triangle
c. 60°
d. isosceles triangle
e. greater
f. less
g. 180°

2. a. sides are \overline{XY} , \overline{XZ} , \overline{YZ}

Angles are $\angle XYZ$, $\angle XZY$, $\angle YXZ$

Vertices are X, Y, Z

b. ΔXYZ

3. a. isosceles triangle
- b. right angle triangle
- c. obtuse angle triangle
- d. scalene triangle
- e. acute angle triangle

5.2 Four - sided Figures

Period allotted: 4 periods

Competencies:

At the end of this sub unit, students should be able to:

- constructs and describe properties of four-sided figures

Introduction

In this sub unit the students will learn the basic construction techniques.

Construct quadrilaterals such as trapezium, parallelogram, rectangle, square, rhombus and kite. Using construction discuss the properties of each quadrilateral.

Teaching notes:

Start the lesson by providing the activities as noted on the student text, guide the students to arrive at generalization of concepts based the activities, let the students to list:

1. The properties of trapezium
2. The properties of parallelogram
3. The properties of rectangle
4. The properties of square
5. The properties of rhombus
6. The properties of kite

Answer for Activity 5.2.1

1.a. four

- b. \overline{AB} , \overline{BC} , \overline{CD} , \overline{DA}
- c. A, B, C, D
- d. $\angle ABC$, $\angle BCD$, $\angle CDA$, $\angle DAB$
- e. Quadrilateral
- f. Quadrilateral ABCD
- g. B
- h. A and C
- i. \overline{BC}

Answer for Exercise 5.2.1

- 1. a. quadrilateral
- b. Diagonal
- c. vertices

- d. ruler compass and protractor
2. D
3. a. \overline{EH}
- b. HE, GF
 - c. $\angle H$
 - d. quadrilateral EFGH
 - e. H and F, E and G
4. check student's construction (construction is done by step of example)

Answer for Exercise 5.2.2

- 1. a. true
- b. false
- c. false
- d. true
- e. False

- f. true
2. a. parallelogram
- b. kite
 - c. square
 - d. trapezium
 - e. rectangle
 - f. square
3. similarity and difference between kite and rhombus

| Similarity | Difference | |
|------------------------|-------------------------|---|
| | Rhombus | Kite |
| Both are quadrilateral | All sides are congruent | Only one pair of adjacent sides are congruent |

| | | |
|-----------------------------------|-----------------------------------|--|
| Their diagonals are perpendicular | All opposite angles are congruent | One pair of opposite angles are congruent. |
| | Diagonals bisect each other | Diagonals do not bisect each other |

4. similarity and difference between rectangle and square

| Similarity | Difference | |
|-----------------------------|---------------------------------|---|
| | Rectangle | square |
| Both are quadrilateral | Diagonals are not perpendicular | Diagonals are perpendicular |
| Diagonals bisect each other | Opposite sides are congruent | All sides are congruent angles are congruent. |

| | | |
|-------------------------------|--|--|
| The diagonals are congruent | | |
| Each interior angle is 90^0 | | |
| Opposite angles are parallel | | |

Assessment:

Dear teachers, at the end of this sub-unit, you can

- Ask oral questions on the meanings of quadrilaterals and trapeziums and identification of their parts.

- Give activities on construction of trapeziums in the given dimension can be given and checks the performance of your students.
- Give activities on construction of parallelograms and describing its properties can be given and checked your students work.
- Give different exercise problems can be given as class work, homework and group work and check your students work.
- Give assignments, quiz or test to assess their level of understanding.

Finally, for slow learners and fast learners or interested students, you can give the following additional exercise problems.

For slow learners

1. a quadrilateral with exactly one pair of opposite sides parallel is _____
2. the opposite sides of parallelogram are _____
3. consecutive angles of parallelogram are _____

For Fast learners

1. a quadrilateral in which the diagonals are perpendicular bisector of each other is _____
2. A rhombus with one angle is right angle is _____
3. A rectangle in which the adjacent sides are congruent is _____
4. A quadrilateral in which one diagonal is perpendicular bisector of the other, but the other diagonal is not bisected is _____.

5.3 Perimeter and Area of triangles

Period allotted: 6 periods

Competencies:

At the end of this sub unit, students should be able to:

- Solves routine and non-routine problems involving area of composite figures formed by any two or more of the following: triangle, square, and rectangle.
- Solves routine and non-routine problems involving Perimeter of triangle.

Introduction:

The main task of this subunit is to familiarize the students, how to calculate area and perimeter of the different types of triangles, such as acute angled triangle, right angled triangle and obtuse angled triangle.

Teaching notes:

In this sub unit you will see the different types of measurements, area and perimeter of triangle. Start the lesson by revising area and perimeter of rectangle and square. Encourage students to derive the area of right angled triangle from area of rectangle. And guide them to derive the formula to

calculate area of obtuse and acute angled triangle and generalize the formula to

calculate area of any triangle is $\frac{1}{2}bh$.

Answer for Activity 5.3.1

1. a, 12 *unit²* b. 16 *unit*
2. Area of a closed figure is the number of square units inside that closed figure.
3. perimeter is the length of the boundary of a closed figure.
4. Area of rectangle is the product of its base and height.

$$\text{Area of rectangle} = \text{base} \times \text{height}$$

$$A = b \times h$$

the perimeter of rectangle is calculated as:

$$\text{perimeter} = b + h + b + h$$

$$P = 2b + 2h$$

Answer for Exercise 4.3.1

1. a. area $= \frac{1}{2}(16\text{cm} \times 6\text{cm}) = 48\text{cm}^2$ and

$$p=10\text{cm}+16\text{cm}+10\text{cm}=36\text{cm}$$

b. area $= \frac{1}{2}(4\text{cm} \times 10\text{cm}) = 20\text{cm}^2$ and

$$p=10\text{cm}+13.6\text{cm}+5\text{cm}=28.622\text{cm}$$

2. $A = \frac{1}{2}(9\text{cm} \times b)$

$$63(2) = 9\text{bcm} \quad b=14$$

3. $A_1 = 3.7\text{m}(5\text{m}) = 18.5\text{m}^2$ and $A_2 = \frac{1}{2}(1\text{m} \times 5\text{m}) = 2.5\text{m}^2$

$$\text{Area of wall} = 18.5\text{m}^2 + 2.5 = 21\text{m}^2$$

$$P = 3.7\text{m} + 3.7\text{m} + 5\text{m} + 3\text{m} + 3\text{m} = 18.4\text{m}$$

4. a. Area of unshaved = area of 1st shaded region + area of 2nd shaded region

$$= \frac{1}{2}(12\text{cm} \times 6\text{cm}) + \frac{1}{2}(6\text{cm} \times 6\text{cm})$$

$$36\text{cm}^2 + 18\text{cm}^2 = 54\text{m}^2$$

b. area of shaded = 18cm^2

Assessment:

Dear teachers, at this time, you have to identify the strengths and weaknesses of your students.

Give: activities on the derivation of area formula for the right-angled triangle, acute angled triangle and obtuse angled triangle and checked the performance of your students.

Give exercises on text book as homework and class work. Check students work and provide them proper feedback.

Give assignments, quiz or test to assess their level of understanding. Finally, for slow learners and fast learners or interested students, you can give the following additional exercise problems.

For slow learners

- 1.Calculate the area of triangle whose base and height are 10cm and 14cm respectively.

For fast learners

- 1.The area of triangle is 64 square units. If its base is 16 units long, then calculate the height of the triangle

5.4. Perimeters and Areas of four sided figures

Period allotted: 8periods

Competencies:

At the end of this sub unit, students should be able to:

- solves routine and non-routine problems involving Perimeter and area of four-sided figures.

Introduction:

In this subunit the students will learn how to calculate area and perimeter of trapezium, rhombus, parallelogram and kite. Do not give them formula, but guide the students to get or derive the formula by themselves. For this purpose, there are activities on the text.

Teaching notes:

Dear teacher, Start the lesson by providing activity 5.4.1, and guide the students while doing the activity, so that they derive the formula of parallelogram is $A = bh$, then give them exercise 5.4.1. Next activity 5.4.2 should be given so that the students will try to derive the formula to calculate

area of trapezium to be $A = \frac{h}{2} (b_1 + b_2)$. Give them exercise 5.4.2 to practice

the formula $A = \frac{h}{2} (b_1 + b_2)$. Finally, to

Calculate area of kite and rhombus, give them activity 5.4.3 and guide them so

that they will derive the formula $A = \frac{1}{2} d_1 d_2$. And let the students to practice

the formula $A = \frac{1}{2} d_1 d_2$ by providing exercise 5.4.3.

Dear teacher, do not forget to check the students work and give them proper feedback after each exercise.

Answer for Activity5.4.2

1. A parallelogram is a quadrilateral in which both pair of opposite sides are parallel.
2. Opposite sides of parallelogram are congruent.

Opposite angles of a parallelogram are congruent. Consecutive (or adjacent) angles of a parallelogram are supplementary.

The diagonals of parallelogram bisect each other.

3.

I. Guide the students to construct parallelogram as

II. $A = \frac{1}{2}(b \times h)$

III. $A = \frac{1}{2}(b \times h)$

IV. $A = \frac{1}{2}(b \times h) + \frac{1}{2}(b \times h)$

V. $A = b \times h$

Answer for Exercise 5.4.1

1. $A = 15\text{cm}(8\text{cm}) = 120\text{cm}^2$

2. $18\text{cm}^2 = 5\text{cm}(h)$

$h = 3.6\text{cm}$

3. Area of PTRS=area of PQRS + area of QTR

$$= 6\text{cm}(13\text{cm}) + \frac{1}{2}(6\text{cm} \times 6\text{cm})$$

$$= 78\text{cm}^2 + 18\text{cm}^2$$

$$=96 \text{ cm}^2$$

4. a. $\text{Area} = 6\text{cm}(5\text{cm}) = 30\text{cm}^2$

b. $30\text{cm}^2 = ZY(8\text{cm})$

$$ZY = 3.75 \text{ cm}$$

c. $p=3.75\text{cm}+3.75\text{cm} +5\text{cm}+5\text{cm}=17.5\text{cm}$

Answer for Activity 5.4.3

1. A trapezium is a special type of quadrilateral in which exactly one pair of opposite sides are parallel.

2.

- i. Guide the students to construct parallelogram as
b

ii. $A = \frac{1}{2}(h \times b_2)$

iii. $A = \frac{1}{2}(h \times b_2)$

iv. Area of trapezium ABCD $= \frac{1}{2}(h \times b_1) + \frac{1}{2}(h \times b_2)$

v. Area of trapezium $= \frac{1}{2}h(b_1 + b_2)$

Answer for Exercise 5.4.2

1. $A = \frac{1}{2}4cm(10cm + 13cm) = 46cm^2$

$P = 4cm + 13cm + 5cm + 10cm = 32cm$

2. $170cm^2 = \frac{1}{2}17cm(12cm + b_2)$

$b_2 = 8cm$

Let $b_1 = b_2 + 2$

$42cm^2 = \frac{1}{2}6cm(b_2 + 2 + b_2)$

$b_2 = 6cm$

3. Then the largest base $= 6cm + 2cm = 8cm$

Answer for Activity 5.4.4

1. A rhombus is a parallelogram in which all its sides are congruent.

Properties of rhombus

- i. All properties of parallelogram are properties of rhombus. ii.
All sides of rhombus are congruent
 - iii. The diagonals of rhombus are perpendicular to each other
 - iv. The diagonal of rhombus bisects the angles at the vertices.
2. Kite is a quadrilateral that has two pairs of consecutive congruent sides, but opposite sides is not congruent.

Properties of kite

- i. The diagonals of kite are perpendicular to each other. But they do not bisect each other.
- ii. One pair of opposite angles of kite is congruent.

3.

- i. AC and BD
- ii. WY and XZ
- iii. $A = \frac{1}{2}(AC)(BE) + \frac{1}{2}(AC)(DE) = \frac{1}{2}(AC)(BD)$
- iv. $A = \frac{1}{2}(WY)(XN) + \frac{1}{2}(WY)(ZN) = \frac{1}{2}(WY)(XZ)$
- v. Area of rhombus is the sum of area ΔABC and ΔADC

$A=1/2 d_1 d_2$, where AC is diagonal 1(d_1) and BD is diagonal 2(d_2) and

Area of kite is the sum of area ΔWXY and ΔWZY

$$A = \Delta WXY + \Delta WZY$$

$$A = \frac{1}{2} WY \times XZ$$

$A = \frac{1}{2} d_1 d_2$, where WY is diagonal1 (d_1) and XZ is diagonal 2
(d_2)

Answer for Exercise 5.4.3

1. $A = \frac{1}{2} (8\text{cm})(6\text{cm}) = 24\text{cm}^2$

$P = 4(5\text{cm}) = 20\text{cm}$

2. $A = (12\text{cm})(16\text{cm}) = 96\text{cm}^2$

3. $P = 2(10\text{mm} + 18\text{mm}) = 56\text{mm}$

4. $144 \text{ cm}^2 = \frac{1}{2} (18\text{cm}) d_2$

$d_2 = 16\text{cm}$

Assessment:

Dear teachers, at this time, you have to identify the strengths and weaknesses of your students.

Give:

- Activities on the derivation of area formula for the right-angled triangle, acute angled triangle, obtuse angled triangle and checked the performance of your students.
- Activities on the computation of perimeter and area of trapezium. □Different exercise problems in calculating areas and perimeter of parallelogram
- Different exercise problems in calculating areas and perimeter of kite and rhombus.
- Finally mark the assignment given. It is good if a test is given here to encourage them to study more. Some additional problems are given below for slow learners and fast learners

For slow learners

- 1.Calculate the area of kite, whose diagonals are 12cm and 8cm.

For Fast learners

1.The lengths of the parallelogram are 4cm, 6cm and the perimeter of the parallelogram is 40cm. Find the lengths of sides of the parallelogram.

5.5. Circumference and Area of a circle

Period allotted: 4periods

Competencies:

At the end of this sub unit, students should be able to:

- Determine the quotient of circumference divided by a diameter of a circle.
- Compute the circumference of a circle.
- Determine the area formula of a circle

Introduction:

This sub-topic mainly discusses about the area and perimeter of a circle. The topic also presents different activities and exercises which will enhance the understanding level of the students.

Teaching notes:

You need to follow the following strategies during teaching.

- Let students revise the center, radius, and diameter of a circle.
- Assist students to determine the quotient of circumference divided by diameter, then guide them to conclude that

$$\frac{C}{d} = \frac{\text{Circumference}}{\text{diameter}} = \frac{22}{7} \approx 3.14$$

(Tell them $\frac{22}{7} \approx 3.14 \approx \pi$)

In order to make students intensively understand the relation between the radius and the radius of a circle you can use examples like the following. Example: The

circumference (C) and diameter (d) of four circles are given in the table. For each circle, find the ratio $\left(\frac{C}{d}\right)$ to two decimal place.

| | | | | |
|---------------|------|-------|------|-------|
| C | 22cm | 11cm | 44cm | 33cm |
| d | 7cm | 3.5cm | 14cm | 10½cm |
| $\frac{C}{d}$ | | | | |

- Let students practice computing the circumference(C), diameter (d) and radius (r) using the formula

$$C = \pi d = \pi(2r) = 2\pi r$$

Answer for Activity5.5.1

Since this activity is practical work, your continues assistance is very important. For example you can guide your students to find the materials required from their environment. Finally you need to provide students with constructive feedback which will help them to clearly understand the topic they are working on.

Answer for Exercise 5.5.1

1.

| Radius | Diameter | Circumference | Area |
|--------------------|--------------------|---------------|-----------------------|
| $\frac{12cm}{\pi}$ | $\frac{24cm}{\pi}$ | 24 cm | $\frac{144cm^2}{\pi}$ |
| 8cm | 16cm | $16\pi cm$ | $64\pi cm^2$ |
| 1cm | 2cm | $2\pi cm$ | $\frac{22}{7}cm^2$ |
| 12cm | 24cm | $24\pi cm$ | $144\pi cm^2$ |

2. The diameter of the circle is six time the diameter of another circle.
 3. Let P_t be the perimeter of the triangular part and C' be perimeter of the quarter circle.

Then $P_t = 3cm + 4cm + 5cm = 12cm$ and

$$C' = \frac{3\pi}{2} cm$$

Finally total perimeter of the region = $P_t + C' = 12cm + \frac{3\pi}{2} cm$

$$= \frac{24 + 3\pi}{2} \text{ cm}$$

4. In similar manner as part one above let A_t be the area of triangular region and let A_c be area of the quarter circle.

$$\text{Then } A_t = \frac{1}{2} \times 3 \times 4 \text{ cm}^2 = 6 \text{ cm}^2 \text{ and } A_c = \frac{1}{4}\pi \times 9 \text{ cm}^2 = \frac{9\pi \text{ cm}^2}{4}$$

$$\begin{aligned} \text{Then total area of the region} &= A_t + A_c = 6 \text{ cm}^2 + \frac{\frac{9\pi \text{ cm}^2}{4}}{} \\ &= \frac{(24 + 9\pi) \text{ cm}^2}{4} \end{aligned}$$

5. Let P_l be perimeter of the larger 'quarter circle' and P_s be the perimeter of the smaller 'quarter circle'.

$$\text{Then } P_l = \frac{\pi}{2} \times 36 \text{ cm} = \frac{18\pi}{2} \text{ cm} \text{ and } P_s = \frac{\pi}{2} \times 24 \text{ cm} = \frac{12\pi}{2} \text{ cm}$$

$$\text{Then the total perimeter} = P_l + P_s = \frac{18\pi}{2} \text{ cm} + \frac{12\pi}{2} \text{ cm} = \frac{30\pi}{2} \text{ cm}$$

Similarly let A_l be the area of larger 'quarter circle' and A_s be the area of the smaller 'quarter circle'.

$$\begin{aligned} \text{Then } A_l &= \frac{1}{4}\pi \times 1296 \text{ cm}^2 = 324\pi \text{ cm}^2 \text{ and } A_s = \frac{1}{4}\pi \times 576 \text{ cm}^2 \\ &= 144\pi \text{ cm}^2 \end{aligned}$$

$$\text{Then total area of the region} = A_l + A_s = 324\pi \text{ cm}^2 + 144\pi \text{ cm}^2$$

$$= 468\pi cm^2$$

Answer for Activity 5.5.2

Since this activity is practical work, your continues assistance is very important. For example you can guide your students to find the materials required from their environment. Finally you need to provide students with constructive feedback which will help them to clearly understand the topic they are working on.

5.6. Applications on Perimeter and Area of a Plane Figure.

Period allotted: 8 periods

Competencies:

At the end of this sub unit, students should be able to:

- Apply the concept of perimeter and area of plane figures in real life problems

Introduction:

In this subunit the students will apply the concept of area and perimeter of plane figures in their real-life situation.

Teaching notes:

Start the lesson by providing examples on application problems as noted on the student text book. And give exercise 4.5.1, check the students work and provide them proper feedback.

Answer for Exercise 5.6.1

1. $A=80m(100m)=8000m^2$

Cost = 800(500) = Birr400,000

2. Area of part of building $= 8m \times 6m = 48m^2 = 480,000cm^2$

Area of HCB = $20\text{cm} \times 40\text{cm} = 800\text{cm}^2$

$$\text{Number of HCB} = \frac{480000\text{cm}^2}{800\text{cm}^2} = 600$$

3. a. Length of facing *material* = $65m + 175m + 65m = 305m$

b. $305m(\text{Birr}150) = \text{Birr}45750$

4. Area of flower bed = $6\text{m}(10\text{m}) = 60\text{m}^2$

Area of flower bed with path = $14\text{m}(10\text{m}) = 140\text{m}^2$

Area of path = $140\text{m}^2 - 60\text{m}^2 = 80\text{m}^2$

Answer for Review Exercise for unit 5

I. True or False

1. True

2. False

3. False

4. False

5. True

6. True

7. False

II. Fill the blank

1. Equilateral triangle

2. Right angle triangle

3. Kite

4. Rhombuses

5. Squares

III. choose the correct answer

1. B
2. A
3. D
4. C
5. B

IV. Work out

$$1.a. A = 8\text{cm}(10\text{cm}) + \frac{1}{2}(6\text{cm} \times 8\text{cm}) = 104\text{cm}^2$$

$$P = 8\text{cm} + 10\text{cm} + 16\text{cm} + 10\text{cm} = 44\text{cm}$$

b. $A = 6\text{cm}(10\text{cm}) = 60\text{cm}^2$

$$\text{BC} = \frac{60\text{cm}^2}{12\text{cm}} = 5\text{cm}$$
,

$$p = 5\text{cm} + 5\text{cm} + 6\text{cm} + 6\text{cm} = 22\text{cm}$$

c. $A = \frac{1}{2}(8\text{cm}(11\text{cm})) = 44\text{cm}^2$

$$p = 5\text{cm} + 5\text{cm} + 9\text{cm} + 9\text{cm} = 28\text{cm}$$

d. $A = \frac{1}{2}(24\text{cm}(10\text{cm})) = 120\text{cm}^2$

$$p = 4(13\text{cm}) = 52\text{cm}$$

e. $\frac{1}{2}8\text{cm}(12\text{cm} + 24\text{cm}) = 144\text{cm}^2$

$$p = 12\text{cm} + 24\text{cm} + 10\text{cm} + 10\text{cm} = 56\text{cm}$$

f. $A = \frac{1}{2} \times 5\text{cm} \times 12\text{cm} = 30\text{cm}^2$

$p = 13\text{cm} + 12\text{cm} + 5\text{cm} = 20\text{cm}$

Unit6

Congruency of plane figures

Total allotted periods: 16 Periods

Unit Outcomes:

At the end of this unit, students will be able to:

- Identify congruent triangles by using the tests for congruency (SSS, SAS, ASA).
- Apply real-life situations in solving geometric problems **Introduction**

In this unit students will learn about congruence of geometric figures. The unit has two sections. The first section deals with the congruence of geometric shapes. The main focus of this section is to enable the students identifying a given triangle is congruent to the other using congruence test for triangles. In the second section the students learn application of congruence of figures in their daily life.

6.1 Congruent of Plane Figures

Total allotted periods: 8 Periods

Competencies:

At the end of this sub unit, students should be able to:

- Explain the concept of congruency of triangles
- Check the congruence of given triangles by tracing, cutting and overlapping.

Introduction:

In this subunit the students will learn about congruent shapes and congruent geometric figures. The main focus of this sub unit is to enable students to identify congruent triangles by applying test for congruence of triangles.

Teaching notes:

Start the lesson by providing the activities to the students as noted on the student text. After each activity give them proper feedback. Then, give the students a short note and exercises to practice the concepts discussed.

Answer for activity 6.1.1

1. b

2. a
3. Not congruent
4. a
5. a
6. The figures that have the same size and shape.
7. When they have equal length.
8. When they have equal length of diameter (radius).
9. When they have equal measure.

Answer for exercise 6.1.1

1. C and d
2. a. False
- b. False
- c. False
- d. True
- e. True F. True
- g. False
- h. True

3. a. Yes
- b. They are congruent

Answer for activity 6.1.2

1. a. XY
 b. YZ
 c. XZ
 d. $\angle X$
 e. $\angle Y$
 f. $\angle Z$
2. a. Yes
 b. They are congruent
3. a. XY
 b. XZ
 c. YZ
 d. $\angle X$
 e. $\angle Y$

f. $\angle Z$

4. Two triangles are congruent, if their corresponding parts (angles and sides)

that match one another are equal.

Answer for exercise 6.1.2

1. a. False

b. False

c. True

d. True

e. False

f. True

2. a. ΔDFE

b. $m(<X)$

c. \overline{YX}

d. YX

e. $<X$

f. $\triangle FDE$

3. a. $\triangle TSR$

b. $\triangle YZX$

c. $\triangle RST$

Assessment:

Give exercises on text book as homework and class work. Check students work and provide them proper feedback. Give assignments, quiz or test to assess their level of understanding.

6.1.3. Tests for congruency of triangles (ASA, SAS, and SSS)

Competencies:

At the end of this section students should be able to:

- Describe each of the tests for congruence SAS, SSS and ASA
- Identify the congruence of two given triangles by using the tests for congruence SAS, SSS and ASA

Introduction:

In previous discussion the students have seen that, in order to say two triangles are congruent, their six corresponding part must be congruent. But, in this section, the students will learn that, they do not need all six pieces of information to show the triangles are congruent. By using only, the three parts of a triangle and applying the three tests for congruence (SSS, SAS, ASA) the students can show whether two triangles are congruent or not.

Teaching notes:

Start the lesson by providing the activities to the students as noted on the student text. After each activity give them proper feedback. Then, give the students a short note and exercises to practice the concepts discussed.

A. Side – Side – side (SSS) congruence test

Answer for activity 6.1.3

Please guide the students to do a given activity 6.1.3

Answer for exercise 6.1.3

1. a. $AB = LM$, $BC = MN$, $AC = LM$

Hence, they are congruent by SSS congruence rule.

Symbolically, $\triangle ABC \cong \triangle LMN$

- b. $DE = PQ$, $EF = QR$, $DF = PR$

Hence, they are congruent by SSS congruence rule.

Symbolically $\triangle DEF \cong \triangle PQR$

- c. $MN = PQ$, $NO = QO$, $MO = PO$

Hence, they are congruent by SSS congruence rule.

Symbolically, $\triangle MNO \cong \triangle PQO$

2. a. $AB = AC$ ----- Given

$BD = CD$ ----- D is mid-point of BC

AD is common side of $\triangle ABD$ and $\triangle ACD$

- b. $\triangle ABD \cong \triangle ACD$ by SSS congruence rule.
 - c. $\angle B = \angle C$, because They are corresponding angles of congruent triangles
3. PR=QT ----- Given

PT=QR-----Given

PQ is common side of $\triangle PQR$ and $\triangle QPT$ Hence, $\triangle PQR \cong \triangle TPQ$ by SSS congruence rule.

- a. Not correct
- b. Correct
- c. Not correct
- d. Correct

B. Side – Angle – side (SAS) congruence test

Answer for activity 6.1.4

Please guide the students to do a given activity 6.1.4

Answer for exercise 6.1.4

1. $\angle E$

2. $PQ = EF$ ----- Given

$RP = DF$ ----- Given, then

The included angle $\angle p = \angle F$ is missing information to say

$\Delta PQR \cong \Delta FED$ by SAS congruence rule

3. a. $AB=DE$given $\angle A=\angle D$given

$AC=DF$given Hence ΔABC and ΔDEF are congruent by
SAS congruence rule.

Symbolically, $\Delta ABC \cong \Delta DEF$

b. $BC=RQ$given

$\angle C = \angle Q$given

$AC = PQ$given

Hence $\triangle ACB$ and $\triangle PQR$ are congruent by SAS congruence rule.

Symbolically, $\triangle ACB \cong \triangle PQR$

c. $WX = YZ$given

$\angle XWY = \angle ZYW$given

WY is common side

Hence $\triangle XWY$ and $\triangle ZYW$ are congruent by SAS congruence rule.

Symbolically, $\triangle XWY \cong \triangle ZYW$

4. $PN = RN$given

$TN = QN$given

$\angle TNP = \angle QNR$by vertically opposite angles

Hence $\Delta TNP \cong \Delta QNR$ by SAS congruence rule

- a. correct
- b. Not correct
- c. Not correct
- d. Correct

C.Angle – Side – Angle (ASA)congruence test

Answer for Activity 6.1.5 a.No

- b. No
- c. No
- d. yes

Answer for Exercise 6.1.5

- 1. MN
- 2. $\angle D = \angle M$ ----- Given

$\angle F = \angle P$ ----- Given, then

The included side $DF = MP$ is missing information to say

$\triangle DEF \blacksquare \triangle MNP$ by ASA congruence rule

3. a. $\angle A = \angle K$given $AB = KM$given

$\angle B = \angle M$given

Hence $\triangle ABC \cong \triangle KMN$ by ASA congruence rule

b. $\angle R = \angle V$given $RQ = VW$given

$\angle Q = \angle W$given

Hence $\triangle RQP \cong \triangle VWU$ by ASA congruence rule

c. $\angle TQP = \angle RPQ$given

QP is common side

$\angle RQP = \angle TPQ$given

Hence $\triangle TPQ \cong \triangle RQP$ by ASA congruence rule

4. a. they are not congruent

- b. they are congruent
 - c. they are not congruent
 - d. they are congruent
5. a. $\angle BAC = \angle DAC$given AC is
common side
- $\angle ACB = \angle ACD$given
- b. $\Delta BAC \cong \Delta DAC$ by ASA congruence rule
 - c. AB=ADcorresponding side of congruent triangles
 - d. DC=CB.....corresponding side of congruent triangles

6.2. Applications of congruent of plane figure

Total allotted periods: 8 Periods

Competencies:

At the end of this section you should be able to:

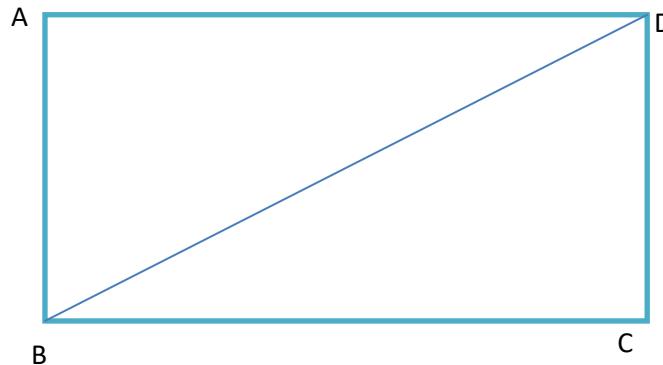
□Apply congruency of plane figures to real life problems **Introduction:**

In section you learn some the applications of congruence of triangles **Teaching Notes:**

Start the lesson by providing examples on application of congruency of triangles and give them exercise as noted on student text book.

Answer for Exercise 6.2

1.



ABCD is rectangle and BD is diagonal of rectangle

$BA=DC$opposite side of rectangle are congruent

$AD=BC$ opposite side of rectangle are congruent

BD is common side

$\Delta BAD \cong \Delta DCB$ by SSS congruence rule

Therefore the diagonal of rectangle divides rectangle in to two congruent triangles

2. $AB=BC$given

$\angle ABD = \angle CBD$ BD is bisector of $\angle ABC$ BD is
common side

Hence, $\Delta ABD \cong \Delta CBD$ by SAS congruence rule

$AD = DC$ corresponding sides of congruent triangles.

Therefore D is the mid- point of AC.

3. $AB = BD$ Given

$\angle ABC = \angle DBC$ Given

BD is common side

Hence $\triangle ABC \cong \triangle DBC$ by SAS Congruence rule.

Assessment:

Dear teachers, at this time, you have to identify the strengths and weaknesses of your students.

Give:

- Different exercise problems in identifying congruent triangles
- Different exercise problems in application of congruency of figures.
- Assignment on congruency of triangles
- Finally mark the assignment given. It is good if a test is given here to encourage them to study more.

Answer for review exercise on unit 6

I. True / False

1. True
2. True
3. True
4. True
5. False
6. True
7. True
8. False
9. True
10. False

II. Choice

11. A
12. C 13. B

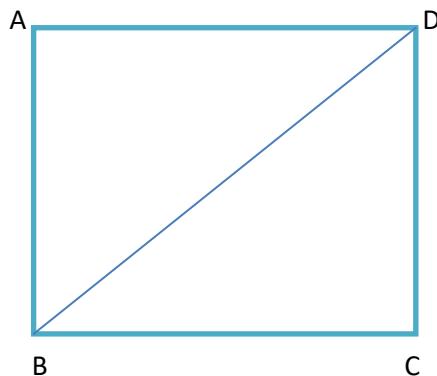
14.B

15.E

16.A

III. Work out

17.



ABCD is square and BD is diagonal of square

BA=DC..... All sides of square are congruent

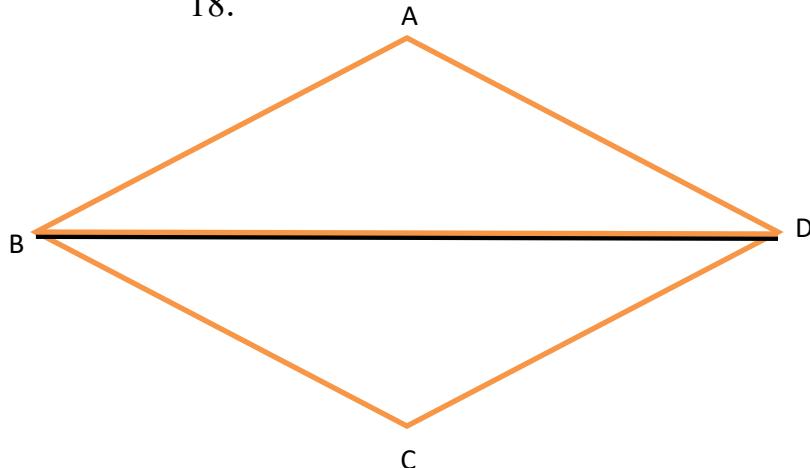
AD=BC All sides of square are congruent

BD is common side

$\Delta BAD \cong \Delta DCB$ by SSS congruence rule

Therefore the diagonal of square divides square in to two congruent triangles

18.



ABCD is kite and BD is diagonal of kite

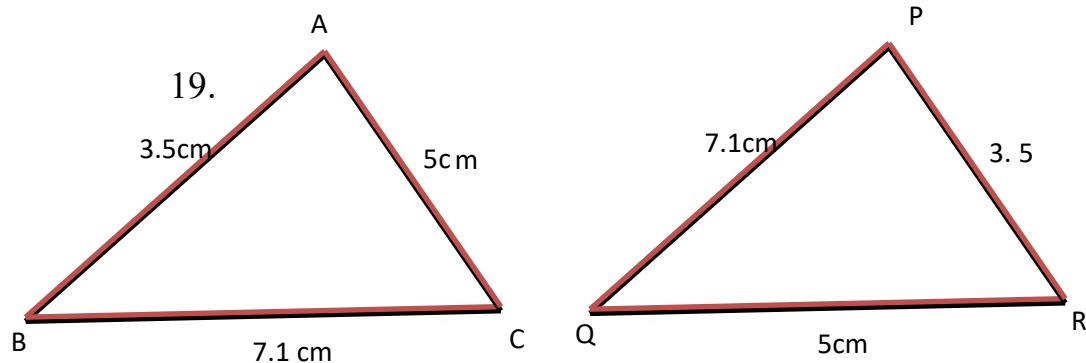
BA=BC Pair of adjacent sides are congruent

AD=CD Pair of adjacent sides are congruent

BD is common side

$\triangle BAD \cong \triangle BCD$ by SSS congruence rule

Therefore the diagonal of kite divides kite in to two congruent triangles



$\triangle ABC \cong \triangle PQR$ by SSS congruence rule.

20. $\triangle ABC \cong \triangle PQR$

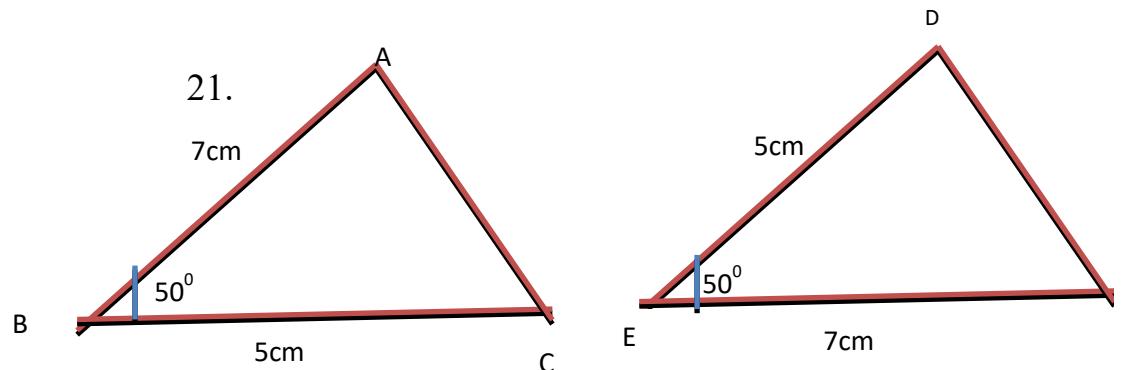
$$\angle B = \angle Q$$

$$(2x + 30)^\circ = 55^\circ$$

$$2x = 55 - 30 \quad 2x = 25$$

$$\frac{2x}{2} = \frac{25}{2}$$

$$x = 12.5$$



$\triangle ABC \cong \triangle FED$ by SAS congruence rule.

22. A.FG = FH Given

GM = HM Given

FM is common side

- b. Hence, $\triangle FGM \cong \triangle FHM$ by SSS congruence rule.
- c. $\angle G = \angle H$ because they are corresponding angles of congruent triangles.
- d. $\angle GFM = \angle HFM$ because they are corresponding angles of congruent triangles.

23. a. $\angle ADC = \angle BDC$Given

DC is common side

$$\angle ACD = \angle BCD$$

Hence $\triangle ADC \cong \triangle BDC$ by SAS congruence rules

- b. $\triangle ABC \cong \triangle DEF$ because they cannot satisfy one of the Congruence rule.
- c. $XY = XZ$Given

WY = WZ Given

XW is common side

Hence $\Delta XYW \cong \Delta XZW$

Unit 7

Data handling

Total allotted periods: 16 Periods

Introduction:

In this unit, students will learn the basic ideas of data handling and mean, mode, median and range in more detail than which have been discussed in lower grades. In data handling, the students will also learn the concepts like

line graph and simple pie charts their interpretation. Students will also learn the measures of dispersions like the range **Unit outcomes:**

At the end of this unit, students will able to:

- Organize data using frequency tables for a given data
- Construct and Interpret data from pie charts
- Calculate Mean, Mode, Median and range of a given data
- Apply the concept of data handling to organize and interpret real life problems

Suggested teaching Aids in Unit 7:

It is expected that all students are aware of data handling in its meaning from daily life. So as to be able to make their understanding up to standard, enabling students to participate in conception of data handling is important. Therefore, constituting different groups, students can develop local examples which will help as additional teaching aids for a better and easy understanding of data

handling. You can also use football field, Television, hand-span, line graphs and pie chart (circle graphs) etc.

7.1. Organization of Data using frequency table

Period allotted: 3 periods

Competencies:

At the end of this sub unit, students should be able to:

- Collect simple data from their environment using tally mark.
- Organizes data in a frequency distribution table.

Introduction:

Students are expected to have some of the basic concepts about data handling from lower grades mathematics. In this sub-unit, they will get more familiarized with basic ideas of collecting data using Tally and organize data in frequency distribution table. And apply the different ways of data collection such as

- By using a questionnaire
- By carrying out an experiment.
- From records or data base.
- From the internet.

Teaching notes:

You may start the lesson by giving chance to the students to explain their understanding about data handing from their daily life. For this purpose, you can let the students perform Activity 7.1.1 and Exercise 7.1.1, so that they can

1. Give some examples of collecting data using Tally marks from their daily life.
2. Discuss the ways of collecting data in mathematical language.

Encourage them to give as many examples of collecting data using Tally marks from their daily life and guide their view of collecting data.

Activity 7.1.1

1. Data is a collection of facts, such as numbers, words, measurements, observations or even just descriptions of things.
2. You can collect data:
 - ✓ by using a questionnaire.
 - ✓ by making observations and recording the results.
 - ✓ by carrying out an experiment.
 - ✓ from records or data base
 - ✓ from the internet
- 3.

| Age of students | Tally | Number of students (frequency) |
|-----------------|-------|-----------------------------------|
| 12 | | 2 |
| 13 | +++ | 11 |

| | | |
|--------------------------|--|---|
| 14 | | 7 |
| 15 | | 8 |
| 16 | | 4 |
| 17 | | 1 |
| Total number of students | | |

Answer for exercise 7.1.1

1.

| Weight of students | Tally marks | Frequency |
|--------------------|-------------|-----------|
| 40 | | 1 |
| 41 | | 0 |
| 42 | | 0 |
| 43 | /// | 5 |

| | | |
|----|---------|---|
| 44 | / / / / | 9 |
| 45 | / / / / | 9 |
| 46 | / / / | 7 |
| 47 | / / / | 5 |
| 48 | | 1 |
| 49 | | 1 |
| 50 | | 1 |
| 51 | | 1 |

2.

| Favorite colors | Tally marks | Frequency |
|-----------------|-------------|-----------|
| White | / / / / | 10 |
| Green | / / / / | 8 |
| Yellow | / / / | 5 |
| Red | / / / | 6 |
| Blue | / / / / | 8 |

| | | |
|--------|-----|---|
| Blacck | /// | 3 |
|--------|-----|---|

3.

| Average temperature | Tally marks | Frequency |
|---------------------|-------------|-----------|
| 19 | /// | 5 |
| 20 | //// | 5 |
| 21 | //// // | 7 |
| 22 | //// /// | 8 |
| 23 | //// | 4 |
| 24 | / | 1 |

Assessment:

Provide project work in collecting and organizing data by using the different methods of data collection.

7.2. Construction and Interpretation of Pie Charts

Period allotted: 4 periods

Competencies:

At the end of this sub unit, students should be able to:

□construct line graphs and pie chart to represent organized data by using the given data or by collecting data from their environment □interpret simple pie charts

Introduction:

The line graphs which are considered in this section are two dimensional that is they represent the correspondence between the elements of two sets, by showing how the elements of one set may be paired with the elements of a second. Next, the procedure to draw circle graphs (pie chart) is listed in the student's textbook. The students are expected to study this procedure and exercise it by drawing various pie chart, using pair of compasses, protractor and rule.

Teaching notes:

This sub-unit seeks further on construction and interpretation of line graphs and pie chars. At the end of discussion on line graphs the teacher should summarize in a form of questions and answers as follows.

1. Graphs of direct proportional relations are straight lines passing through the origin,
2. Graphs of inverse proportional relations are smooth curves that move down wards as X increases (i.e. y-decreases as X-increases). It is also straight line.
3. Straight lines graphs parallel to the X-axis, represent constant values of y-as x-varies.
4. Graphs constantly rising as we move to the right represent values of y constantly increasing as x increases.

The procedure to draw circle graphs is listed in the, students text book. The students are expected to study this procedure and exercise it by drawing various circle graphs, using pair of compasses, protractor and ruler. It is important that the students be convinced that the circle graph is especially

useful for showing the relation of one item to another and of one item to the whole number of items.

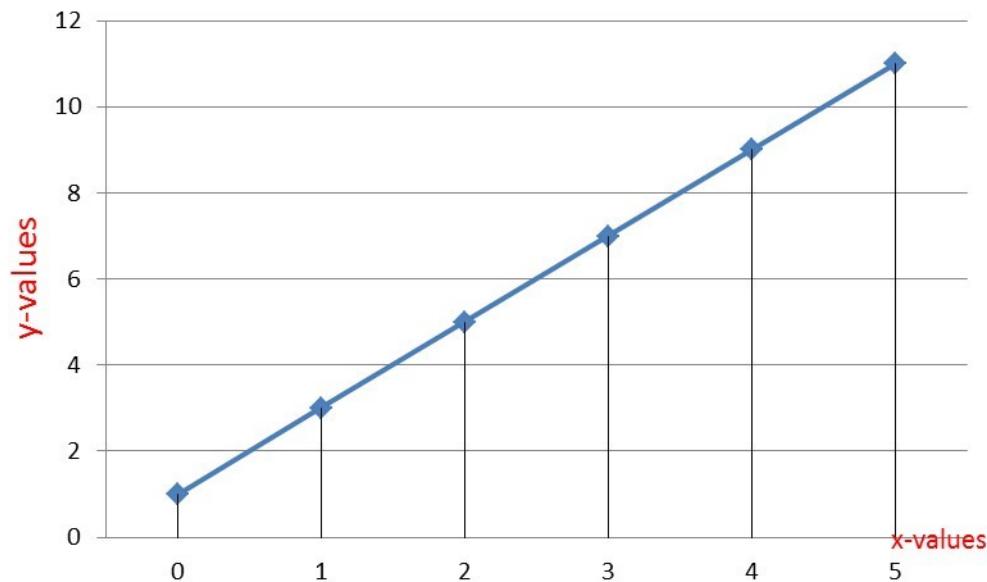
Dear teacher, encourage your students to respond to each questions of the activities in the textbook and give fairly equal chance to your student. You have to assess the progress of your students by providing activity 7.2.1 and 7.2.2, exercise 7.2.1 and 7.2.2. At the end of each activities and exercise give remedial measures based on their feedback.

Answer for activity 6.2.1

1.a.

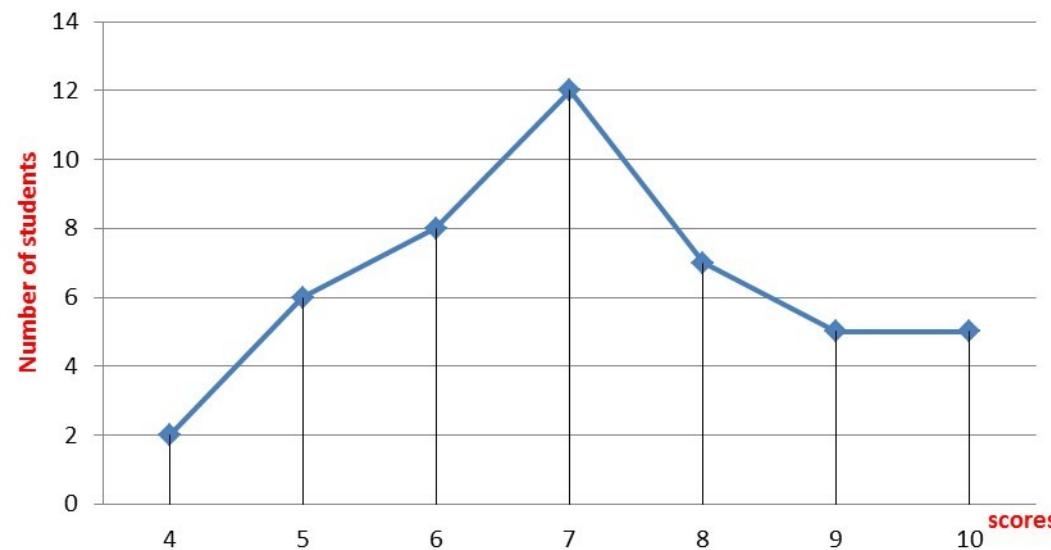
| | | | | | | |
|-------|-------|-------|-------|-------|-------|--------|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 1 | 3 | 5 | 7 | 9 | 11 |
| (x,y) | (0,1) | (1,3) | (2,5) | (3,7) | (4,9) | (5,11) |

b.



2.

| score | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------------------|---|---|---|----|---|---|----|
| Number of students | 2 | 6 | 8 | 12 | 7 | 5 | 5 |

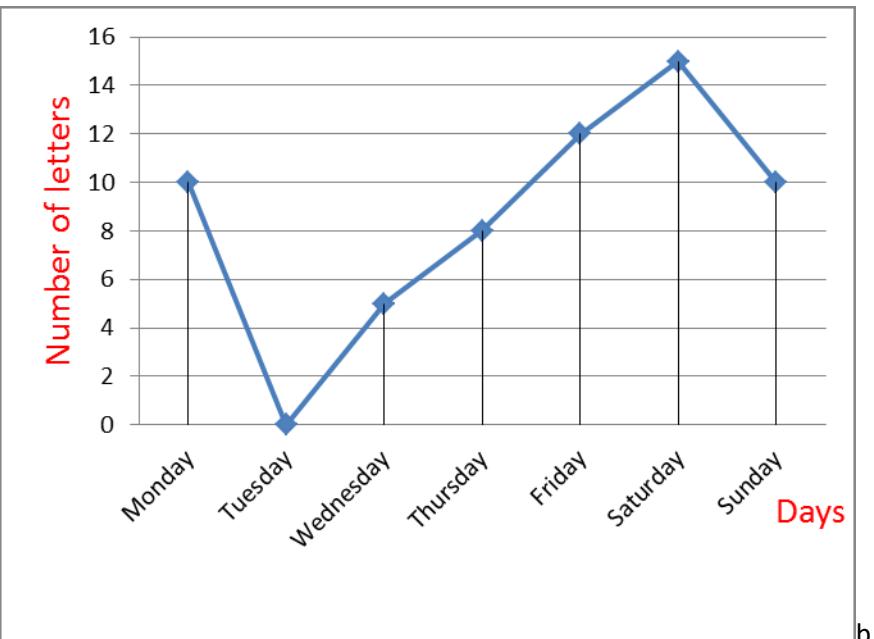


3. Line graph is a graph that uses lines to connect individual data points on a Cartesian coordinate plane.

Exercise 7.2.1

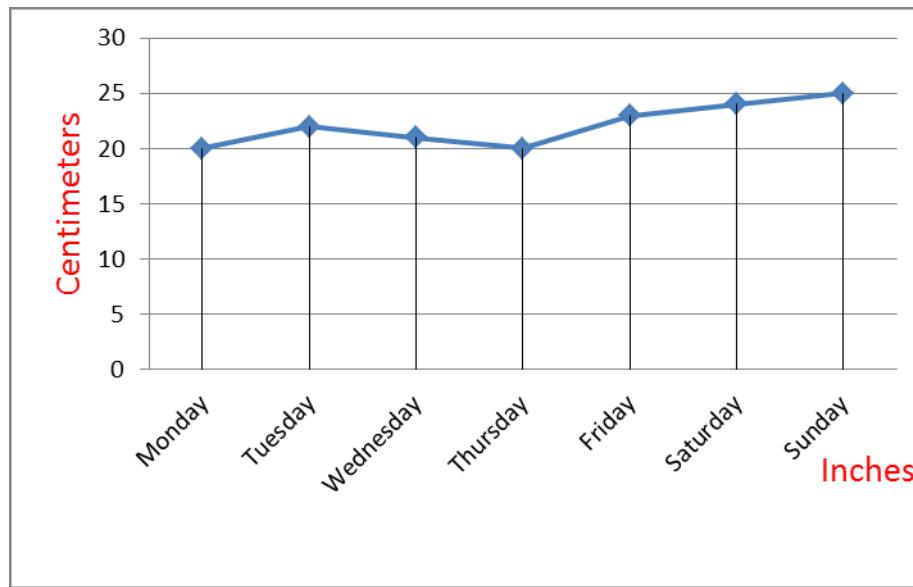
1. a. The number of letters delivered to an office in one week

| Days | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|
| Number of Letters | 10 | 0 | 5 | 8 | 12 | 15 | 10 |



b.

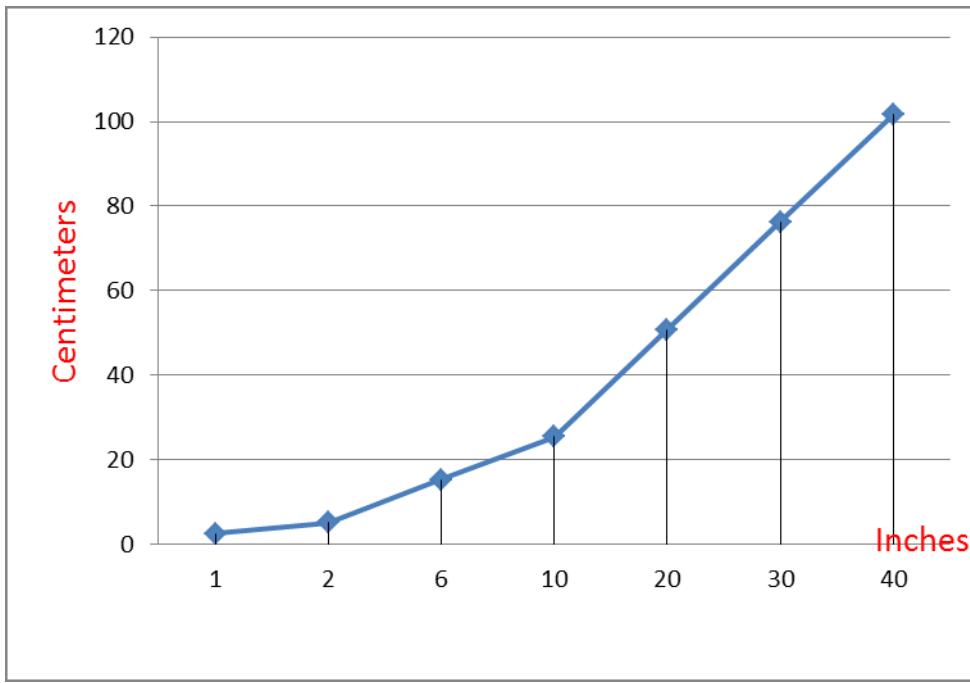
| Days | Mon | Tue | Wed | Th | Frid | Sat | Sun |
|-------------------|-----|-----|-----|----|------|-----|-----|
| Temperature in °C | 20 | 22 | 21 | 20 | 23 | 24 | 25 |



2. a.

| | | | | | | | |
|-------------|------|------|-------|------|------|------|-------|
| Inches | 1 | 2 | 6 | 10 | 20 | 30 | 40 |
| Centimeters | 2.54 | 5.08 | 15.24 | 25.4 | 50.8 | 76.2 | 101.6 |

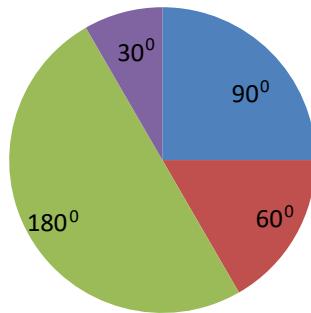
b.



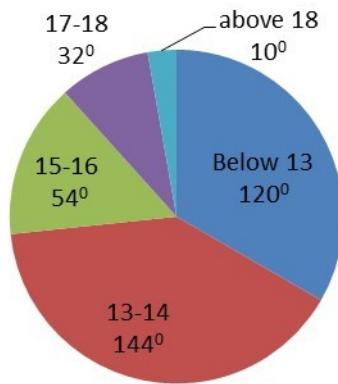
3. a. 3:00
- b. The petrol put in the storage tank.
- c. sales gradually increased
- d. The line shows decreasing of petrol.

Answer for activity 6.2.2

1.



2.



Answer for exercise 7.2.2

1.a. All their choices

- b. Banana
- c. Coffee

d. i. Number of students = $\frac{72 \times 1200}{360} = 240$ =

ii. Number of students = $\frac{45 \times 1200}{360} = 150$

b. Spent on food =

c. Saving =

$$\text{iii. Number of students} = \frac{48 \times 1200}{360} = 16$$

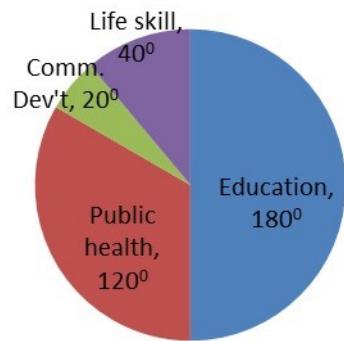
$$2. \text{ a. Spent on rent} = \frac{33 \times 8400}{100} = \text{Birr } 2772$$

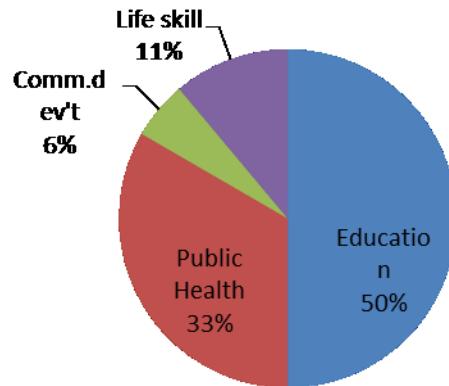
$$\frac{40 \times 8400}{100} = \text{Birr } 3360$$

$$\frac{9 \times 8400}{100} = \text{Birr } 756$$

d. The family more spent on food.

3.

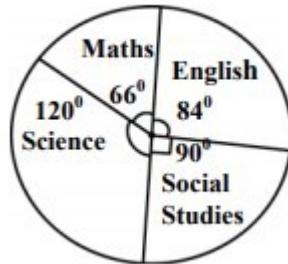




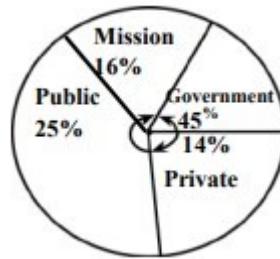
Assessment

At the end of this lesson, apart from Exercises, you can give class activities, assignments and quiz or test, to assess, their level of understanding. For fast learners or interested students you can also give the following additional exercise problems.

1. The given pie chart shows the students who passed in English, Mathematics, science and social studies: If the total number of students in the class is 60, find the number of students passing in each subject



2. The pie chart indicates the number of Students in different School types. If the total number of Students is 1200, then how many students are there in private schools?



7.3. The Mean, Mode, Median and Range of Data

Period allotted: 7 periods

Competencies:

At the end of this sub unit, students should be able to:

Calculate the mean, mode, median and range of the data.

Introduction:

Under this topic students will learn about the measures of central tendencies like mean, mode, and median. The measure of dispersion range will also be discussed.

Teaching Notes:

The three measures of central tendency are called mean, mode and median while the range is called measure of dispersion.

Mean

In discussing this topic, first provide activity 7.3.1 and the following example

Example1: Consider the following data: 20,40,60,80,100,120

- a) To find the mean from the raw data here, let the students add the 6 values and divide the sum by 6 to get: Solution:

$$\text{mean} = \frac{20+40+60+80+100+120}{6} = 70$$

Mode

The students can easily find mode from raw data here you can discuss the unimodal, bimodal, Trimodal and no mode at all and provide activity

7.3.2.

Example2: Find the mode of these sets of data: a) 18,

20, 38 ,40 ,50, 38

b) 92, 300, 400, 500, 600, 700 **Solution:**

- a) The mode is 38.
- b) Each value occurs only once, so there is no mode for the given data.

Median

In treating this part, the discussion will focus on the number of observations being odd or even.

So as to attempt to deal with median, first give chance for the students to do activity 6.3.3 and allow them to narrate their observation.

Range

You can begin the discussion by asking the students if they can tell what range is. Following the reply of the students you can formally define range and discuss and provide activity 7.3.4.

Example3: Find the range of these sets of data.

$$\text{a)} -200, -700, 0, -1000 \quad \text{b)} 400, -300, -200, 0$$

Solution: -

$$\text{a) Range} = \text{highest Value} - \text{lowest value}$$

$$= 0 - (-1000)$$

$$= 1000$$

$$\text{b) Range} = \text{highest value} - \text{lowest value}$$

$$= 400 - (-300)$$

$$= 700$$

At the end of each discussion on measures of central tendency and measure of variation provide exercise 7.3.1, 7.3.2, 7.3.3 and 7.3.4 and provide them proper feedback.

Answer for activity 7.3.1

1. 70
2. 14
3. Depends on the students answer

Answer for exercise 7.3.1

$$1. \frac{96}{6} = 16 \quad b. \frac{433}{5} = 86.5 \quad c. \frac{482}{8} = 60.25$$

$$d. \frac{5100}{5} = 1020$$

$$2. \frac{112}{8} = 14$$

$$3. \frac{38+85+60+x}{4} = 70$$

$$183 + x = 280$$

$$x = 97$$

4. *sum of three numbers* = $18 \times 3 = 54$ and

$$\text{sum of five numbers} = 24 \times 5 = 120$$

$$\text{sum of eight numbers} = 54 + 120 = 174$$

$$\text{Mean of eight numbers} = \frac{174}{8} = 21.75$$

$$5. \text{Mean} = \frac{16+2x++6+10+4}{5} = 8$$

$$\frac{2x+36}{5} = 8$$

$$2x + 36 = 40$$

$$x = 2$$

Answer for activity 7.3.2

1. a. 6 b. 23 and 24 c. all numbers occurred at once
2. The mode of list of data is the value which occurs most frequently.

Answer for exercise 7.3.2

1. Mode=9, it is unimodal
- b. Mode = 18 and 24, It is bimodal
- c. Mode = 38, 43 and 5, it is trimodal
- d. Mode = 121, it is unimodal
- e. has no mode
- f. mode = 7.2, it is unimodal

Answer for activity 7.3.3

- 1.a. 10, 12, 14, 17, 18,
 - b. 2, 4, 4, 6, 8, 12, 14, 18, 18
-
2. a. 14
 - b. 8

Answer for exercise 7.3.3

1. a. 23
 - b. 108
 - c. 410
 - d. 410
-
2. 10,000

Answer for activity 7.3.4

- 1.a. Lowest = 15 and Highest = 100
 - b. Lowest = 108 and Highest = 183
-
2. a. $100 - 15 = 85$
 - b. $183 - 108 = 75$

3. The range of the listed data is the difference between the highest value and the lowest value

Answer for exercise 7.3.4

1.a. Range = $90 - 13 = 77$

b. Range = $94 - 46 = 48$

c. $0 - (-900) = 90$

d. $9.7 - 7.2 = 2.5$ 2. $94 - 21 = 73$

Assessment:

Dear Teachers you are best wished to exercise your maximum teaching potential to deliver to your students the knowledge and skills contained in this sub-unit. Finally, you can ask students the following additional exercise problems to check if they have gained the insight and for consolidating the entire sub-unit.

Ask the student:

- What are the three measure of central tendency?
- What is mean?
- What is mode?
- What is the difference between mean and range?

For gifted students, you can give additional exercise problems like:

1. Given 38 35 35 40 70 90 79 99 120 then,
 - a) Calculate, the mean, mode, media and range.
2. A goal shooter has scores of 14, 18, 10, 24, 32, 26 and 32 in seven games.

How many goals must she score in the 8th game to bring her mean score up to 24.

7.4. Applications of Data Handling

Period allotted: 4 periods

Competencies:

At the end of this sub unit, students should be able to:

- Apply the concept of data handling to organize and interpret real life problems.

Introduction:

Under this topic students will apply data handling techniques in their life problems.

Teaching Notes:

Provide application problems on data handling and explain how to solve the problems as noted in the student text. Give exercise 7.4.1 and provide them proper feedback. Answer for exercise 7.4.1

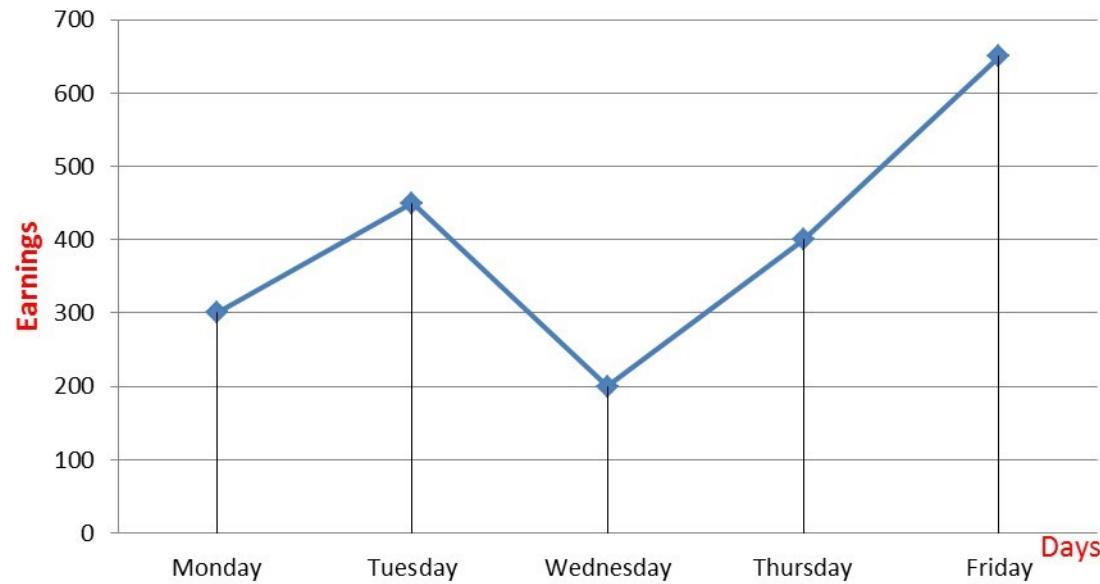
$$1. \text{ Mean} = \frac{1147}{8} = 143.375$$

Mode = no

Median = 141

Range = $160 - 130 = 30$

2. a.



b. Tuesday and Friday

$$3. \text{ Mean} = \frac{84}{6} = 14$$

$$\text{Median} = 15.5$$

Mode = 18

Range = 20

$$3.C1 = \frac{108 \times 3000}{360} = 900 \quad C2 =$$

$$\frac{54 \times 3000}{360} = 450$$

$$C3 = \frac{72 \times 3000}{360} = 600$$

$$C4 = \frac{36 \times 3000}{360} = 300$$

$$C5 = \frac{90 \times 3000}{360} = 750$$

Assessment

Give different application problems to the students and check their performance and based on their performance to take remedial measures.

Answer for review exercise

I. True or False

1. False
2. False
3. True
4. True
5. True

II. Work out

6. a. $\frac{56 \times 1440}{360} = 224$

b. $\frac{204 \times 1440}{360} = 816$

7. a. For education = $\frac{54 \times 720,000}{100}$

= 388,800,000

b. For public health = $\frac{24 \times 720,000}{100}$

$$= 172,800,000$$

c. For social service = $\frac{14 \times 720,000}{100} = 100,800,000$

d. For social service = $\frac{8 \times 720,000}{100}$

$$= 57,600,000$$

8. The sum of 7 numbers = $20 \times 7 = 140$

The sum of 5 numbers = $44 \times 5 = 220$

The sum of 12 numbers = $140 + 220 = 360$

The mean of 12 numbers = $\frac{360}{12} = 30$

9. a. Mean = 5, Mode = 3

Median = 4.5

Range = 8

b. Mean = 9.9,

Mode = 7

Median = 9.5

Range = 11

c. Mean = 16.25, Mode = 17 Median = 16.5

Range = 10

10. a. 46 and 47

b. Mean = $\frac{376}{8} = 47$

Range = $48 - 44 = 4$ 11.a.

Mode = 24

b. $\frac{286}{11} = 26$

12. a. Mean = 51.375

Mode = 32

Median = 40.5

b. Mean = 49

Mode = has no mode

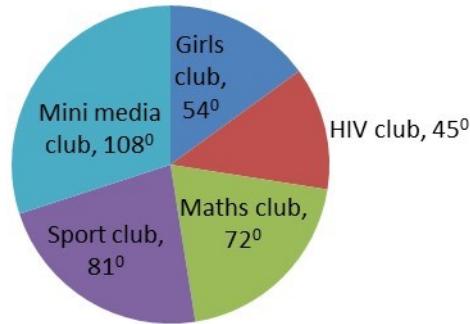
Median = 43.5

13. $\frac{x+(x+3)+(x-5)+2x+3x}{5} = 8$

$$8x - 2 = 40$$

$$x = 5.25$$

14.



$$15. \text{ a. } \frac{5+7+4+1+n+5}{6} = 6$$

$$n + 22 = 36$$

$$n = 14$$

b. n=4

c. n=2

d. $\frac{2.6+3.5+n+6.2}{4} = 4$

$n + 12.3 = 16$

$n = 3.7$

16. a, $28 - 18 = 10$

b. Mean = $\frac{168}{7}$

= 24

c. Friday

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Mathematics

Grade 7

INTRODUCTION

Ethiopia has been working towards accelerated improvement in educational provisions, with particular emphasis on providing "quality and equitable education for all" which is instrumental to develop 21st century competencies and move the society forward. In line with this, the major aim of this curriculum framework developed for the middle level education system of the country is to produce citizens who are innovative, inventive, productive, self-directed, responsible and active contributors to national development. Moreover, it is within the domain of the most important aims of the curriculum framework enabling learners become creative and critical thinkers, decision makers as well as problem solvers.

The document has 3 issues which deal with the major components of mathematics curriculum including minimum learning competence, content flowchart and syllabi based on core skill of 21st century learners, cross- cutting and nationally pressing issues. The mathematics curriculum is mainly based

upon the learner profile developed for the purpose of indicating the various competencies expected to be developed at the end of middle level education below.

Middle level Education Student Profile on Mathematics

Middle level education represents the period of puberty which is accompanied by physical, emotional and mental changes. The education provided should take this into account and facilitate adjustment for the changes and ensure success and continuity in learning. In addition to this, the education at this level is intended to consolidate knowledge, attitude and skills developed during previous learning. It is also meant for helping students acquire knowledge, attitudes and skills which make them ready for meeting the rigors of learning and developing foundational career, technical and entrepreneurial skills in secondary schools. Therefore, at the end of middle level education, students would have the following profile:

- ☞ Apply digital literacy skills for communication and learning,

- ☞ Apply knowledge and skills of logic, mathematics to investigate, experiment and solve personal, social and environmental problems,
- ☞ Utilize scientific, technical and entrepreneurial knowledge and skills for further training, employment, innovation and entrepreneurship
- ☞ Use indigenous knowledge, values and skills to interact and solve personal and community problems
- ☞ Understand and interact with social realities and the physical environment for utilization and protection,
- ☞ Possess knowledge, attitudes and skills useful for learning and training in secondary school

Grade 7

Learning Objectives for Grade 7

At the end of grade 7, students should be able to:

- ☞ Understand the concept of set.
- ☞ Define and represent integer numbers on the number line.
- ☞ Add, subtract, multiply and divide using integer numbers.
- ☞ Solve linear equations with positive coefficients of the variable using the rules of transformations.
- ☞ Solve simple problems of ratios and proportions

- ☞ Solve problems related to percentages including problems on profit, loss, simple interest, compound interest, Income Tax, procurement and climate change.
- ☞ Construct and describe the properties of four-sided figures.
- ☞ Calculate perimeters and areas of four-sided figures.
- ☞ Identify the congruence of two given triangles by using the tests for congruence SAS, SSS and ASA
- ☞ Collect data and construct simple pie charts for a given data.
- ☞ Calculate the mean, mode, median and range of a given data.

Unit 1: Basic Concepts Sets(*12 periods*)

Unit Outcomes: Students will be able to:

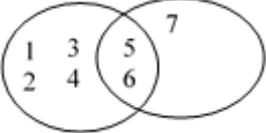
- understand the concept of set.
- describe the relation between two sets
- perform two operations (intersection & union) on sets.

| Competencies | Content | Teaching / Learning activities and Resources | Assessment |
|--------------|---------|--|------------|
|--------------|---------|--|------------|

Grade 7 teacher's Guide

| Competencies | Content | Teaching / Learning activities and Resources | Assessment |
|--|--|--|--|
| <ul style="list-style-type: none"> • explain what is meant by "set" & "element" | 1.1 Introduction to sets <i>(3 periods)</i> | <ul style="list-style-type: none"> • Encourage students to give their own examples of set (like the set of female students in the class) • Guide students to come to an idea of empty set and its symbol by using eg. like The set of students in your class who are 100 years old. • Assist students to use the appropriate symbols and terms related to a set. | <ul style="list-style-type: none"> • Ask students to give examples of sets. |
| <ul style="list-style-type: none"> • describe relationship among sets such as proper subset, subset, equal and equivalent sets. | 1.2 Relations among sets <i>(4 periods)</i> | <ul style="list-style-type: none"> • Let students identify and practice the notion of sub set, proper subset, equal and equivalent sets using several illustrative examples. (the number of elements may not be greater than 3). Example - let $A = \{a, b\}$, determine the proper sub set and subsets of sets $A, \{a\}, \{b\}, \{a, b\}, \emptyset$, are subsets of set A, $\{a\}, \{b\}, \emptyset$ are the proper sub sets of set A. | <ul style="list-style-type: none"> • Give problems to determine, subsets, proper subsets, equal sets and equivalent sets. |

Grade 7 teacher's Guide

| Competencies | Content | Teaching / Learning activities and Resources | Assessment |
|--|---|---|--|
| <ul style="list-style-type: none"> • determine the intersection of two given sets. • determine the union of two given sets. • usevenn diagram to represent union and intersection of two set. | <p>1.3 Operations on sets <i>(5 periods)</i></p> <p>1.3.1 The intersection of sets</p> <p>1.3.2 The union of sets</p> | <ul style="list-style-type: none"> • Let students practice to determine intersection and union of two sets. • Assist students to represent the intersection and union of two sets by using Venn diagram. • Help students to solve problems of intersection and union of sets from a given diagram you may use examples like:  <p>Find A = _____</p> <p>B = _____</p> <p>$A \cap B =$ _____ and and vise - versa.</p> <p>$A \cup B =$ _____ and and vise - versa.</p> <p>Assist students to practice in solving simple word problems. You may use examples like:</p> <p>In a certain school member of Mathematics club are Obang, Kebede, Aster and Chaltu and the members of English club are Ahmed, Obang, Wolango and Kebede</p> | <ul style="list-style-type: none"> • Ask students to determine the union and intersection of two sets and represent them by Venn diagram. |

Grade 7 teacher's Guide

| Competencies | Content | Teaching / Learning activities and Resources | Assessment |
|--------------|---------|---|------------|
| | | then use Venn diagram to represent the situation. | |

Unit 2: Integers (34 periods)

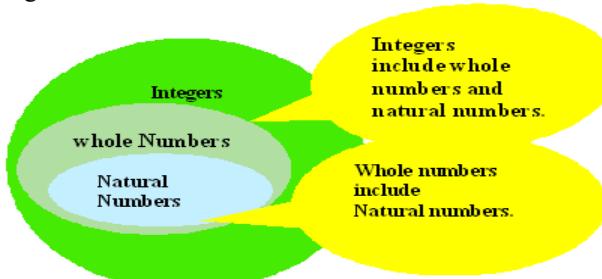
Learning Outcomes: At the end of this unit, learners will be able to:

Grade 7 teacher's Guide

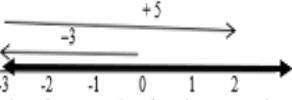
- Understand the concept of integers
- Represent integers on a number line
- Identify the commutative, associative and distributive properties of operation of integers
- Perform the operations addition and subtraction on integers.
- Apply integers in the real-life situation

| Competencies | Contents | Learning Strategies | Assessment |
|--|---|--|--|
| <ul style="list-style-type: none">• Describe whole and natural numbers• Identify the relation between whole and natural numbers | 2.1 Revision of Whole and Natural Numbers <i>(3 periods)</i> | <ul style="list-style-type: none">• Start the lesson by giving the application of the unit.• Assist students to revise the concept of whole and natural numbers• Assist students to revise counting backward and forward of numbers• Introduce the concept and the symbol of sets, elements, the relation between two sets, intersection and union of two sets as well as venn diagram. | <ul style="list-style-type: none">• Ask students orally to describe and identify whole and natural numbers.• Ask your students to solve real-life applications of integers in terms of temperature, altitude and money to express positive and negative numbers• Provide feedback for learners to improve their learning |

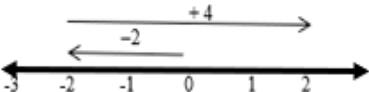
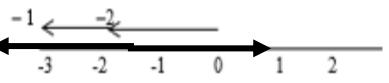
Grade 7 teacher's Guide

| Competencies | Contents | Learning Strategies | Assessment |
|--|---|---|--|
| <ul style="list-style-type: none"> • Apply real-life applications of integers in terms of temperature, altitude and money to express positive and negative numbers • Define the set of integers • Indicate integers on the number line. • Describe the relations, among natural numbers, whole numbers and integers ($N \subset W \subset Z$) | <p>2.2 Introduction to Integers <i>(4 periods)</i></p> | <ul style="list-style-type: none"> • Guide a group of students to give real-life applications of integers in terms of temperature, altitude and money to express positive and negative numbers • Introduce the concept integer and the symbol and defining the set of integers. $Z = \{..., -3, -2, -1, 0, 1, 2, 3, ...\}$ • Assist students to represent integers on the number line. • Guide students to discuss and communicate the relation between the set N, W and Z and show using Venn diagram.  | <ul style="list-style-type: none"> • Ask students to describe and represent integers on a number line. • Ask your students to relate the set N, W and Z and show them using Venn diagram. • Provide feedback for learners to improve their learning |
| <ul style="list-style-type: none"> • Compare and order integers using a number line • Determine the predecessor and successor of a given integer. | <p>2.3 Comparing and Ordering Integers <i>(5 periods)</i></p> | <ul style="list-style-type: none"> • Assist students to practice by comparing and ordering integers by plotting them on the number line. • Engage the students to determine the predecessor and successor of a given integer. • Project: Give students as a project to register the daily temperature of the cities from Ethiopian mass media and answer the following. <ul style="list-style-type: none"> (i) Graph the temperature for each city on the number | <ul style="list-style-type: none"> • Ask students to compare and order integers by plotting them on the number line. • Ask your students to determine the predecessor and |

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| <ul style="list-style-type: none"> • Find the sum of integers. • Find the difference between two integers. | <p>2.3 Addition and Subtraction of Integers <i>(8 periods)</i></p> | <p>line.</p> <p>(ii) Which city was coldest? (iii) Which city was warmest?</p> <ul style="list-style-type: none"> • Introduce students to practice identifying 'plus' sign and 'positive' sign; 'negative' sign and 'minus' sign. eg. $3 + 5$, $3 - 5$, $-3 - 5$, $-3 + 5$, $3 + (-5)$, $-3 + (-4)$ • Assist students to practice adding common signs eg. $-1 + (-2)$ means '-1 add (-2)' start at -1 and go 2 units to the left $-1 + (-2) = -3$  <ul style="list-style-type: none"> • Assist students to practice adding different signs eg. $-3 + 5$ means '-3 add 5' start at -3 and go 5 units to the right $-3 + 5 = 2$  | <p>successor of a given integer.</p> <ul style="list-style-type: none"> • Provide constructive feedback for learners to improve their learning • Give exercise as home work <ul style="list-style-type: none"> • Ask students to add two common sign integers and two different sign integers. • Ask students to subtract two common sign integers and two different sign integers. • Provide feedback for learners to improve their learning • Give homework or class work Exercise problems on addition and subtraction of integers |

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| | | <ul style="list-style-type: none"> Assist students to practice subtracting common signs. eg. $-2 - (-4)$ means '-2 subtract -4' means that '-2 add 4' start at -2 and go 4 units to the right $-3 + 4 = 2$  <ul style="list-style-type: none"> Assist students to practice subtracting different signs. eg. $-2 - 1$ means '-2 subtract 1' start at -2 and go 1 unit to the right $-2 - 1 = -3$  | |
| | | <ul style="list-style-type: none"> Encourage students to come to conclude Find the difference between $3,000^{\circ}\text{F}$ and -250°F, the temperatures the space shuttle must endure. <ul style="list-style-type: none"> When adding two numbers with the same sign, what sign do you use for the sum? Critical Thinking. Choose any two negative integers. Is the sum of the integers less than or greater than the value of either of the integers? Will this be true no matter which integers you choose? Explain. | |
| <ul style="list-style-type: none"> Solve problems on multiplication of integers. Identify the commutative and associative property of | 2.5 Multiplication and Division of Integers (8 periods) | <ul style="list-style-type: none"> Introduce to students the rules of multiplication of signs of integers such as: <ul style="list-style-type: none"> $(-1)(-1) = 1$ $0 = -1(0)$ | <ul style="list-style-type: none"> Give multiplicative exercise and ask students to multiply common sign integers |

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| <p>multiplication.</p> <ul style="list-style-type: none"> Identify the distributive property of multiplication over addition. Divide integers whose quotient as expressed in decimals (2 decimal places) | | $0 = -1(-1 + 1)$ $0 = (-1)(-1) + (-1)(1)$ $0 = (-1)(-1) + (-1)$ <p>So, $(-1)(-1) = 1$.</p> <ul style="list-style-type: none"> Assist students to find the following rules of multiplication: <ul style="list-style-type: none"> $(-1)(1)$ $(1)(-1)$ $(1)(1)$ Assist students to practice multiplying integers using number line eg. $(2)(-2)$ To graph -2, you would start at 0 and move 2 units to the left. $2(-2)$ means $(-2) + (-2)$. To graph $2(-2)$, start at 0 and move 2 two times to the left. Therefore, $(2)(-2) = -2$ <ul style="list-style-type: none"> You can let students to work out problems involving multiplication up to 3 digit number from real life. Assist students in group to discuss and communicate the commutative and associative property of multiplication. Allow students to discuss and communicate the distributive property of multiplication over addition Assist students to practices give examples like: a) $2 \times 8 \times 5 = (2 \times 5) \times 8 = 10 \times 8 = 80$ | <p>and two different sign integers.</p> <ul style="list-style-type: none"> Ask students the commutative and associative property of multiplication. Ask students the distributive property of multiplication over addition. Ask students to discover that division is not commutative as well as associative. Provide descriptive feedback for learners to improve their learning Give homework or class work on multiplication and division of integers |

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| | | <p>b) $7 \times 6 + 3 \times 6 = (7 + 3) \times 6 = 10 \times 6 = 60$</p> <ul style="list-style-type: none"> • Assist students to exercise division of integers by two, three or four digits number. • Assist students to divide integers and express the quotients in decimal terminating after 2 decimal places. <p>Critical Thinking. Guide a group of students discuss and communicate to discover that division is not commutative as well as associative.</p> | |
| <ul style="list-style-type: none"> • Describe even and odd integers • Identify even and odd integers • Identify the property of operations on even and odd integers. | <p>2.6 Even and odd Integers <i>(6 periods)</i></p> | <ul style="list-style-type: none"> • Assist students to differentiate even and odd numbers by using examples from their experience like: <ul style="list-style-type: none"> ○ grouping themselves according to their roll number where 1 group is formed by students having even roll numbers and the other by students having odd roll numbers • Encourage students to list the first few even numbers and odd numbers and let them see the pattern of these numbers. • Guide students to conclude that: <ol style="list-style-type: none"> 1. even + even = even 2. odd + odd = even 3. odd + even = odd = even + odd • Critical Thinking. Guide group of students to discuss and communicate to answer the following questions: <ol style="list-style-type: none"> 1. even–even = ? 2. odd–odd = ? 3. odd– even = ? 4. even– odd = ? 5. even×even = ? | <ul style="list-style-type: none"> • Ask students to differentiate even and odd integers from their experience. • Ask students to list the first few even numbers and odd numbers and conclude the pattern of these numbers. • Ask students the sum, difference, and multiplication of even and odd integers. • Provide descriptive feedback for learners to improve their learning. <p>Give students various exercise problems to</p> |

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| | | 6. even \times odd = ? | add, subtract and multiply even and odd integers and check their work. |

Unit 3: Ratio, Proportion and Percentage (27 periods)

Unit Outcomes:-At the end of this unit, students will able to:

- Understand the notions of ratio and proportions.
- Solve problems involving ratio and proportion
- Describe a percentage
- Solve problems involving percentages.
- Relate fractions, decimals and percentages to real life situations
- Apply the concept of percentage in solving real life problems

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| <ul style="list-style-type: none"> • Explain the notation of ratio • Visualizes the ratio of 2 given numbers. • expresses ratios in their simplest forms. • finds the missing term in a pair of equivalent ratios. | 3.1 Ratio and Proportion(7 periods) 3.1.1 Ratio 3.1.2 Proportion | <ul style="list-style-type: none"> • Start the lesson by giving the application of the unit. • Divide students into small groups and let leaders present their ideas to the class for discussion. Define ratio as a comparison of two quantities? They may use examples like: The ratio of boys to girls in their class is say 15:30 and write the final answer in its simplest form as 1:2. Discuss real life application of ratio and proportion? • Encourage students to interpret scales written in ratio from their school map. • Engage students to revise proportion and factor (constant) | <ul style="list-style-type: none"> • Take note of the degree of involvement of learners in each activity • Give activities and problems as class and homework. Observe learners while they are performing group work and |

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| | | <p>of proportionality.</p> <ul style="list-style-type: none"> Let students to define proportion as equality of two ratios. | <p>present outcomes of their discussions using bar model</p> <ul style="list-style-type: none"> Record their performance Provide constructive feedback based on their performance Give different exercise problems on ratio and proportion and check their work. |
| <ul style="list-style-type: none"> visualizes percent and its relationship to fractions, ratios, and decimal numbers using models. identifies the base, percentage, and rate in a problem. | 3.2 Revision on Percentages <i>(9 periods)</i> | <ul style="list-style-type: none"> Divide students into small groups and let leaders present their ideas to the class for discussion. Define percentage as a comparison of a given part with whole amount? Let students to revise conversion of percentage to fraction and decimal using a percent bar model. Eg. Use a percent bar model to find an equivalent percent for $\frac{1}{3}$. Draw a model to represent 100 and divide it into thirds. Shade $\frac{1}{3}$. | <ul style="list-style-type: none"> Ask questions and let some students to solve routine and non-routine problems involving percentage like 10%, 25%, 50%, 150% of a given quantity using appropriate strategies and tools Provide constructive feedback for learners to improve their learning. Give different exercise problems on the use |

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| | | | of the concept of base, percent and percentage and follow up the performance of students |
| <ul style="list-style-type: none"> solves routine and non-routine problems involving percentage using appropriate strategies and tools | | <p>0 $\frac{1}{3}$ 1 </p> <p>$\frac{1}{3}$ of 100 = $33\frac{1}{3}$, so $1/3$ of 100% = -----</p> <p>Tell which operation you can use to find $\frac{1}{3}$ of 100 Then find $\frac{1}{3}$ of 100% = -----</p> <ul style="list-style-type: none"> Let the students to become familiar with the concepts and terms such as "base", "amount," "percent" and "percentage" of a given base using the concept of proportion. You may use examples like: What amount is 25% of 500 Birr? Here B = 500 Birr, Percent = 25, amount = A? $\frac{A}{B} = \frac{P}{100}$ i.e. $\frac{A}{500} = \frac{25}{100}$ Engage students to calculate the percentage of a given quantity. They may use example like: Abebe spends 300 birr for transportation in a month. If his salary is Birr 6000. What is his percentage expenditure for transport? Engage students to solve different word problems on | |

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| | | <p>Business, taxation, insurance, Gas emissions, production, health, investment etc. using problem solving methods</p> <ul style="list-style-type: none"> • Divide students into small groups and let leaders present their ideas to the class for discussion about the concept of Ethiopian profit and loss, income Tax, Turn Over Tax, VAT ▪ Let students provide feedback on presented ideas • Let two students summarize the ideas and that be followed by a final summary of the teacher | |
| <ul style="list-style-type: none"> • Apply the concept of percentage to solve real life problems | <p>3.3 Application of Ratio, Proportion and Percentage (<i>11 periods</i>)</p> <p>2.3.1 Calculating Profit and Loss as a Percentage</p> <p>2.3.2 Simple Interest</p> <p>2.3.3 Compound Interest</p> <p>2.3.4 Ethiopian Income Tax, Turn Over Tax, VAT</p> | <ul style="list-style-type: none"> • Engage students to solve different word problems on Gas emissions, etc. using problem solving method. | <ul style="list-style-type: none"> • Ask group of students to work the real-life application problems. • Observe students while they are working together • Ask your students to communicate their result • Provide feedback for learners to improve their learning • Give different exercise problems on application of ratio and proportion and percentage and check their work. |

Unit 4: Linear Equations (*23 periods*)

Unit outcomes: At the end of this unit, students will able to:

- Identify variables, terms and variables in algebraic expressions
- Simplify algebraic expressions
- Develop their skills on rearranging and solving linear equations.
- Apply the rules of transformation of linear equations for solving problems
- Draw a line through the origin whose equation is given.
- Apply real-life situations in solving linear equations

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| <ul style="list-style-type: none"> • Describe algebraic terms and expressions • Simplify algebraic expressions with and without brackets with one variable. | <p style="text-align: center;">4.1 Algebraic Terms and Expressions <i>(4 periods)</i></p> <p style="text-align: center;">4.1.1 Use of Variables in Formula</p> <p style="text-align: center;">4.1.2 Variables, Terms and Expressions</p> | <ul style="list-style-type: none"> • Start the lesson by providing the application of the unit. • Encourage students discuss about to relate the real-life situations with one variables. • Assist students to use internet and explain the concepts like terms and unlike terms in an expression. • Assist students to simplify given expressions by collecting like terms. <p style="text-align: center;">Example: Simplify $3x + 2y - 4x + 5y$ $3x \text{ and } 4x \text{ are like terms with } 3x - 4x = -x$ </p> | <ul style="list-style-type: none"> • Ask students to change simple word problems in to mathematical expressions • Give exercises on simplification of algebraic expressions involving with and without bracket with one variable • Provide feedback for |

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| | | <p style="text-align: center;">$2y$ and $5y$ are like terms with $2y + 5y = 7y$ $3x + 2y - 4x + 5y = -x + 7y$</p> <ul style="list-style-type: none"> • Assist students to solve real-life problems using variables. <p>Example: Three men took a 20,000 Birr project and if two of them get equal amount and one of the project coordinators get 2,000 Birr more of the others. Find the share of each.</p> <p>Let the share of each of the two men be x, then the share of the coordinator is $x + 2000$.</p> $\begin{aligned} \text{then } x + x + (x + 2000) &= 20000 \\ 3x + 2000 &= 20000 \\ 3x + 2000 - 2000 &= 20000 - 2000 \\ 3x &= 18000 \\ \frac{3x}{3} &= \frac{18000}{3} \\ x &= 6000 \end{aligned}$ | <p>learners to improve their learning</p> |
| | | <p>Therefore, the share of the two men is 6000 Birr each and the share of the coordinator is 8000 Birr.</p> <p>Project as a critical thinking: Give group of students as a project to go to one of woodwork or metalwork work shop production. Students should select one type of production, and ask the workshop personnel the amounts of money spend producing the selected material such as: raw material cost, man power cost, electric cost, etc. Ask also the number of the materials produced per month (x) and selling price for each material. Write an expression that shows the profit from selling the x materials.</p> | |

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| <ul style="list-style-type: none"> Define a linear equation Solve linear equations involving brackets | 4.2 Solving Linear Equations (<i>7 periods</i>) 4.2.1 Linear Equations Involving Brackets | <p>Students discuss the rules of distributive property to remove brackets.</p> $a + (b + c) = a + b + c$ $a - (b + c) = a - b - c$ <ul style="list-style-type: none"> Guide students to apply distributive property, order and collect like terms in simplifying and solving linear equations. <p>Example: Solve $-3(x - 5) + 1 = 4 + x$</p> <p>$-3x + 15 + 1 = 4 + x$ Distribute -3 to the terms within the parentheses.</p> <p>$-3x + 16 = 4 + x$ Simplify.</p> <p>$-3x - x + 16 = 4 + x - x$ Subtract x from both sides</p> <p>$-4x + 16 - 16 = 4 - 16$ Subtract 16 from both sides</p> <p>$-4x = -12$ Divide both sides by -4</p> <p>$x = 3$</p> <p>Eg. 1</p> <ul style="list-style-type: none"> Ask students to discuss in groups and communicate as a Critical Thinking such as: Three times the quantity $y + 7$ equals four times the quantity $y + 2$. What values of y makes the sentences true? Assist students to solve real-life problems to solve linear equations involving bracket. | <ul style="list-style-type: none"> Give exercises on solving linear equations which involve brackets and check their answers. Ask students to solve real-life applications of linear equations involving brackets. Provide constructive feedback for learners to improve their learning Give exercise problems to solve linear equation |
| <ul style="list-style-type: none"> Solve linear equations involving fractions | 4.2.2 Linear Equations Involving Fractions | <ul style="list-style-type: none"> Guide students to solve an equation with the variable on both sides that involves fractions, start by eliminating the fractions from the equation. <p>Ask students to discuss in groups and communicate as a Critical Thinking such as when solving an equation using the Distributive</p> | <ul style="list-style-type: none"> Ask your students to solve linear equations involving fraction. Ask students to solve real-life applications of linear equations |

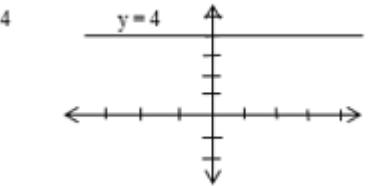
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| | | <p>Property that involves distributing fractions, usually the first step is to multiply by the LCD to eliminate the fractions in order to simplify computation. Is it necessary to do this to solve: $\frac{1}{2}(4x + 6) = \frac{1}{3}(9x - 24)$. Why or why not?</p> <p>Example: Solve $\frac{7}{10}x + \frac{3}{2} = \frac{3}{5}x + 2$</p> <p>Determine the least common multiple of the denominators: LCM (10, 5, 2) = 10</p> <p>Multiply both sides of the equation by the LCM.</p> $10\left(\frac{7}{10}x + \frac{3}{2}\right) = 10\left(\frac{3}{5}x + 2\right)$ $7x + 15 = 6x + 20 \quad \text{Distribute 10 to the terms within the parentheses}$ $7x + 15 - 15 = 6x + 20 - 15 \quad \text{Subtract } -15 \text{ from both sides}$ $7x - 6x = 6x - 6x + 5 \quad \text{Subtract } 6x \text{ from both sides}$ $x = 5$ <ul style="list-style-type: none"> • Assist students to solve real-life problems to solve linear equations involving fractions. | <p>involving fractions.</p> <ul style="list-style-type: none"> • Provide descriptive feedback for learners to improve their learning • Give different exercise problems on linear equations involving fractions and check their work. |
| <ul style="list-style-type: none"> • Describe the Cartesian coordinate system • Draw the four quadrants of the Cartesian plane and mark the origin, x -axis and y- axis • Plot points on the Cartesian coordinate plane given their coordinates | <p>4.3. Cartesian Coordinate System <i>(7 periods)</i></p> <p>4..3.1 The Four Quadrants of the Cartesian Coordinate Plane</p> <p>quadrant.</p> | <ul style="list-style-type: none"> • Assist students to realize that the x - axis and y-axis divide the coordinate plane into four quadrants and to read and plot points in the coordinate's plane. • Guide students to describe the sign of coordinates (x, y) in each quadrant. | <ul style="list-style-type: none"> • Ask students to identify the quadrants of the Cartesian plane. • Provide descriptive feedback for learners to improve their learning • Give different exercise |

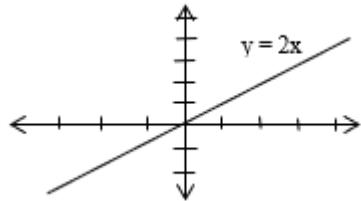
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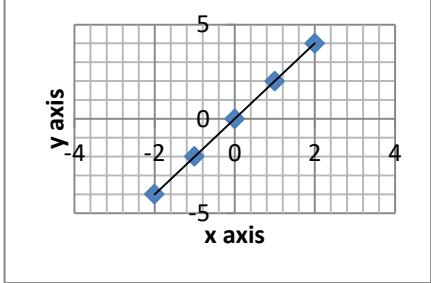
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| | | | <p>problems on the Cartesian coordinate system and follow up the performance of students</p> |
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| <p>Draw the graph of linear equations like $y = mx$ on Cartesian coordinate plane using table values manually and computer applications.</p> | <p>4.3.2 Coordinates and Straight Lines</p> | <ul style="list-style-type: none"> Show the students how to draw a line in a Cartesian Coordinate plane with y-is constant and x values varies. Example: $y = 4$ <table border="1" data-bbox="851 382 1498 451"> <tr> <td>x</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr> <td>y</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td></tr> </table>  <ul style="list-style-type: none"> Guide the students to draw a vertical line and come to the conclusion that $x = b$ where $b \in Q$ is an equation for a vertical line. Assist students to draw a line whose equation is of the form $y = mx$, where $m \in Q$ by the following steps: <ol style="list-style-type: none"> 1. Make table of values for easy x coordinates 2. Use the equation $y = mx$ to calculate the y value 3. Plot the points 4. Draw the lines through these points | x | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | y | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | <ul style="list-style-type: none"> Ask your students to draw linear equations like $y = mx$; m is an integers in a Cartesian coordinate plane and compare their result <ol style="list-style-type: none"> a) by using table values manually b) by using computer applications Provide descriptive feedback for learners to improve their learning Give different exercise problems on the draw the graph of line equation $y = mx$ on Cartesian coordinate system and follow up the performance of students |
| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | | | | | | | | | | | | | |
| y | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | | | | | | | | | |

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| | | <p>Example:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td>y</td> <td>-4</td> <td>-2</td> <td>0</td> <td>2</td> <td>4</td> </tr> </table> <p>Draw the line $y = 2x$</p>  <ul style="list-style-type: none"> • Guide students to draw the graph of $y = 2x$ by using software such as computer Excel or GeoGebra or Matlab or Mathematica, etc and compare your result with manual drawing. Below is the graph of $y = 2x$ using computer Excel | x | -2 | -1 | 0 | 1 | 2 | y | -4 | -2 | 0 | 2 | 4 | |
| x | -2 | -1 | 0 | 1 | 2 | | | | | | | | | | |
| y | -4 | -2 | 0 | 2 | 4 | | | | | | | | | | |

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| | |  <ul style="list-style-type: none"> • Assist students to discuss in groups and communicate the following as Critical Thinking to generalize the line with equation of the form $y = mx$: <ul style="list-style-type: none"> ◦ passes through the origin ◦ the number m is called the slope of the line ◦ observe the nature of the lines when m is integers . • Help the students to discuss in groups and communicate the following as Critical Thinking to write an equation for a line that contains points whose coordinates are $(-2, -6), (-1, -3), (0, 0), (1, 3), (2, 6), (3, 9)$. Therefore, $y = 3x$ is the equation this line. | |
| <ul style="list-style-type: none"> • Apply linear equations in the real-life situation • Solve linear equations real-life problems | 4.4 Applications of Linear Equations <i>(5 periods)</i> | <ul style="list-style-type: none"> • Assist students to work in groups and communicate the solutions of the word problems in agriculture, engineering, business, education, day to day activities, etc. • Guide students to discuss and in groups and communicate the solution of the problems like road transport, business, etc. | <ul style="list-style-type: none"> • Ask group of students to solve real-life application problems in terms of linear equations. • Observe students while they are working together |

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| | | <ul style="list-style-type: none">• Assist students to discuss in groups on causes and effects of climate change, and protection of the environmentGuide students to solve application problems like the Rise of Atmospheric Carbon Dioxide; Rising of Temperature; Rise of Sea Level, etc. | <ul style="list-style-type: none">• Ask your students to communicate their result• Provide descriptive feedback for learners to improve their learningGive different exercise problems on application of linear equations and check their work. |

Unit 5: Perimeter and Area of Plane Figures (28 periods)

Unit Outcomes: At the end of this unit, learners will able to:

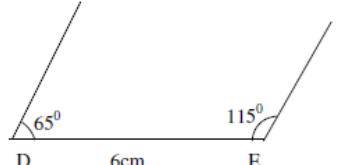
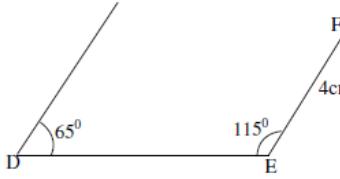
- Classifies the different kinds of angles.
- Constructs and describe properties of four- sided figures
- Find the perimeter of triangle, parallelograms, trapezium, rhombus and composite shapes
- Derive formula for area of triangle, parallelograms, trapezium and rhombus.
- Calculate areas of triangle, parallelograms, trapezium, rhombus and composite shapes
- Calculate circumference and area of circle.
- Apply the concept of area and perimeter of Plane figures in solving real life problems

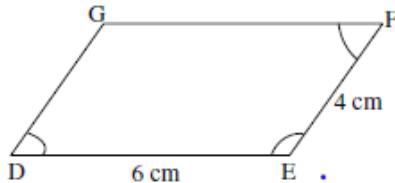
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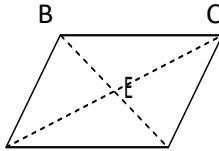
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| <ul style="list-style-type: none"> • classifies the different kinds of angles. | <p>5.1. Revision of Triangles <i>(3 periods)</i></p> | <ul style="list-style-type: none"> • Start the lesson by giving the application of the unit. • Encourage students to revise the properties of triangles | <ul style="list-style-type: none"> • Take note of the degree of involvement of learners in each activity |
| constructs and describe properties of four-sided figures | <p>5.2 Four - sided Figures <i>(4 periods)</i></p> | <ul style="list-style-type: none"> • Divide students into small groups and let leaders present their ideas to the class for discussion on the term of Four - sided Figures l and the concepts of diagonals, interior angles, and adjacent sides and opposite sides of a four - sided figures like squares, rectangles, parallelogram trapezium and kite • Eg1.. Let the students to explain the term parallelogram. • Divide students into small groups and let students to construct a parallelogram with given dimensions: <ul style="list-style-type: none"> a). using ruler, protractor and pair of compasses. b). using Geometry sketchpad (GSP) c) using GeoGebra software <p>Eg2. Construct a parallelogram DEFG with $DE = 6\text{cm}$, $EF = 4\text{cm}$, $m\angle D = 65^\circ$</p> <p>A) using ruler, protractor and pair of compasses</p> <ol style="list-style-type: none"> 1) . Draw line segment AB 6cm  2) Construct $m\angle GDE = 65^\circ$ and $m\angle DEF = 115^\circ$ | <ul style="list-style-type: none"> • Ask questions and let some students how to construct and describe properties of parallelogram • Provide constrictive feedback for learners to improve their learning. • Give project on construction of parallelogram in the given dimension can be given and the teacher checks the performance of students |

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| | |  <p>A horizontal line segment DE is shown. At point D, there is an angle of 65°. At point E, there is an angle of 115°.</p> | |
| | | <p>3) Mark point F such $EF = 4\text{cm}$</p>  <p>A horizontal line segment DE is shown. Point F is located above point E. A line segment EF is drawn such that $EF = 4\text{cm}$.</p> <p>4) Construct $m\angle EFG$ where measure is 65° where G is the intersection of DG and FG, then DEFG is the required parallelogram.</p> | |

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| | |  <p>b) using GSP</p> <ul style="list-style-type: none"> Construct a segment by selecting the Segment tool from the toolbar. First, click the first point. Then click on a second point to draw the segment. Next, use one of the endpoints of the original segment as the first point for the new segment and click on a second point to construct the new segment. Construct a parallel line to the original segment by first highlighting the original segment and the endpoint not on that segment. Then select Parallel Line from the Construct menu. Construct a parallel line to the second segment by highlighting the second segment and the point not on it. Then select Parallel Line from the Construct menu. Next, construct a point on the intersection of the two lines. Use the Point tool from the toolbar to select the point where the two lines intersect. Construct the interior of the parallelogram by highlighting all four points and selecting Quadrilateral Interior under the Construct menu. <p>✓ Encourage students to come to the conclusion that:</p> <ul style="list-style-type: none"> the opposite sides of a parallelogram are equal. | |

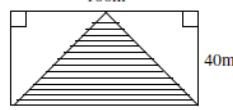
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| | | <ul style="list-style-type: none"> • the opposite angles of a parallelogram are equal. • the adjacent angles are supplementary • the diagonals of a parallelogram bisect each other by measurement • Allow the students to explain the properties of parallelogram using paper-folding | |
| | | <p>Eg.3 <i>The diagonals of a parallelogram bisect each other.</i></p> <ul style="list-style-type: none"> • Guide students to : Fold the diagonals of a given parallelogram ABCD. Compare the lengths of BE and AE by folding the bisector of angle BEA. Are the diagonals equal in length? Fold a line perpendicular to ED through E. Compare the lengths of EB and ED by folding along this perpendicular line. Repeat the same procedure for the other diagonal AC. Do the diagonals of a parallelogram bisect each other? <div style="text-align: center; margin-top: 20px;">  </div> <ul style="list-style-type: none"> • Encourage the students to revise the definition of rectangle and square. And to define a rhombus drawing | |

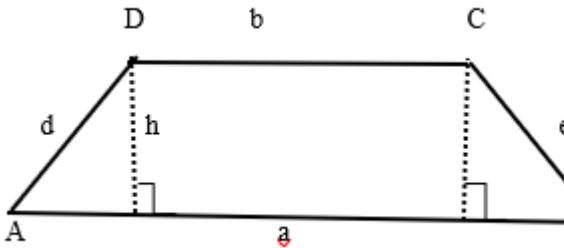
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| | | <p>its diagram using GSP.</p> <ul style="list-style-type: none"> Engage students in constructing and explaining the properties of rectangles, squares, rhombuses trapezium and kite.in similar manner to parallelogram Let students identify the relationship between a parallelogram, rectangles, squares, rhombuses, trapezium and kite. | |
| <ul style="list-style-type: none"> solves routine and non-routine problems involving Perimeter and area of four-sided figures | <p>5.3 Perimeter and Area of Four-sided Figures (8 periods)</p> | <ul style="list-style-type: none"> At the beginning give to students' definition as well as the application of perimeter & area of plane figures such as: Perimeter is the length of the boundary of a closed figure whereas area of a closed figure is the number of square units inside that closed figure. Knowing about perimeter and area of plane figure can be useful in your daily life. Daily life examples for area and perimeter: Fencing off an area to plot a crop; since fences cost money for a given area you would want to minimize the perimeter; planning the construction of a house. Since you have to pour a concrete foundation, within the housing constraints you want to maximize the area within the constraints which are related to the perimeter (like you can only get so close to a neighbor's house, etc.); Building a barn with box stalls for horses. You would again like to minimize the building material used and build for the largest area given the amount of building material that you have planned for. | <ul style="list-style-type: none"> Ask questions and let some students the definition of perimeter and area as well as its application in their environment Provide constrictive feedback for learners to improve their learning. Give different exercise problems on perimeter and area of four-sided figures and check their work |
| | | <ul style="list-style-type: none"> Divide students into small groups and let leaders present their ideas to the class for discussion how to show perimeter and area formula for rectangle using patterns | <ul style="list-style-type: none"> Ask questions and let some students how to drive and solve |

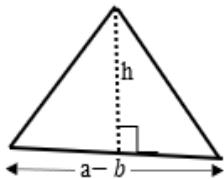
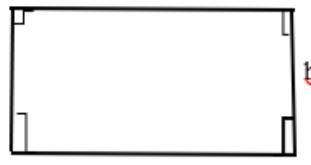
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| | | <p>of unit square</p> <p>Eg. Encourage students to use the perimeter and area formula for rectangle to derive the perimeter and area of a <i>parallelogram</i> using paper-folding and GSP Software,</p> <ul style="list-style-type: none"> • <i>Guide students to: Parallelogram is a four-sided figure and two pairs of opposite sides parallel (also has two pairs of opposite sides equal).</i> • Engage students to exercise computing the perimeter and area of a parallelogram using the formula. | <p>Perimeter and area of parallelogram.</p> <ul style="list-style-type: none"> • Provide constrictive feedback for learners to improve their learning. • Give project or exercise problems on parallelogram in the given dimension and the teacher checks the performance of students |
| | | <p>Encourage students to practice on the application of the perimeter and area formula of a parallelogram in real life situation.</p> <p>Eg. Find the area of the shaded part of the fig. given below.</p>  <p>Eg. Encourage students to revise properties of the trapezium Consider a trapezium of parallel side AB (a) and DC (b) nonparallel sides AD (d) and BC (e) and height (h) as shown by the fig. then</p> | <ul style="list-style-type: none"> • Ask questions and let some students how to drive and solve Perimeter and area of trapezium. • Provide constrictive feedback for learners to improve their learning. • Give project or exercise problem on Perimeter and Area of Trapezium and the |

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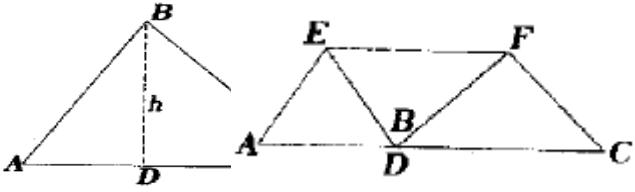
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| | |  <p>i) Encourage students to deduced the basic concept of perimeter (P) of a trapezium (i.e) the perimeter of a trapezium, is the total distance around it) $P = AB + BC + DC + AD$ $P = b + d + a + e$</p> <p>ii) Encourage students to use the area formula for rectangle and triangle to derive the area formula of a trapezium using paper-folding.</p> <ul style="list-style-type: none"> Let CE and DF Perpendicular to AB, Cut a triangle $\triangle EBC$ and $\triangle AFD$ and connect pieces together the triangle ends so that the trapezium is divided into a triangle and rectangle. The base of the triangle is the difference between the lengths of two parallel sides. That is $b_1 - b_2$. | teacher checks the performance of students |

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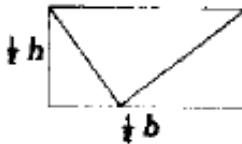
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| | |   | |
| | | <p>Therefore, Area of the trapezium</p> $ \begin{aligned} &= \text{Area of the rectangle} + \text{Area of the triangle} \\ &= bh + \frac{1}{2}(a-b)h \\ &= h(b + \frac{1}{2}(a-b)) \\ &= \frac{h(2b+a-b)}{2} \\ &= \frac{h(a+b)}{2} \\ &= (\text{Half the sum of parallel sides}) \times \\ &\quad (\text{perpendicular distance between the parallel sides}) \end{aligned} $ <ul style="list-style-type: none"> • Encourage students to exercise computing the perimeter and area of a trapezium • Help students to practice on the application of the perimeter and the area formula of a trapezium in real life situation. <p>Example Girma needs to know the area and</p> | |

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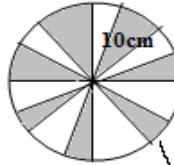
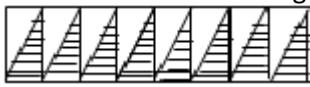
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| | | <p>perimeter of his field whose shape is a trapezium with legs 50m and 60m and parallel side 100m and 130m with height 50m. Calculate the perimeter and area of Girma's field.</p> <ul style="list-style-type: none"> • Similarly, encourage to drive and compute the perimeter and area of a rhombusesand kite. | |
| <ul style="list-style-type: none"> • solves routine and non-routine problems involving area of composite figures formed by any two or more of the following: triangle, square, and rectangle. | 5.4 Perimeters and Areas of Triangles <i>(6 periods)</i> | <ul style="list-style-type: none"> • Divide students into small groups and let leaders present their ideas to the class for discussion how to solve area of a right-angled triangle, rectangle and square. • Encourage students to use the area formula for rectangle to derive the area of a triangle using paper-folding. • <i>Guide students to:</i>a) Fold the altitude BD of the given triangle ABC $(fig. I).$ | <ul style="list-style-type: none"> • Ask questions and let some students how to drive and solve area of a right-angled triangle, rectangle and square. • Provide constrictive feedback for learners to improve their learning. |

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| <ul style="list-style-type: none"> solves routine and non-routine problems involving Perimeter of triangle. | | <p>b) Fold the vertex B onto the base of the altitude BD (fig. 2). How is line EF related to line AC? How are AE and EB related?</p> <p>c) Fold the base angle vertices A and C to the base of the angle, D (fig. 3).</p>  <p>fig. 1 fig. 2</p> <p>fig. 3</p> <p>d) In fig. 3, the rectangular shape has sides whose measures are equal to one-half the base AC of triangle ABC and one-half the altitude BD (fig. 4). What is the area of the rectangle? $A = \frac{1}{2} b \cdot \frac{1}{2} h = \frac{1}{4} bh$. How are the areas of this rectangle and the</p> | <ul style="list-style-type: none"> Give projector exercise problems on area of a right-angled triangle, rectangle and square and the teacher checks the performance of students |

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| | | <p><i>original triangle related? Area of triangle = 2 Area of rectangle. What is the area of the triangle? Area of triangle = $\frac{1}{2}bh$</i></p> | | | | | |
| | |  <p style="text-align: center;"><i>fig. 4</i></p> <ul style="list-style-type: none"> Engage students to exercise computing the Perimeter and area of a triangle using the formula. | | | | | |
| <ul style="list-style-type: none"> to determine the quotient of circumference divided by a diameter of a circle. compute the circumference of a circle. determine the area formula of a circle | 5.5. Circumference and Area of a circle (4 Periods) | <ul style="list-style-type: none"> Let students revise the center, radius, and diameter of a circle. Assist students to determine the quotient of circumference divided by diameter, then guide them to conclude that $\frac{C}{d} = \frac{\text{Circumference}}{\text{diameter}} = \frac{22}{7} \approx 3.14$ <p>(Tell them $\frac{22}{7} \approx 3.14 \approx \pi$)</p> <p>Example: The circumference (C) and diameter (d) of four circles are given in the table. For each circle, find the ratio $\left(\frac{C}{d}\right)$ to two decimal place.</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>C</td> <td>22cm</td> <td>11cm</td> <td>44cm</td> </tr> </table> | C | 22cm | 11cm | 44cm | <ul style="list-style-type: none"> Different exercise problems and activities on determination of circumference of a circle can be given, and the work of students assessed. Activity can be set by the teacher to assist students derive area formula for the circle. Activity can be set by the teacher to assist |
| C | 22cm | 11cm | 44cm | | | | |

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| | | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px; text-align: center;">d</td><td style="padding: 5px; text-align: center;">7cm</td><td style="padding: 5px; text-align: center;">3.5cm</td><td style="padding: 5px; text-align: center;">14cm</td><td style="padding: 5px;">students</td><td style="padding: 5px;">100% area formula for the circle.</td></tr> <tr> <td style="padding: 5px; text-align: center;">$\frac{C}{d}$</td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td><td style="padding: 5px;"></td></tr> </table> <ul style="list-style-type: none"> • Let students practise computing the circumference(C), diameter (d) and radius (r) using the formula $C = \pi d = \pi(2r) = 2\pi r$ • Introduce the concept area of a circle by assisting students in group to draw a circle, radius 10cm. Divide into 16 equal parts and derive the formula.  <ul style="list-style-type: none"> • Cut out parts and arrange them in to a shape that is almost a rectangle. Cut one part in half to make the ends. The circumference has been shared out between the top and bottom of rectangle • So length of rectangle = $\frac{1}{2}C$ • Width of rectangle = r <p style="text-align: center;">Area of rectangle</p>  $ \begin{aligned} &= \text{length} \times \text{width} \\ &= \frac{1}{2} C \times r \\ &= \frac{1}{2} \times 2\pi r \times r \\ A &= \pi \times r \times r \end{aligned} $ | d | 7cm | 3.5cm | 14cm | students | 100% area formula for the circle. | $\frac{C}{d}$ | | | | | | |
| d | 7cm | 3.5cm | 14cm | students | 100% area formula for the circle. | | | | | | | | | | |
| $\frac{C}{d}$ | | | | | | | | | | | | | | | |

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| | | $A = \pi r^2$... area formula of a circle | |
| <ul style="list-style-type: none"> • Apply the concept of perimeter and area of plane figures in real life problems | 5.6. Applications of Perimeter and Area of Plane Figures <i>(3 periods)</i> | <ul style="list-style-type: none"> • Engage students to practice on the application of the Perimeter and area formula of a triangle and four-sided figures in nature surrounding humans, technology, architecture and mappings. | <ul style="list-style-type: none"> • Ask students real-life application exercise problems and Observe students while they are working. • Ask your students to communicate their result |

Unit 6: Congruency of Plane Figures (16 periods)

Unit Outcomes:-At the end of this unit, learners will able to:

- Identify congruent triangles by using the tests for congruency (SSS, SAS, ASA).
- Apply real-life situations in solving geometric problems

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| <ul style="list-style-type: none"> • Explain the concept of congruency of triangles • Check the congruence of given triangles by tracing, cutting and | 6.1 Congruent of Plane Figures <i>(8 periods)</i> 6.1.1 Definition and Illustration of | <ul style="list-style-type: none"> • Start the lesson by providing the application of the unit. • Show two figures of congruency by having equal size and same shape, • After introducing the concept of congruent | <ul style="list-style-type: none"> • Draw different triangles and ask students to determine the congruency of triangles by using congruence definition. • Ask students to prepare a triangle congruent to a given triangle by tracing, cutting and |

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| <p>overlapping.</p> <ul style="list-style-type: none"> • Apply real-life applications of congruency of triangles | <p>Congruent Figures</p> <p>6.1.2 Congruency of Triangles</p> | <p>figures and the symbol ‘\square’ for congruent. Assist students to explain congruent triangles.</p> <ul style="list-style-type: none"> • Use the definition of congruence in terms of rigid models to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. • Assist students to discuss and communicate example of congruency of triangles on Abay (Blue Nile) Bridge on Abay River in Ethiopia.  <p>Help groups of students to discuss and communicate whether $\triangle JKL$ and $\triangle PQR$ are congruent or not congruent based on the given information</p> <p>a) $m\angle J = 48^\circ$, $m\angle K = 93^\circ$, $m\angle P = 48^\circ$,</p> | <p>overlapping</p> <ul style="list-style-type: none"> • Ask students to solve real-life applications of congruency of triangles. • Provide feedback for learners to improve their learning |

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| | | $m\angle R = 39^\circ,$ $\overline{JK} \cong \overline{PQ}, \overline{KL} \cong \overline{QR}, \overline{JL} \cong \overline{PR}$ b) $m\angle J = m\angle K = m\angle L = 60^\circ,$ $m\angle P = m\angle Q = m\angle R = 60^\circ,$ $JK = KL = JL = 1.2 \text{ cm}, PQ = QR = PR = 1.5 \text{ cm}$ | |
| <ul style="list-style-type: none"> • Describe each of the tests for congruence SAS, SSS and ASA • Identify the congruence of two given triangles by using the tests for congruence SAS, SSS and ASA | 6.1.3 Tests for Congruency of Triangles (ASA, SAS and SSS) | <ul style="list-style-type: none"> • Students have seen that two triangles are congruent if they have six pairs of congruent corresponding parts. However, it is not always possible to check all three pairs of corresponding sides and all three pairs of corresponding angles. Fortunately, there are shortcuts for determining whether two triangles are congruent. • Project as a critical thinking: Assist the students to draw two triangles where two angles and the included side of one triangle are congruent to two angles and the included side of another triangle. Ask students to measure the remaining side and two angles of each triangle and let them write their findings. Encourage your students to conclude the congruence of these two triangles by showing that all conditions in the definition of ASA are fulfilled. Students may use the same approach suggested for SAS above to teach SSS and | <ul style="list-style-type: none"> • Ask students to describe each of the tests for congruence SAS, SSS and ASA • Ask students to identify the congruence of two given triangles by using the tests for congruence SAS, SSS and ASA • Provide feedback for learners to improve their learning • Give activity on congruence tests. and the teacher checks the performance of students |

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| | | ASA. <ul style="list-style-type: none"> • Assist students to discuss in groups and communicate the following as Critical Thinking. $\triangle ABC$ and $\triangle DEF$ are both right angles and both triangles contain a 30° angle. Both triangles have a side that is 9.5 mm long. Abebe claims that he can use the ASA Triangle Congruence Theorem to show that the triangles are congruent. Do you agree? Explain. • Aware the students about the concept of similar figures by using models of figures or objects like: photographs, polygons having the same shape but not necessarily the same size. | |
| Apply congruency of plane figures to real life problems | 6.2 Applications of Congruent of Plane Figures <i>(8 periods)</i> | <ul style="list-style-type: none"> • Assist students to work in groups and communicate the results of the real-life applications in nature surrounding humans, technology, architecture, and mappings. | <ul style="list-style-type: none"> • Ask group of students how to apply congruency of plane figures to real life problems. • Observe students while they are working together • Ask your students to communicate their result • Provide feedback for learners to improve their learning |

Unit 7: Data handling (*16 periods*)

Unit Outcomes: At the end of this unit, students will able to:

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- Organize data using frequency tables for a given data
- Constrict and Interpret data from pie charts
- Calculate Mean, Mode, Median and range of a given data
- Apply the concept of data handling to organize and interpret real life problems

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| <ul style="list-style-type: none"> • collect simple data from their environment using tally mark. • organizes data in a frequency distribution table. | 7.1 Organization of Data using Frequency table <i>(3 periods)</i> | <ul style="list-style-type: none"> • Start the lesson by giving the application of the unit • Let students discuss and debate in groups on how to collect the data of a given phenomenon using Tally Mark and how to prepare frequency Table. Eg. The number of male students in a class. • Let students provide feedback on presented ideas • Let two students summarize the ideas and that be followed by a final summary of the teacher | <ul style="list-style-type: none"> • Take note of the degree of involvement of learners in each activity • Provide constructive feedback • Give simple project work on collecting data and assessed students' performance. |
| <ul style="list-style-type: none"> • construct line graphs and pie chart to represent organized data by using the given data or by collecting data from their environment • interpret simple pie charts | 7.2. Construction and Interpretation of Pie Charts <i>(4 periods)</i> | <ul style="list-style-type: none"> ▪ Let students discuss and debate in groups on how to construct and interpret pie charts for a given data: a). manually, b). using Scientific calculator and c) using available Software or datasheets ▪ Encourage students to construct pie charts by collecting data from their environment. ▪ Engage students to interpret the constructed pie charts | <ul style="list-style-type: none"> • Ask questions and let some students to draw a graph of data. • Give project on construction and interpretation of pie charts • Provide constrictive feedback for learners to improve their learning. |

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| <ul style="list-style-type: none"> Calculate the mean, mode, median and range of the data. | <p>7.3. The Mean, Mode, Median and Range of Data <i>(5 periods)</i></p> | <ul style="list-style-type: none"> Let students to calculate mean, mode, median and rang of a given data manually and using Scientific calculator as well as SPSS. | <ul style="list-style-type: none"> Ask students to compute mean, mode, median and range of a given data Give homework or classwork on computing the mean, Mode, median and range and the teacher check their work. Provide feedback for learners |
| <ul style="list-style-type: none"> Apply the concept of data handling to organize and interpret real life problems | <p>7.4. Applications of Data Handling <i>(4 periods)</i></p> | <ul style="list-style-type: none"> Let students to clarify the difference between mean, mode and median using different real life application examples. Encourage the students to use the knowledge of calculating mean, mode, median and range of Ethiopian Road Traffic and Security data to interpret causes for Road Transport Accidents, on the Effect of Ethiopian Road Transport, Accidents on material damage and human death. | <ul style="list-style-type: none"> Ask group of students to work the real-life application problems. Observe students while they are working together Provide feedback for learners to improve their learning |