Mathematics
Grade 7

Introduction

Many of the topics studied in earlier grades like operations on numbers, variables, equations and inequalities, ratio, proportions and percentages; measurements, geometry and data handling are studied in grade 7 further in depth. Students of grade 7 will also be introduced with new concepts like the set of rational numbers, collecting simple data using tally marks, constructing and interpreting different types of graphs, calculations of the mean, median mode and range of given data, etc. Mathematics learning at this grade level has to provide necessary precondition for other subjects like physics, chemistry, biology, information technology, etc. by facilitating the recognition and description of regularities and a quantitative treatment of phenomena and processes of nature and technology. Issues related to population, taxation, savings, finance, interest, investment; etc. should be described and analyzed under the appropriate topics. Real life examples and problems of application have to be used as much as possible.

Students extend their work with ratios, proportions and percentages to develop an understanding of proportionality that they apply to solve problems in numerous contexts. They use ratio and proportionality to solve a wide variety of percent problems including problems involving discounts, interest, taxes, etc.

By decomposing two and three - dimensional shapes into smaller, component shapes, students find surface areas and develop and justify formulas for the surface areas and volumes of prisms and cylinders. As students decompose prisms and cylinders by slicing them, they develop and understand formulas for their volumes. (Volume = Area of base × height). They apply these formulas in problem solving to determine volumes of prisms and cylinders.

Students extend understanding of addition, subtraction, multiplication and division together with their properties to all rational numbers. They use the arithmetic of rational numbers as they formulate and solve linear equations in one variable and use these equations to solve problems.

Learning Objectives for Grade 7

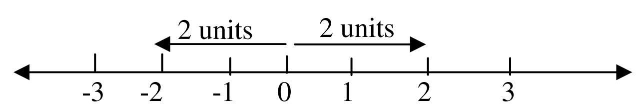
At the end of grade 7, students should be able to:

- Define and represent rational numbers on the number line.
- Determine the absolute value of a rational number.
- Solve simple equations involving absolute value.
- Add, subtract, multiply and divide using rational numbers.
- Solve linear equations and inequalities 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 and simple interest.
- Collect data and construct simple line graph, pie charts for a given data.
- Calculate the mean, mode, median and range of a given data.
- Construct and describe the properties of quadrilaterals such as trapeziums and parallelograms.
- Find the sum of the measures of the interior angles of a convex polygon.
- Calculate perimeters and areas of triangles, trapeziums, parallelograms and circles.
- Calculate surface areas and volumes of prisms and cylinders.

Unit 1: Rational numbers *(32 periods)*

Unit Outcomes: Students will be able to:

- define and represent rational numbers as fractions
- show the relationship among **W, Z** and **Q**.
- order rational numbers.
- operate with rational numbers.

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
Students will be able to: • express Rational numbers as fractions. • represent rational numbers as a set of fractions on a number line. • describe the relationship among the sets W, Z and Q • determine the absolute value of a rational number. • solve simple equations containg absolute value.	***1. Rational numbers*** **1.1 The concept of rational Numbers** *(9 periods)* • Use of rational numbers on a number line • Relationship among W, Z and Q • Absolute value of rational numbers	• Let students revise the order and representation of integers. • Lead students to define rational numbers as a set of fractions • Assist students to represent some rational numbers on a numbers line • Introduce Q as a representation of the set of rational numbers. • Help students to show the relationship between W, Z and Q. **(W $\subseteq$Z)., (W $\subseteq$ Q), (Z $\subseteq$ Q).** • Introducing and defining the concept of absolute value of rational numbers "a" $\lvert a \rvert = \begin{cases} a \text{ if } a \geq 0, \\ -a \text{ if } a < 0 \end{cases}$ • Guide students to interpret the concept of absolute value of a rational number geometrically. e.g /2/ = 2 and /-2/ = 2 means that on a number line the distance of 2 from0 is 2 units and the distance of -2 from 0 is also 2 units  Help students to solve simple equation of absolute values ex. equations like /x/ =3	• Give different exercise problems on ordering of rational numbers. • Ask and let some students represent given rational numbers on the number line, using the black-board. • Let students use Venn diagrams to show the relationship among W, Z and Q • Class-work and home-work exercise problems on evaluating absolute values of rational numbers.

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
• compare rational number • order rational numbers by representing them on number line . • determine the absolute value of a rational number.	**1.2 Comparing and ordering rational numbers** *(7 periods)* • The order of rational numbers.	• Assist students to compare and order rational numbers on a number line by changing the fractions to equivalent fractions with common denominator • Lead students to generalize the fact that for any two given rational numbers the one situated on the right on a number line is greater than the other number on the left.	• Give students various exercise problems to compare rational numbers using the inequality signs "<" and ">" between given rational numbers and check their work.
• add rational numbers • apply the commutative and the associative properties of addition	**1.3 Operation on rational numbers** *(16 periods)* **1.3.1 Addition of rational numbers**	• Let students revise addition of integers using a number line. • Discuss by stating and showing the rule for addition of two rational numbers using examples • If the signs of the addends are different (i) take the sign of the addend with the greater absolute value. (ii) take the absolute values of both numbers and subtract the addend with smaller absolute value from the addend with greater absolute value. ex $-6 + 2 = -4$ • If both rational number are negative (i) decide (put) the sign first (ii) take the sum of the absolute values of the addend ex. $-3 + (-5) = -8$ • Let students show the validity of the commutative property and associative property. • Assist students to generalize that, for any rational number a, b, c (i) $a + b = b + c$ (ii) $(a + b) + c = a + (b + c)$	• Give different exercise problems on addition of rational numbers and check their work. • Give different exercise problems on the use of the commutative and associative properties and follow up the performance of students
• subtract one rational numbers from another.	**1.3.2 Subtraction of rational numbers**	• Assist students to express subtraction of rational numbers as addition of the opposite of the rational number to be subtracted. **Example** $4 – 3 = 4 + (-3)$	• Give exercise problem on subtraction of rational numbers

Competencies	*Content*	*Teaching / Learning activities and Resources*	*Assessment*
		• The rule studied for addition of rational numbers can be applied to find the sum 4 + (-3). **Example** 2 - (-5) = 2 + 5	
• find the product of two rational numbers • apply the rules of multiplication of rational numbers. • use the commutative, and associative properties of multiplication and distributive property of multiplication over addition of rational numbers.	**1.3.3 Multiplication of Rational Numbers**	• You can start the lesson by introducing the rules for multiplication of rational numbers (i) Product of two rational numbers with different signs (a) decide the sign of the product, it is " - " (b) take the product of -(|-3 |× | 4| the absolute value the numbers **Example** $-3 \times 4 = -(\lvert -3 \rvert \times \lvert 4 \rvert)$ $= -(3 \times 4)$ $= -12$ (ii) Product of two negative rational numbers (a) decide the sign of the product, it is " + " (b) take the absolute values of the numbers and multiply them. **Example** $(-3) \times (-4) = \lvert -3 \rvert \times \lvert -4 \rvert$ $= 3 \times 4$ $= 12$ Assist students to come to the conclusion about the validity of the commutative, associative and distributive property of multiplication of rational numbers.	• Give exercise problems to your students on the application of the learnt rules and follow up their work and to take remedial measures based on their feedback. • Give exercise problems on the commutative and associative properties of multiplication.
• divide one rational number by another non-zero rational number • apply the rules for division of two rational numbers.	**1.3.4 Division of rational numbers**	• Discuss the rules for division of two rational numbers using examples and let the students come to the following conclusion. 1) To determine the sign of the quotient:- (a) If the signs of the dividend and the divisor are the same, the sign of the quotient is " + " you may take examples like: $\frac{-8}{-4} = \frac{8}{4} = 2$	• Give different exercise problem on division of rational numbers and check their work. • A quiz on the unit can be given and measures can be taken depending on the feedback obtained.

Competencies	*Content*	*Teaching / Learning activities and Resources*	*Assessment*
		b) If the sign of the dividend and the divisor are different, the sign of the quotient is " - " you may take examples like: $\frac{-8}{4} = -\frac{8}{4} = -2$, $\frac{9}{-3} = -\left(\frac{9}{3}\right) = -3$ let them realize $\frac{-8}{4} = \frac{8}{-4} = \frac{-8}{4}$ 2) To determine the value of the quotient divide the absolute value of the dividend by the divisor. Assist students to realize that division by zero is undefined.	

Unit 2: Linear equations and inequalities *(15 periods)*

Unit Outcomes: Students will be able to:

- solve linear equations using transformation rules.
- solve linear inequalities using transformation rules.

Competencies	*Content*	*Teaching / Learning activities and Resources*	*Assessment*
Students will be able to: • solve linear equation by using rules of equivalent transformation (with positive coefficient of the variable)	***2. Linear equations and inequalities*** **2.1 Solving linear equations** *(13 periods)*	• Let students revise and discuss the rules of equivalent transformation of equations i.e., 1. Addition and subtraction of the same number to and from both sides. 2. Multiplying and dividing both sides of an equation by the same non-zero rational number. • Assist students to justify each step of the solution. You may use example like: e.g $\frac{3}{4}x - 2 = 1$ $\frac{3}{4}x = 3$ ----------- (adding 2 to both sides) 3x = 12 --------------- (multiplying each side by 4) x = 4 ---------------- (dividing each side by 3)	• different activities to your students on solving simple linear equations and check their work. • Oral questions and various exercise problems can be given as class and home works.
• solving linear inequalities with positive coefficients using the rule of equivalent transformation.	**2.2 Solving Linear inequalities** *(12 periods)*	• Let students revise and discuss the rules of transformation of inequalities using examples. 1. Adding or subtracting the same number to or from each side of an inequality keeps the inequality sign remain as it is. 2. Multiplying or dividing both sides of an inequality by the same positive number keeps the inequality sign as it is. You may use examples like: $4 > 2$ $4 \times 3 > 2 \times 3$ $12 > 6$ • Assist students to demonstrate how to solve a linear inequality that requires one or more equivalent transformations.	• Various oral questions can be asked, exercises can be given as class and home works. • Some students can be asked to solve inequality on the board. • Ask students to solve linear in equalities.

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
		You may use examples like: • Solve $2x + 1 > 3$ **Solution** $2x > 2$ ----- (subtracting 1 from both sides) $x > 1$ ------- (dividing both sides by 2) • Let students choose solutions of a given inequality from a given set of numbers (universal set).	

Unit 3: Ratio, proportion and percentage *(24 periods)*

Unit Outcomes: Students will be able to:

- understand the notions of ratio and proportions.
- solve problems related to percentage.
- make use of the concept of percentage to solve problems of profit, loss and simple interest.

Competencies	*Content*	*Teaching / Learning activities and Resources*	*Assessment*
Students will be able to: • explain the notion of ratio. • solve simple problems on ratio • solve problems on proportion	***3. Ratio, proportion and percentage*** **3.1 Ratio and proportion** *(6 periods)*	• Let students come to the definition of ratio as a comparison of two quantities. You may use examples like: The ratio of boys to girls in their class is say 20:40 and write the final answer in its simplest form as 1:2 • Encourage students to interpret scales written in ratio from their school map. • Start the lesson by revising direct or indirect proportion and factor (constant) of proportionality • Assist students to define proportion as equality of two ratios.	• Ask oral questions and give activities and problems as class and home works.
• compute the percentage of a given quantity • solve problems related to percentage	**3.2 Further on percentage** *(7 periods)*	• Let the students be 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 30% of Birr 600? Here b = Birr 600 Percent = 30 amount = a? $\frac{a}{b} = \frac{P}{100}$ i.e. $\frac{a}{600} = \frac{30}{100}$ • Assist students to calculate the percentage of a given quantity, you may use example like: a teacher spends 150 birr for transportation in a month. If his salary is Birr 3000 what is his percentage expenditure for transport? • Let students practice on solving different word problems on production, taxation, insurance, health, investment, etc.	• Ask students to calculate percentage of a given base like: 10%, 25%, 50%, 150% of a given quantity, say 50kg.
• apply the concepts of percentage to solve	**3.3 Application of percentage in calculations** *(11 periods)*	• Facilitate for students to discuss on the concepts of profit and loss	• Give different application problems to the

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
problems on profit and loss	**3.3.1 Calculating profit and loss as a percentage**	• Encourage the students to use simple formulas such as: $\% \text{ profit} = \frac{\text{Profit}}{\text{cost price}} \times 100\%$ $\% \text{ loss} = \frac{\text{loss}}{\text{cost price}} \times 100\%$ calculate percentage profit and percentage loss.	students and check their work. • Activities can be designed by the teacher and performed by students so that the teacher assesses the performance of students.
• apply the concept of percentage to solve problems on simple interest	**3.3.2 Simple interest**	• Discuss the concept of simple interest and introduce the formula I = PRT, where I = interest P = Principal R = The interest rate per period (Expressed as percentage) T = time	

Unit 4: Data handling *(20 periods)*

Unit Outcomes: Students will be able to:

- collect data and construct simple line graph, pie charts for a given data.
- calculate the mean, mode and median of a given data.
- find the range of a given data.

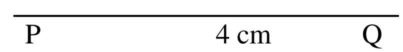
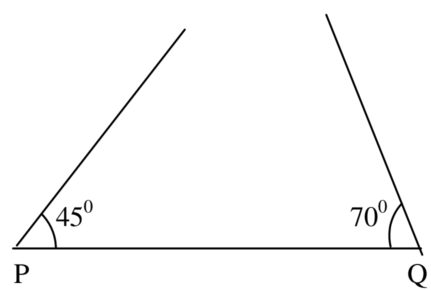
Competencies	*Content*	*Teaching / Learning activities and Resources*	*Assessment*
Students will be able to: • collect simple data from their environment using tally mark.	***4. Data handling*** **4.1 Collecting data using Tally Mark** *(5 periods)*	• After revising how to collect the data assist student to practice collecting simple data of a given pehnomena using Tally Mark and guide them how to prepare Tally Mark Table. Eg. The number of pupils in a class who are born in each month.	• Activity on collecting data can be given and the performance of students is assessed.
• construct line graphs using the given data. • construct line graphs by collecting data from their environment • interpret simple line graphs. • construct pie charts using the given data. • construct pie charts by collecting data from their environment. • interpret simple pie charts.	**4.2 Construction and interpretation of line graphs and pie charts** *(10 periods)*	• After showing how to construct line graphs and pie charts assist the students to construct line graphs, pie charts using a given data. • Encourage the students to construct line graphs and pie charts by collecting data from their environment. e.g. The number of teachers in each department in the school. • Guide the students to interpret the constructed line graphs and pie charts.	• Different exercise problems on drawing graphs can be given and the works of students are checked and assessed.
• describe the terms mean, mode, median and range of data • calculate the mean of data • calculate the mode of date • calculate the median of data	**4.3 The mean, mode median and range of data** *(5 periods)*	• By revising the method of finding the average of a given data guide the students to conclude that average of a given data is the same as a mean. • Help students to calculate mean, mode, median and rage of a given data. • Let students clarify the difference between mean, mode and median using different examples. • Lead the students to use the knowledge of calculating mean, mode, median and range of a given data.	• Activities and exercise problems on calculating and finding the mean, mode, median and range of a given data can be given and their performance be

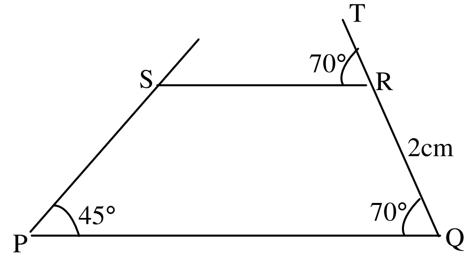
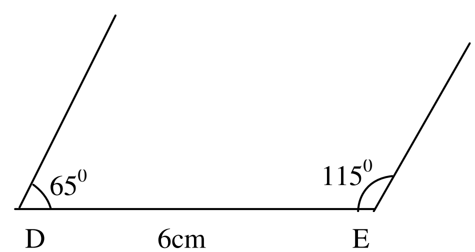
Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
• calculate the range of data.		eg. make them to calculate mean, mode, median and range of their 1st semester results.	assessed.

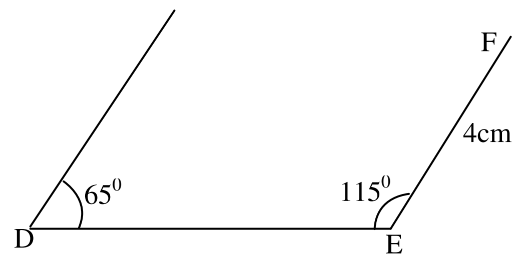
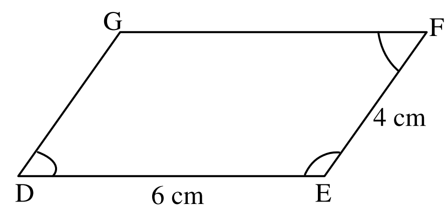
Unit 5: Geometric figures and measurement *(40 periods)*

Unit Outcomes: Students will be able to:

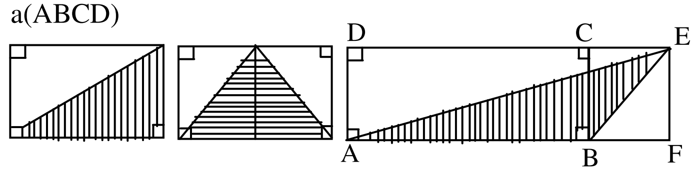
- identify, construct and describe properties of quadrilaterals such as trapezium and parallelogram.
- identify the difference between convex and concave polygons.
- find the sum of the measures of the interior angles of a convex polygon.
- calculate perimeters and areas of triangles and trapeziums.

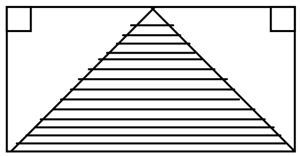
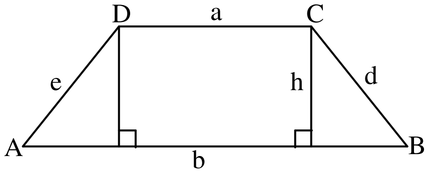
Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
Students will be able to: • explain the concept of a quadrilateral • identify the parts of a quadrilateral • explain the parts of a trapezium • construct a trapezium with given dimensions. • describe the properties of trapezium	***5. Geometric figures and measurement*** **5.1 Quadrilaterals, polygons and circles** *(12 periods)* **5.1.1 Quadrilaterals** • Construction and properties of trapezium	• Facilitate students to discuss on the concepts "diagonals", "interior angles", "adjecent sides" and "opposite sides" of a quadrilateral. • Let students explain the term "trapezium" and identify "bases", "legs" and "height" of a trapezium. • Assist students in constructing a given trapezium using ruler, protractor and pair of compasses. eg. Construct a trapezium PQRS with RS // PQ and QR = 2cm, PQ = 4cm, m(P) = 45^0 and m(Q) = 70^0 1) Draw a line segment PQ = 4cm  2) Construct P and Q with the given measures  3) Mark point R such that QR = 2cm	• Oral questions on the meanings of quadrilaterals and trapeziums and identification of their parts can be asked. • Activity on construction of trapeziums in the given dimension can be given and the teacher checks the performances of students.

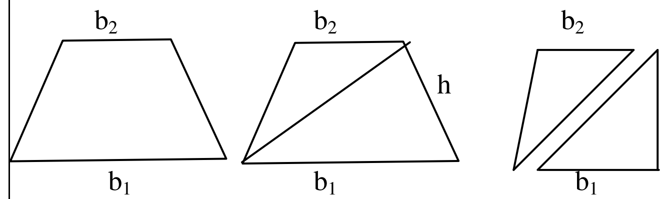
Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
• explain the concept parallelogram • construct a parallelogram with given dimensions. • describe the properties of parallelogram.	• Construction and properties of parallelogram.	 4) Construct $m(T\hat{R}S) = 70^0$ on QT, then PQRS is the required trapezium. • Encourage the students to conclude that a trapezium is a special type of a quadrilateral in which one pair of opposite sides are parallel. • Allow the students to explain the term parallelogram • Help the students to a construct a parallelogram with given dimensions using ruler, protractor and pair of compasses. eg. Construct a parallelogram DEFG with $DE = 6cm$, $EF = 4cm$, $m(\hat{D}) = 65^0$ 1) Draw line segment $DE = 6cm$  2) Construct $m(\hat{D}) = 65^0$ and $m(\hat{E}) = 115^0$  3) Mark point F such that $EF = 4$ cm	• Activities on construction of parallelograms and describing its properties can be given and students work checked by the teacher.

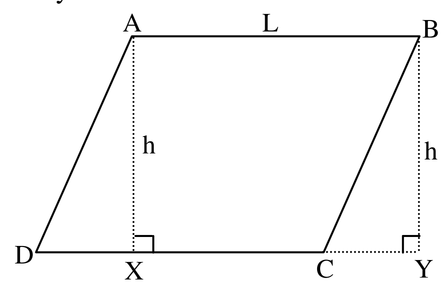
Competencies	*Content*	*Teaching / Learning activities and Resources*	*Assessment*
• construct rectangles, squares and rhombuses • describe the properties of a rectangle • describe the properties of a square • describe the properties of a rhombus • identify the relationship between a	• Construction and properties of special parallelograms.	 4) Construct $E\hat{F}G$ where measure is 65^0 (where G is the intersection of DG and FG, then DEFG is the required parallelogram.  Assist students to come to the conclusion that: • the opposite sides of a parallelogram are equal. • the opposite angles of a parallelogram are equal. • the adjacent angles are supplementary • the diagonals of a parallelogram bisect each other by measurement * By revising the definition of rectangle and square help the students to define a rhombus by drawing its diagram on the blackboard. • Assist students in constructing rectangles, squares and rhombuses in similar manner to parallelogram. • Lead students to come to the conclusion that: - diagonals of a rectangle are equal in length. - diagonals of a rhombus are perpendicular - diagonals of a square are equal in length and perpendicular to each other. • Let students identify the relationship between a	• Activities can be set by the teacher, including asking students to draw required figures on the board. • Different exercise problems can be given as class and home works and the students works are checked by the teacher.

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
parallelogram a rhombus, a rectangle • define a polygon • identify the difference between convex and concave polygons • name polygons having up to ten sides based on their number of sides.	**5.1.2 Polygons**	parallelogram, a rhombus, a rectangle and a square. • By giving simple examples such as triangles, quadrilaterals introduce the concept of polygons and let the students define polygons. (A polygon is a simple closed path made up of line segments) • Lead students to identify the difference between convex and concave polygon by using different models of convex and concave polygons. • Assist student to classify polygons by their number of sides like triangle (3 - sides), quadrilateral (4 - sides), pentagon (5 - sides) and so on. up to decagon (10 - sides)	
• define a circle • identify the center, radius, diameter, chord and arc of a circle. • explain the relations between radius, diameter and chords of a circle	**5.1.3 Circles**	• Help students to define the circle as a set of points equidistant from a point called the center of the circle by looking the figure of the circle. • Facilitate students to draw a circle and demonstrate center, radius, diameter, chord and arc of a circle. • Guide students to come to the conclusion that $d = 2r$ and the diameter as the longest chord of a circle.	• Activities on drawing circles and reaching on the conclusion that $d = 2r$. can be given to students. • Activity using groups on proving the angle sum theorem can be given, and students' work checked and assessed.
• state the angle sum theorem of a triangle • prove the sum of the measures of interior angles of a triangle is 180° • apply the angle sum theorem of a triangle in solving related problems.	**5.2 Theorems of triangles** *(11 periods)* • The three angles of a triangle add up to 180°	• Guide the students in group work to draw any triangle, cut it out carefully, tear the vertices off and fit them together. Based on the result lead them to guess that the sum of the measures of interior angles of a triangle is 180°. • After motivating and assisting students to revise the concept of alternate interior angles, remind the students the fact that the degree measure of straight angle is 180°. • Let students proof that the sum of degree measure of interior angles of a triangle is 180° based on the knowledge of alternate interior angles and the measure of straight angle. • Let students find the unknown angle of a triangle by applying the angle sum theorem of a triangle.	
• explain the relation	• The exterior angle of a	• Encourage the students to prove the exterior angles	• Different exercise

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
between the exterior angle and the two remote interior angles of a triangle. • prove the exterior angle of a triangle equals the sum of the two remote interior angles • apply the exterior angle theorem of triangle in solving related problems.	triangle equals the sum of the two remote interior angles.	theorem of triangle by using the knowledge of angle sum theorem of a triangle and the measure of straight angle. • Lead students to determine unknown interior or exterior angle of a triangle by applying the exterior angle theorem of triangle.	problems can be given, and the works of students checked.
• derive a formula for the sum of the interior angles of n-sides convex polygon. • apply the formula for the sum of the interior angles of n-sided convex polygon to solve related problems.	• The sum of the interior angles of a convex polygon of n sides is (n - 2) × 180°	• Facilitate discussion to show that the sum of angles of a quadrilateral is 360°, allow students to draw any quadrilateral and let them select any vertex. From that vertex, let them draw every possible diagonal. (only one possible) 1) Ask them to count the number of triangles formed. 2) Guide them to apply that the sum of the measures that the sum of the angles of each triangle is 180^0 and conclude that the sum of the angles of the quadrilateral is $2 \times 180^0 = 360^0$ • Considering five and six sided polygons, lead students to generalize that the sum of the measures of the interior angles of any convex polygon of n - sides is (n–2) × 180°. • Assist the students to use the formula (n–2) × 180° to solve related problems.	• Assessing the opinions of students in the discussions and posing oral questions will help the teacher to assess students performances.
• derive the area formula for a triangle • state and apply the formula for computing the area of a triangle • solve real life problem using the formula	**5.3 Measurement** *(17 periods)* **5.3.1 Area of a triangle**	• Let students, revise the concept area of a right angled triangle, rectangle and square. • Guide students to use the area formula for rectangle to deduce the area formula for right-angled triangle and use it for other triangles. For example a(ABCD) 	• Activities can be assigned on the derivation of area formula for the right angled triangle and performance of students are checked and assessed. • Different exercise problem on applying the area formula of the right-angled triangle can be given. • Activities can be designed

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
		Area (ABCD) = AB × BC Area (ΔABE) = a(ΔAFE) − a(ΔBFE) = ½(AF × EF) − ½(BF × EF) = ½ EF(AF − BF) = ½ EF × AB but EF = BC Area (ΔABE) = ½ BC × AB ∴ Area (ΔABE) = ½ area (ABCD) A = ½ bh Area of a triangle = $\frac{\text{base} \times \text{height}}{2}$ A = ½bh, where b is the length of a base and h is length of the corresponding height. • Assists students to exercise computing the area of a triangle using the formula • Help students to practise on the application of the area formula of a triangle in reali life situation **Example** Find the area of the shaded part of the fig. given below. 	by the teacher on the application of the area formula for triangle.
• compute the perimeter of a trapezium • derive the area formula for trapezium • determine the area of trapezium.	**5.3.2 Perimeter and area of trapezium**	• Encourage students to revise properties of the trapezium • Give a trapezium of parallel side $\overline{AB}$ and $\overline{DC}$ non-parallel sides $\overline{AD}$ and $\overline{BC}$ and height (h) as shown by the fig. then 	• Activity on the computation of perimeter of trapezium can be designed by the teacher, and students performances assessed.

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
		i) Help 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) $P = AB + BC + DC + AD$ $P = b + d + a + e$ ii) Help students to derive the area formula of a trapezium • You may use the following method.  Trapezium = cut a long one side of the diagonal = gives two triangles • Area of the trapezium = Sum of the Area of the triangles $A = ½b_1 h + ½ b_2h$ $A = \frac{h}{2}(b_1 + b_2)$ • The area of a trapezium is half the sum of the parallel sides times the distance between them. • Assist 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. **Example** Musa needs to know the area and perimeter of his field whose shape is a trapezium with legs 40m and 50m and parallel side 90m and 120m with height 40m. Calculate the perimeter and area of Musa's field.	• Activity can be set by the teacher, using a cardboard in the shape of a trapezium, cut it into two triangles and let students deduce the area formula for the trapezium. • Different exercise problems on the application of the formula for the area of trapezium can be given and the work of students be assessed.

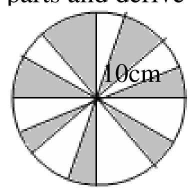
Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
• calculate the perimeter of parallelogram • derive the area formula for parallelogram • calculate the area of a parallelogram.	**5.3.3 Perimeter and Area of parallelogram**	• Let students revise the properties of parallelogram • Guide students to discuss on calculating the perimeter of a parallelogram. • Encourage students to derive the area formula for parallelogram. • You may derive the formula as follows.  • ΔAXD and ΔBYC are congruent • If ΔAXD is cut off the parallelogram ABCD and placed in the position BYC it makes a rectangle ABYX • Area of rectangle ABYX = Area of parallelogram ABCD • Area of rectangle ABYX $= L \times h$ • So Area of parallelogram AB CD $= L \times h$ • Area of a parallelogram = Length of base × the perpendicular height $A = b \times h$ • Encourage student to paractise applying these formula for solving problem.	• Different exercise problems in calculating areas and perimeters of parallelograms can be given and students performances are checked.
• to determine the quotient of circumference divided by a diameter of a circle. • explain the number π as a factor of proportionality • compute the circumference of a	**5.3.4 Circumference of a circle**	• Let students revise the center, radius, and diameter of a circle • Encourage students to measure and find out the circumference and diameter of certain circular objects • Assist students to determined the quotient of circumference divided by diameter, then guide them to conclude that $\frac{C}{d} = \frac{\text{Circumference}}{\text{diameter}} = \frac{22}{7} \approx 3.14$	• Different exercise problems and activities on determination of circumference of a circle can be given, and the work of students assessed.

<table>
<tr><th>Competencies</th><th>Content</th><th>Teaching / Learning activities and Resources</th><th>Assessment</th></tr>
<tr><td>circle.</td><td></td><td>
(tell them $\approx \frac{22}{7}$ 3.14 π)
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.
<table>
<tr><td>C</td><td>22cm</td><td>11cm</td><td>44cm</td><td>33cm</td></tr>
<tr><td>d</td><td>7cm</td><td>3.5cm</td><td>14cm</td><td>10½cm</td></tr>
<tr><td>$\frac{C}{d}$</td><td></td><td></td><td></td><td></td></tr>
</table>

Let students paractise computing the circumference(C), diameter (d) and radius (r) using the formula
$C = \pi d = \pi(2r) = 2\pi r$

</td><td></td></tr>
<tr><td>determine the area formula of a circle</td><td>5.3.5 Area of a circle</td><td>

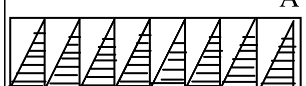
Introduce the concept area of a circle by assisting students in group to draw a circle, radius 10cm. Divide into 16 equal parts and derive the formula

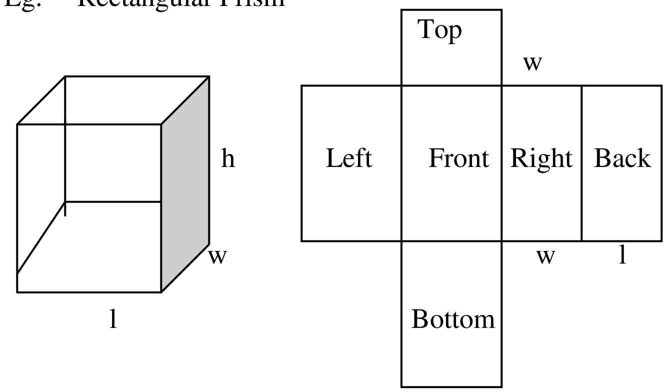


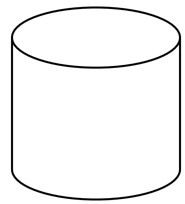
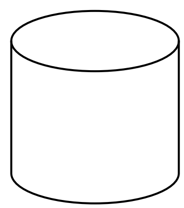
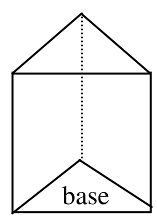
Cut out parts and arrange them in to a shape that is almost a rectangle. Cut one part in half to make the ends.

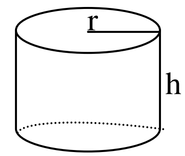
The circumference has been shered out between the top and bottom of rectangle

So length of rectangle = ½C
Width of rectangle - r
Area of rectangle = length $\times$ width
= ½ C $\times$ r
= ½ $\times$ $2\pi r \times r$
A = $\pi \times r \times r$


$A = \pi r^2$... area formula of a circle
</td><td>Activity can be set by the teacher to assist students derive area formula for the circle.</td></tr>
</table>

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
• state the surface area formula of prism. • calculate the surface area of prism using the formula • produce a model of right prism • state the surface area formula of cylinder • calculate the surface area of cylinder using the formula • produce a model of cylinder. • state the surface area formula of cylinder • calculate the surface area of cylinder using the formula.	**5.3.6 Surface area of prisms and cylinder**	Let students to precise applying these formulas for solving problem. • Lead students to derive the surface area formula of right prism by using net of prisms Eg. Rectangular Prism  • We can see here that the net of a rectangular prism is made from six rectangles. • The front and the back are the same, the right side and the left side are the same, and the top and the bottom are the same Area of front = Area of back = lh Area of left = Area of Right = wh Area of top = Area of bottom = lw lateral surface Area (A_ℓ) = Sum of areas of lateral faces = Area of front + Area of back + Area of left + Area of right = lh + lh + wh + w h =2lh + 2wh = 2h (l + w) OR = h × 2 (l + w) = ph (p = perimeter of the base) Total surface Area (A_T) = A_ℓ + $2A_B$ = lateral surface area + Area of two bases	• Activity is planned and assigned to students; so that they make use of net of prism to find surface area formula for prism. • Various exercise problems on calculating of areas of prisms and cylinders are given, and the works of students are checked by the teacher.

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
		$= 2lh + 2wh + 2lw$ $= 2(lh + wh + lw)$ $\therefore$ Total surface area $= A_\ell + 2A_B$ • Lead students use the same formula for finding A_ℓ of triangular prism. • Help students to apply the formula for computing the surface area of different prism. • Lead students to derive the surface area formula for cylinder as follows. -1st assist students to cut a cylinder vertically. Then its lateral surface gives rectangle with $2\pi r$ by h h   h $2\pi r$ $A_\ell = 2\pi r \times h$ $= 2\pi rh$  $A_T = A_\ell + 2A_B$ $A_T = \left\{ \begin{array}{l} \text{circumferance} \\ \text{of bases} \end{array} \right\} \times \text{height} + 2(\text{Area of base})$ $A_T = 2\pi rh + 2\pi r^2$ $A_T = 2\pi r(h + r)$ • Assist students to apply the formula for computing the surface area of cylinder.	
• state the volume formula of prisms. • calculate the volume of prisms. • state the volume formula of cylinder. • calculate the volume of	**5.3.7 Volumes of prism and cylinders.**	• Elaboration a common formula for the volume of right prisms. $V = \text{Base Area} \times \text{height}$ $V = A_Bh$  h	• A quiz on the unit can be well planned and given to students, the performances are checked and assessed.

Competencies	***Content***	***Teaching / Learning activities and Resources***	***Assessment***
cylinder.		• Guide students to reach the conclusion that a cylinder is a circular prism. So its volume can be found using the same formula as for all prisms. $V = A_B h$  but its base is a circle, $A = \pi r^2$ $V = \pi r^2 h$ • Assist students to apply the formula for computing the volumes of prisms. **Remark:** Calculation of radius r from the areas and volumes of cylinder is not included.	