JUNIOR HIGH SCHOOL 1

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.1 **NUMBERS AND NUMERALS**	1.1.1 count and write numerals up to 100,000,000	Counting and writing numerals from 10,000,000 to 100,000,000	**TLMs:** Abacus, Colour-coded materials, Place value chart Guide pupils to revise counting and writing numerals in ten thousands, hundred thousands and millions. Using the idea of counting in millions, guide pupils to recognize the number of millions in ten million as (10,000,000 = 10 × 1,000,000) Using the non-proportional structured materials like the abacus or colour-coded materials, guide pupils to count in ten millions. Show, for example, 54,621,242 on a place value chart. Point out that the commas between periods make it easier to read numerals. Assist pupils to read number names of given numerals (E.g. 54,621,242) as; *Fifty four million, six hundred and twenty one thousand, two hundred and forty two.*	read and write number names and numerals as teacher calls out the digits in a given numeral (E.g. 72,034,856) bring in news papers or magazines that mention numbers in millions to record) mention numbers they hear on TV and radio reports (this can be taken as projects to be carried out weekly for pupils; investigate types of numbers that appear in government's budgets, elections results, census reports, etc.
	1.1.2 identify and explain the place values of digits in a numeral up to 100,000,000	Place value	Using the abacus or place value chart guide pupils to find the place value of digits in numerals up to 8-digits. Discuss with pupils the value of digits in given numerals.	write the value of digits in given numerals

Millions periods			Thousands periods			Hundreds periods		
H	T	O	H	T	O	H	T	O
	5	4	6	2	1	2	4	2

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.1 (CONT'D) **NUMBERS AND NUMERALS**	The pupil will be able to:		E.g. in 27,430,561 the value of 6 is 60, the value of 3 is 30,000, the value of 7 is 7,000,000, etc Discus with pupils the difference between the place value of a digit in a numeral and the value of a digit in a numeral.	Let pupils:
	1.1.3 use < and > to compare and order numbers up to 100,000,000	Comparing and Ordering numbers up to 100,000,000	Guide pupils to use less than (**<**) and the greater than (**>**) symbols to compare and order whole numbers, using the idea of place value.	compare and order given whole numbers (up to 8-digits)
	1.1.4 round numbers to the nearest ten, hundred, thousand and million	Rounding numbers to the nearest ten, hundred, thousand and million	Guide pupils to use number lines marked off by tens, hundreds, thousands, and millions to round numerals to the nearest ten, hundred, thousand, and million. Using the number line guide pupils to discover that; (i) numbers greater than or equal to 5 are rounded up as 10 (ii) numbers greater than or equal to 50 are rounded up as 100 (iii) numbers greater than or equal to 500 are rounded up as 1000	write given numerals to the nearest ten, hundred, thousand, or million
	1.1.5 identify prime and composite numbers	Prime and Composite numbers	Guide pupils to use the sieve of Eratosthenes to identify prime numbers up to 100. Discuss with pupils that a prime number is any whole number that has only two distinct factors- itself and 1. A composite number is any whole number other than one that is not a prime number.	

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	The pupil will be able to:			Let pupils:
UNIT 1.1 (CONT'D) **NUMBERS AND NUMERALS**	1.1.6 find prime factors of natural numbers	Prime factors	Guide pupils to use the Factor Tree to find factors and prime factors of natural numbers. Express a natural number as a product of prime factors only.	express a given natural number as the product of prime factors only.
	1.1.7 identify and use the HCF of two natural numbers in solving problems	Highest Common Factor (HCF) of up to 3-digit numbers	Guide pupils to list all the factors of two or three natural numbers E.g. 84 and 90 Set of factors of 84 = {1, 2,3, 4, 6, 7, 12, 14, 21,28, 42, 84} Set of factors of 90 = {1, 2, 3,5, 6, 9, 10, 15,18, 30, 45, 90} Guide pupils to identify which numbers appear in both lists as common factors Set of common factors = {1, 2, 6} Guide pupils to identify the largest number which appears in the common factors as the Highest Common Factor(H.C.F), i.e. 6 Also, guide pupils to use the idea of prime factorization to find the HCF of numbers. Pose word problems involving HCF for pupils to solve	find the HCF of two or three given natural numbers solve word problems involving HCF E.g. A manufacturer sells toffees which are packed in a small box. One customer has a weekly order of 180 toffees and another has a weekly order of 120 toffees. What is the highest number of toffees that the manufacturer should pack in each box so that he can fulfil both orders with complete boxes?

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	The pupil will be able to:			Let pupils:
UNIT 1.1 (CONT'D) **NUMBERS AND NUMERALS**	1.1.8 identify and use the LCM of two or three natural numbers to solve problems	Least Common Multiples (LCM) up to 2-digit numbers	Guide pupils to find the Least Common Multiple (LCM) of given natural numbers by using; • Multiples; E.g. 6 and 8 Set of multiples of 6 = {6, 12, 18, 24, 30, 36, 42, 48, …} Set of multiples of 8 = {8, 16, 24, 32, 40, 48,…} Set of common multiples = {24, 48, …} L.C.M of 6 and 8 = {24} • Product of prime factors; E.g. 30 and 40 Product of prime factors of 30 = $2 \times 3 \times 5$ Product of prime factors of 40 = $2 \times 2 \times 2 \times 5$ $\therefore$ L.C.M of 30 and 40 = $2 \times 2 \times 2 \times 3 \times 5 = 120$ Guide pupils to Pose word problems involving LCM for pupils to solve	find the L.C.M of two or three natural numbers solve word problems involving L.C.M E.g. Dora and her friend are walking through the sand. Dora's footprints are 50cm apart and her friend's footprints are 40cm apart. If her friend steps in Dora's first footprint. What is the minimum number of steps that her friend should take before their footprints match again?
	1.1.9 carry out the four operations on whole numbers including word problems	Addition, Subtraction, Multiplication and Division of whole numbers including word problems	Guide pupils to add and subtract whole numbers up to 8-digits Guide pupils to multiply 4-digit whole numbers by 3-digit whole numbers up to the product 100,000,000 Guide pupils to divide 4-digit whole numbers by 1 or 2-digit whole numbers with or without remainders Pose word problems involving addition, subtraction, multiplication and division of whole numbers for pupils to solve	add and subtract given 8-digit whole numbers multiply given 4-digit whole numbers by 3-digit whole numbers divide given 4-digit numbers by 1 or 2 digit numbers solve word problems involving addition, subtraction, multiplication and division of whole numbers.

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	The pupil will be able to:			Let pupils:
UNIT 1.1 (CONT'D) **NUMBERS AND NUMERALS**	1.1.10 state and use the properties of basic operations on whole numbers to solve problems	Properties of operations	Guide pupils to establish the commutative property of addition and multiplication i.e. $a + b = b + a$ and $a \times b = b \times a$ Guide pupils to establish the associative property of addition and multiplication. i.e. $(a + b) + c = a + (b + c)$ and $(a \times b) \times c = a \times (b \times c)$ Guide pupils to establish the distributive property i.e. $a \times (b + c) = (a \times b) + (a \times c)$ Guide pupils to establish the zero property (identity) of addition. i.e. $a + 0 = 0 + a = a$, therefore zero is the identity element of addition Guide pupils to establish the identity property of multiplication. i.e. $a \times 1 = 1 \times a = a$, therefore the identity element of multiplication is 1 Guide pupils to find out the operations for which various number systems are closed.	Find the value of n if $4 \times n = 6 \times 4$. Find which combination of sums will make the multiplication easier in the sum $2 \times 4 \times 9 \times 25$? Put in brackets to make the sentence correct: i. $2 \times 3 + 4 = 14$ ii. $6 + 4 \times 3 + 2 = 20$ iii. $36 = 4 \times 3 + 6 \times 4$ What should be in the brackets to make the sentence true? $9 \times (2+5) = (9 \times 2) + (\quad)$
	1.1.11 find good estimates for the sum, product and quotient of natural numbers	Estimation of sum, product and quotient of natural numbers	Discuss with pupils that an estimate is only an approximate answer to a problem. The estimate may be more or less than the actual. To find the estimate of a sum, guide pupils to round up or down each addend and add. Example; Actual: 5847 + 8132 = 13, 979 Estimate: 6000 + 8000 = 14,000	estimate a given sum, product or quotient solve real life problems involving estimation

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	The pupil will be able to:			Let pupils:
UNIT 1.1 (CONT'D) **NUMBERS AND NUMERALS**			Guide pupils to use rounding up or down `to estimate products. Example; Actual: 327 × 2 = 654 Estimate: 300 × 2 = 600 Guide pupils to use multiples of ten to estimate a 2-digit quotient. E.g. 478 ÷ 6 70 × 6 = 420 80 × 6 = 480 Guide pupils to identify that since 478 is between 420 and 480, the quotient will be less than 80 but greater than 70. Guide pupils to use multiples of 100 to estimate a 3-digit quotient. E.g. 5372 ÷ 6 700 × 6 = 4200 800 × 6 = 4800 900 × 6 = 5400 Guide pupils to identify that since 5372 is between 4800 and 5400, the quotient will be less than 900 but greater than 800. Pose real life problems involving estimation for pupils to solve. E.g. ask pupils to find from a classroom shop, the cost of a bar of soap. Pupils then work out, how much they will need approximately, to be able to buy four bars of soap	

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	The pupil will be able to:			Let pupils:
UNIT 1.2 **SETS**	1.2.1 identify sets of objects and numbers	Sets of objects and numbers	Guide pupils to collect and sort objects into groups and let pupils describe the groups of objects formed Guide pupils to form other sets(groups) according to a given criteria using objects and numbers Introduce the concept of a set as a well defined collection of objects or ideas Guide pupils to use real life situations to form sets. E.g. a set of prefects in the school	form sets using real life situations
	1.2.2 describe and write sets of objects and numbers	Describing and writing Sets	Introduce ways of describing and writing sets using: • Defining property; i.e. describing the members (elements) of a set in words. E.g. a set of mathematical instruments. • Listing the members of a set using only curly brackets'{ }' and commas to separate the members. E.g. **S =** {0, 1, 2,…, 26} **NOTE**: Use capital letters to represent sets. E.g. **A** = {months of the year}.	describe and write sets using words as well as the curly brackets
	1.2.3 distinguish between different types of sets	Types of Sets (Finite, Infinite, Unit and Empty [Null] Sets)	Guide pupils to list members of different types of sets, count and classify the sets as: 1. **Finite Set** (a set with limited number of members) 2. **Infinite Set** (a set with unlimited number of elements). 3. **Unit set** (a set with a single member). 4. **Empty** (Null): - a set with no elements or members. **Note:** Use real life situations to illustrate each of the four sets described above	state with examples the types of sets

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	The pupil will be able to:			Let pupils:
UNIT 1.2 (CONT'D) **SETS**	1.2.4 distinguish between equal and equivalent sets	Equal and Equivalent Sets	Guide pupils to establish equal sets as sets having the same members. E.g. **P** = {odd numbers between 2 and 8} $\Rightarrow$ **P** = {3, 5, 7}. **Q** = {prime numbers between 2 and 8} $\Rightarrow$ **Q** = {3, 5, 7}, **P** is equal to **Q**. Introduce equivalent sets as sets having the same number of elements. E.g. **A** = {1, 3, 5, 7} and **B** = {Δ, $\square$, $\bigcirc$, $\blacklozenge$}; **A** is equivalent to **B**. **Note: P** and **Q** are also equivalent sets but sets **A** and **B** are not equal sets. Thus all equal sets are equivalent but not all equivalent sets are equal. Introduce the notation for "number of elements in the set" as n(A), n(B). **Example: A = {2, 4, 6, 8}. Then n(A)= 4**	identify and state two sets as equivalent or equal sets
	1.2.5 write subsets of given sets with members up to 5	Subsets	Brainstorm with pupils on the concept of a universal set. Explain subsets as the sets whose members can be found among members of another set. E.g. if **A =** {1, 2, 3,…,10} and **B** = {3, 4, 8}, then set **B** is a subset of set **A**. Introduce the symbol of subset '$\subset$'. E.g. B $\subset$ A or A $\supset$ B. **Note:** Introduce the idea of empty set as a subset of every set and every set as a subset of itself	
	1.2.6 list members of an intersection and union of sets	Intersection and Union of Sets	Guide pupils to form two sets from a given set. E.g. Q = {whole numbers up to 15} A = {0,1,10,11,12} B = {1, 3, 4, 12} Let pupils write a new set containing common members from sets A and B, i.e. a set with members 1 and 12 as the intersection of sets A and B.	identify and list the union and intersection of two or more sets

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UNIT 1.2 (CONT'D) **SETS**	The pupil will be able to:		Introduce the intersection symbol '$\cap$' and write A intersection B as A $\cap$ B = {1, 12}. Let pupils list all the members of two sets without repeating any member to form a new set. Explain that this new set is called the ***union*** of sets A and B. It is written as A $\cup$ B and read as A union B.	Let pupils:
UNIT 1.3 FRACTIONS	1.3.1 find the equivalent fractions of a given fraction	Equivalent fractions	**TLMs:** Strips of paper, Fraction charts, Addition machine tape, Cuisenaire rods, etc. Revise the concept of fractions with pupils Guide pupils to write different names for the same fraction using concrete and semi-concrete materials. Assist pupils to determine the rule for equivalent fractions i.e. $\frac{a}{b}=\frac{a}{b}\times\frac{c}{c}$ Thus to find the equivalent fraction of a given fraction, multiply the numerator and the denominator of the fraction by the same number.	write equivalent fractions for given fractions
	1.3.2 compare and order fractions	Ordering fractions	Using the concept of equivalent fractions involving the LCM of the denominators of fractions, guide pupils to compare two fractions. E.g. Arrange the following fractions in descending order: $\frac{5}{6}, \frac{7}{8}, \frac{3}{4}$ LCM of 6, 8 and 4 is 24, the equivalent fractions	arrange a set of given fractions in • ascending order • descending order

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	The pupil will be able to:			Let pupils:
UNIT 1.3 (CONT'D) **FRACTIONS**			are $\frac{20}{24}, \frac{21}{24}, \frac{18}{24}$ and the descending order is $\frac{3}{4}, \frac{5}{6}, \frac{7}{8}$ Guide pupils to order fractions in ascending and descending (order of magnitude) using concrete and semi concrete materials as well as charts showing relationships between fractions.	
	1.3.3 add and subtract fractions with 2-digit denominators	Addition and subtraction of fractions including word problems	Using the concept of equivalent fractions involving the LCM of the denominators of fractions, guide pupils to add and subtract fractions with 2-digit denominators. E.g. (1) $\frac{2}{15}+\frac{1}{12}$ LCM of 15 and 12 is 60; the equivalent fractions are $\frac{8}{60}$ and $\frac{5}{60}$ so $\frac{2}{15}+\frac{1}{12}=\frac{8}{60}+\frac{5}{60}=\frac{13}{60}$ *similarly* $\frac{2}{15}-\frac{1}{12}=\frac{8}{60}-\frac{5}{60}=\frac{3}{60}$ Assist pupils to use the concept of Least Common Multiple (L.C.M) to write equivalent fractions for fractions to be added or subtracted. Pose word problems involving addition and subtraction of fractions for pupils to solve.	solve word problems involving addition and subtraction of fractions

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	The pupil will be able to:			Let pupils:
UNIT 1.3 (CONT'D) **FRACTIONS**	1.3.4 multiply fractions	Multiplication of fractions including word problems	Revise with pupils multiplication of a fraction by a whole number and vice versa E.g. (i) $\frac{3}{4}\times 8$ (ii) $12\times\frac{2}{3}$ Guide pupils to multiply a fraction by a fraction, using concrete and semi-concrete materials as well as real life situations. Perform activities with pupils to find a general rule for multiplying a fraction by a fraction as $\frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$ Let pupils discover that to multiply a fraction by a fraction, find: (i) the product of their numerators (ii) the product of their denominators Pose word problems involving multiplication of fractions for pupils to solve.	solve word problems involving multiplication of fractions
	1.3.5 divide fractions	Division of fractions including word problems	Guide pupils to divide a whole number by a fraction by interpreting it as the number of times that fraction can be obtained from the whole number. E.g. $3\div\frac{1}{4}$ can be interpreted as "how many one-fourths pieces are there in 3 wholes?" $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ From the illustration, there are 12 one-fourths pieces in 3 wholes.	divide: (i) a whole number by a fraction (ii) a fraction by a whole number (iii) a fraction by a fraction solve word problems involving division of fractions

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	The pupil will be able to:			Let pupils:
UNIT 1.3 (CONT'D) **FRACTIONS**			Guide pupils to use the reciprocal of a number (multiplicative inverse) in re-writing and solving the division sentence (Note: The product of a number and its reciprocal is 1). $3 \div \frac{1}{4} = \square$ can also be interpreted as $\square \times \frac{1}{4} = 3$, i.e. "what times $\frac{1}{4}$ is 3?". Multiply both sides of by the reciprocal $\square \times \frac{1}{4} \times \frac{4}{1} = 3 \times \frac{4}{1}$ $\square = 12$ Also $3 \div \frac{1}{4}$ can be written as $\frac{3}{1} \div \frac{1}{4}$ or $\frac{\frac{3}{1}}{\frac{1}{4}}$ and multiplying through by the reciprocal of the divisor $3 \div \frac{1}{4} = \frac{\frac{3}{1}}{\frac{1}{4}} = \frac{\frac{3}{1} \times \frac{4}{1}}{\frac{1}{4} \times \frac{4}{1}} = \frac{\frac{3}{1} \times \frac{4}{1}}{1} = 12.$ Hence, the quotient is obtained by multiplying the dividend by the reciprocal of the divisor. E.g. $\frac{4}{9} \div \frac{5}{7} = n \Rightarrow \frac{4}{9} = \frac{5}{7} \times n$ multiply each side by the inverse of the divisor $\frac{5}{7}$ to obtain, $\frac{4}{9} \times \frac{7}{5} = n \times \frac{5}{7} \times \frac{7}{5}$ $\frac{4 \times 7}{9 \times 5} = n \times 1$	

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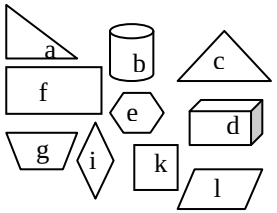
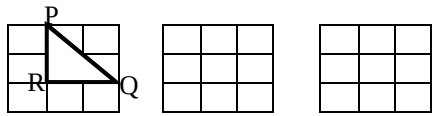
	The pupil will be able to:			Let pupils:
UNIT 1.3 (CONT'D) **FRACTIONS**			Therefore $\frac{4}{9} \div \frac{5}{7} = \frac{4}{9} \times \frac{7}{5} = \frac{28}{45}$ n = $\frac{28}{45}$ Guide pupils to deduce the rule that to divide by a fraction, multiply the dividend by the reciprocal of the divisor. i.e. $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$ Pose word problems involving division of fractions for pupils to solve.	
UNIT 1.4 **SHAPE AND SPACE**	1.4.1 draw plane shapes and identify their parts :	Plane shapes	**TLMs:** Empty chalk boxes, Cartons, Tins, Cut-out shapes from cards. Real objects of different shapes, Solid shapes made from card boards: prisms – cubes, cuboids, cylinders; pyramids – rectangular, triangular and circular pyramids. Guide pupils to identify shapes that have i. congruent sides ii. all sides equal iii. congruent angles Guide pupils to identify shapes that are symmetrical and show the lines of symmetry Assist pupils to classify real objects into various plane shapes such as triangles, right-angled triangles, trapeziums, kite, etc. and solid shapes such into prisms, pyramids etc.	Which of shapes below i. have all sides equal? ii. ave right angles? iii. re prisms? iv. re symmetrical  E.g. Draw rectangle WXYZ and show and name the symmetries

<table>
<tr><th>UNIT</th><th>SPECIFIC OBJECTIVES</th><th>CONTENT</th><th>TEACHING AND LEARNING ACTIVITIES</th><th>EVALUATION</th></tr>
<tr>
<td>UNIT 1.4 (CONT'D)

SHAPE AND SPACE</td>
<td>The pupil will be able to:

1.4.2 sort shapes according to given descriptions</td>
<td>Investigations with shapes</td>
<td>Guide pupils to draw plane shapes of given dimensions (such as rectangles, squares and triangles) in square grids, and name their vertices with letters.

E.g. The shape PQR in the figure is right angled triangle. Using corners of the grid as vertices, investigate the different right angled triangles that can be drawn in a 3×3 grid and label the vertices.

Identify which of the triangles drawn
i. have a pair of congruent sides
ii. has the longest side
iii. are symmetrical.</td>
<td>Let pupils:</td>
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<td></td>
<td>1.4.3 find the relation between the number of faces, edges and vertices of solid shapes</td>
<td>Relation connecting faces, edges and vertices of solid shapes</td>
<td>Guide pupils to make nets of solid shapes from cards, fold and glue them to form the solid shapes - cubes, cuboids, pyramids, triangular prism, pyramids, tetrahedron and octahedron.

Put pupils investigate and record the number of faces, edges and vertices each solid shape has using either the real objects or solid shapes made from cards.

Let pupils record their findings using the following table:

<table>
<tr><th>Solid shapes</th><th>No. of faces</th><th>No. of edges</th><th>No. of vertices</th></tr>
<tr><td>Cube</td><td></td><td></td><td></td></tr>
<tr><td>Cuboid</td><td></td><td></td><td></td></tr>
<tr><td>Triangular prism</td><td></td><td></td><td></td></tr>
<tr><td>Pyramid</td><td></td><td></td><td></td></tr>
<tr><td>Tetrahedron</td><td></td><td></td><td></td></tr>
<tr><td>Octahedron</td><td></td><td></td><td></td></tr>
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</td>
<td>Find the number of faces, vertices and edges in a hexagonal prism.</td>
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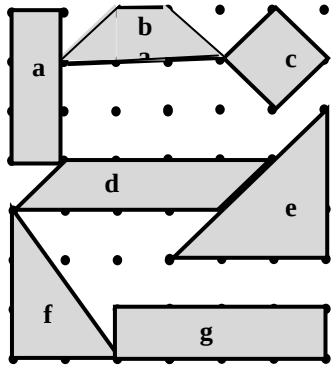
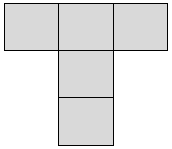
</table>

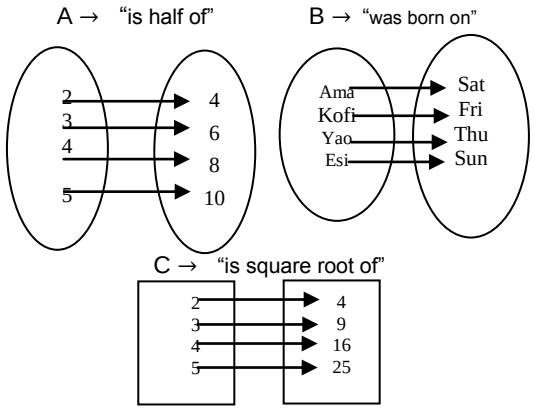
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.4 (CONT'D) **SHAPE AND SPACE**			Pupils brainstorm to determine the relation between the number of faces, edges and vertices of each solid shape. i.e. F + V - 2 = E **or** F + V = E + 2 Encourage pupils to think critically and tolerate each other's view toward solutions.	
UNIT 1.5 **LENGTH AND AREA**	1.5.1 solve problems on perimeter of polygons	Perimeter of polygons	**TLMs:** Geoboard, Graph paper, Rubber band Cut-out shapes (including circular shapes), Thread Revise the concept of perimeter as the total length or measure round a plane shape using practical activities. Guide pupils to measure the sides of the shapes drawn under objective 4.1.2 above and find the perimeter of shapes. Let them investigate the triangle with the largest perimeter that can be drawn in the 3×3 square grid using corners of the grid as vertices. Guide pupils to investigate the largest rectangle that can be drawn a 4×4 square grid using corners of the grid as vertices. Guide pupils to measure the sides of the rectangles and find their perimeter. Assist them to discover the rule for finding the perimeter of a rectangle as *P = 2(Length + Width)* Guide pupils to draw different polygons with equal sides in square grid using corners of the grid as vertices. Guide pupils to also discover that the perimeter of a regular polygon is $P = n \times Length$, where n is the number of sides. Pose word problems for pupils to solve	find the perimeter of given shapes drawn in square grids solve word problems involving perimeter of polygons

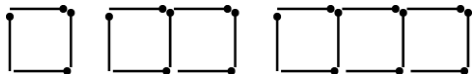
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.5 (CONT'D) **LENGTH AND AREA**	1.5.2 solve problems on circumference of a circle	Perimeter of a circle (Circumference)	Revise parts of a circle and the idea that circumference is the perimeter of a circle using real objects like; Milk tin, Milo tin, etc Guide pupils to carry out practical activities in groups to discover the relationship between the circumference and the diameter of a circle as; Circumference $\approx 3 \times$ Diameter. The approximate value of $C \div d$ is denoted by the Greek letter π. Pupils can be encouraged to use the calculator to check the value of π. Therefore $C = \pi d$ *or* $C = 2\pi r$ (since $d = 2r$) Guide pupils to use the relation **$C = 2\pi r$** to find the circumference of circles Pose word problems involving circumference of circles for pupils to solve. **Note:** Encourage pupils to share ideas in their groups	find the circumference of a circle given its radius or diameter and vice versa solve word problems involving the circumference of a circle
	1.5.3 find the area of a rectangle	Area of a rectangle and polygons	Guide pupils to find the shapes which have the same size by finding the numbers of squares enclosed by the shapes. Find the area of each shape if the side of each square in the grid is 5cm long.	find the area of a rectangle given its dimensions determine the perimeter of different rectangles that have the same area Find the perimeter of

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.5 (CONT'D) **LENGTH AND AREA**	The pupil will be able to:		 Guide pupils to estimate the areas covered by the shapes (i.e. triangles, rectangles and polygons) whose perimeters were calculated in grids above. Pose word problems involving area of rectangles and squares for pupils to solve  E.g. The T-shape is a net of an open cube. If the area of the T-shape is 180cm^2, what is the length of the side of the cube?	Let pupils: a square board whose area is 100 cm^2. What is its perimeter? determine the area of a square given its perimeter solve word problems involving area of rectangles and squares
UNIT 1.6 **POWERS OF NATURAL NUMBERS**	1.6.1 find the value of the power of a natural number	Positive powers of natural numbers with positive exponents (index)	**TLMs:** Counters**,** Bottle tops**,** Small stone. Guide pupils to illustrate with examples the meaning of repeated factors using counters or bottle tops. E.g. $2 \times 2 \times 2 \times 2$ is repeated factors, and each factor is 2	write powers of given natural numbers write natural numbers as powers of a product of its prime factors

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.6 (CONT'D) **POWERS OF NATURAL NUMBERS**	The pupil will be able to:		Guide pupils to discover the idea of the power of a number E.g. $2 \times 2 \times 2 \times 2 = 2^4$ and 2^4 is the power. i.e. Power { 2^4 ← Index or exponent; base ← Guide pupils to distinguish between factors and prime factors of natural numbers. Assist pupils to write a natural number as powers of a product of its prime factors E.g. $72 = 2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$	Let pupils:
	1.6.2 use the rule (i) $a^n \times a^m = a^{(n+m)}$ (i) $a^n \div a^m = a^{(n-m)}$ to solve problems	Multiplication and division of powers	Guide pupils to perform activities to find the rule for multiplying and dividing powers of numbers. i.e. (i) $a^n \times a^m = a^{(n+m)}$ (ii) $a^n \div a^m = a^{(n-m)}$ where $n > m$.	solve problems involving the use of the rule $a^n \times a^m = a^{(n+m)}$ and $a^n \div a^m = a^{(n-m)}$ where $n > m$
	1.6.3 use the fact that the value of any natural number with zero as exponent or index is 1	Zero as an exponent	Perform activities with pupils to discover that for any natural number **a, $a^0 = 1$** i.e. (i) $2^4 \div 2^4 = \frac{2\times2\times2\times2}{2\times2\times2\times2} = 1$ (ii) $2^4 \div 2^4 = 2^{4-4} = 2^0 = 1$	solve problems involving the use of the rule $a^n \div a^m = a^{(n-m)}$ where $n = m$

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.7 **INTRODUCTION TO CALCULATORS**	1.7.1 identify some basic keys on the calculator and their functions	Basic functions of the keys of the calculator Calculator for real life computation	Introduce pupils to some of the basic keys of a calculator and guide them to use it properly. E.g. C, MR, M+, $\pm$, $\sqrt{}$ etc. Guide pupils to compute simple problems involving all the four preparations using the calculator e.g. find the sum 246 + 3.64 – 16.748 Let pupils use the calculator to solve real life problems involving several digits and/or decimal places. **Note**: Encourage pupils to use the calculator to check their answers from computations in all areas where applicable.	solve real life problems involving several digits or decimals using the calculator
UNIT 1.8 **RELATIONS**	1.8.1 identify and write relations between two sets in everyday life	Relations between two sets in everyday life	Guide pupils to identify the relation between pairs of sets in everyday life, like; Ama “is the sister of” Ernest, Doris “is the mother of” Yaa, etc. Guide pupils to realize that in mathematics we also have many relations. E.g. 2 “is half of” 4 3 “is the square root of” 9 5 “is less than” 8 **Note:** Encourage pupils to work as a team and have the sense of belongingness	find the relation between a pair of given sets make Family Trees of their own up to their grand parents

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.8 (CONT'D) **RELATIONS**	1.8.2 represent a relation by matching and identify the domain and the co-domain	Representing a relation as a mapping	Guide pupils to identify that relation can be represented by matching diagram. i.e.  	find the domain in a given relation find the co-domain of a given relation
	1.8.3 identify the co-domain domain and range of a relation for a given domain	Co-Domain Domain and Range of a relation	Assist pupils to identify the domain as the set of elements in the first set from the direction of the matching diagram E.g. from the relation "is half of" the domain is the set D = {2, 3, 4, 5} Assist pupils to identify the co-domain as the set of elements in the second set from the direction of the mapping diagram. E.g. from the relation "was born on" the co-domain is {Monday, Friday, Saturday, Sunday} Guide pupils to identify the range as a subset of the Co-domain E.g. the range for the relation "was born on" is the set R = {Monday, Friday, Sunday}	find the range of a given relation

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.8 (CONT'D) **RELATIONS**	1.8.4 write relations or mapping as set of ordered pairs	Relation as ordered pair	Guide pupils to write ordered pairs for the mappings A, B and C above. E.g. A = {(2,4), (3,6), (8,8), (5,10)} B = {(Ama, Saturday), (Kofi, Friday), Yao, Thursday), (Esi, Sunday)} C = {(2,4), (3,9, (4,16), (5,25)}	write pair of members that satisfy a given relation
	1.8.5 find the rule for mapping	Rules for mapping	Guide pupils to state rules for mapping by using the inverse of the relation. To write the rule a variable ordered pair is introduced (x, y) and for the rule, ***y*** is expressed in terms of ***x,*** (i.e. the inverse relation). E.g. the rule of the mapping A above is the inverse mapping, which is "is twice" or y is two times x, (i.e. y=2x). This may be illustrated in a table as shown below Domain 2 3 4 5 x ↓ ↓ ↓ ↓ ↓ Range 4 6 8 10 Y=2x	
	1.8.6 find rule for mappings and use it to solve problems	Investigate patterns for rules	Guide pupils to investigate patterns and find rule for mappings. E.g. Match sticks are used to make the following patterns.  Pattern Pattern 2 Pattern 3	

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.8 (CONT'D) **RELATIONS**	The pupil will be able to:		Complete the table for the number of sticks in the perimeter and the pattern. Pattern number 1 2 3 *n* | 1 | 2 | 3 | 4 | 5 | 6 | p Sticks in the perimeter | 4 | 6 | | | | | | Total number of sticks | 4 | 7 | | | | | | Using your table find the number of match sticks: i. in the perimeter of the 20th pattern ii. in the 20th pattern iii. in the perimeter of the nth pattern iv. in the nth pattern.	Let pupils:
UNIT 1.9 **ALGEBRAIC EXPRESSIONS**	1.9.1 find the members of a domain that make an open statement true	Open statements	**TLMs:** rectangular cut out, bottle tops, algebra tiles Guide pupils to revise closed statements as either true or false statements E.g. (a) 7 nines is 64 (false) (b) 2 + 3 = 5 (true) (c) 4 × 6 = 10 (false) Guide pupils to note that open statements are statements which do not have any definite response. Make open statements with defined domain for pupils to identify members of the domain that make the statements true. E.g. x > 6; D = {x : x = 5, 6, 7, 8, 9, 10}	indicate if a given statement is true or false find the member in a given domain that makes a given statement true
	1.9.2 add and subtract algebraic expressions	Addition and subtraction of algebraic expressions	Guide pupils to simplify algebraic expressions E.g. (i) 3a + 5b + 2a – b (ii) 3p + 4p – p Perform activities like "think of a number" game with pupils E.g. think of a number, add 2 to it and multiply the	simplify given algebraic expressions including word problems

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:		sum by 3 $(x + 2) \times 3 = 3x + 6$.	Let pupils:
UNIT 1.9 (CONT'D) **ALGEBRAIC EXPRESSIONS**			Think of another number, multiply it by 2, add 4 to the result i.e. $(y \times 2) + 4 = 2y + 4$ Add the results; $(3x + 6) + (2y + 4) = 3x + 2y + 10$.	
	1.9.3 multiply simple algebraic expressions	Multiplication of algebraic expressions	Guide pupils to multiply the given algebraic expressions E.g. (i) $3b \times b$ (ii) $5a \times 2b$ (iii) $4b \times 3b$ Guide pupils to perform activities like "think of a number" game which involves multiplying algebraic expressions.	multiply pairs of given expressions including word problems
UNIT 1.10 **CAPACITY, MASS, TIME AND MONEY**	1.10.1 add and subtract capacities	**CAPACITY:** Addition and subtraction of capacities	**TLMs:** Tea and Table spoons**,** Soft drink cans and bottles**,** Measuring cylinders, Jugs and Scale balance **Revision:** Pupils to estimate capacities of given containers and verify by measuring. Guide pupils to change measures of capacities in millilitres (ml) to litres (l) and millilitres (ml) and vice versa. Perform activities with pupils involving adding and subtracting capacities in millilitres and litres.	solve word problems involving addition and subtraction of capacities
	1.10.2 add and subtract masses of objects	**MASS:** Adding and subtracting masses of objects	**Revision:** Pupils to estimate masses of objects and verify by measuring to the nearest kilogram. Guide pupils to find the masses of familiar objects using scale balance and then add and find their differences	solve word problems involving, addition and subtraction of masses

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.10 (CONT'D) **CAPACITY, MASS, TIME AND MONEY**	1.10.3 use the relationship between the various units of time	**TIME:** Relationships between various units of time	Guide pupils to find the relation between days, hours, minutes and seconds. Take pupils through activities, which involve addition and subtraction of duration of different events.	identify the relationship between the various units of time
	1.10.4 solve word problems involving time	Word problems involving the relationship between days, hours, minutes and seconds	Guide pupils to solve word problems involving the relationship between the various units of time.	solve word problems involving the relationship between the various units of time
	1.10.5 solve word problems involving addition and subtraction of various amounts of money	**MONEY:** Addition and subtraction of money including word problems	Guide pupils to add and subtract monies in cedis and pesewas. Pose word problems on spending and making money for pupils to solve	solve word problems involving the addition and subtraction of amounts of money solve word problems on spending and making money
UNIT 1.11 **INTEGERS**	1.11.1 explain situations resulting to concept of integers and locate integers on a number line	The idea of integers (Negative and positive integers)	Discuss with pupils everyday situations resulting in the concept of integers as positive and negative whole numbers. E.g.: 1. Having or owing money 2. Floors above or below ground level 3. Number of years BC or AD Guide pupils to write negative numbers as signed numbers. E.g. (– 3) or (¯ 3) as negative three. Use practical activities to guide pupils to match integers with points on the number line.	locate given integers on a number line

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.11 (CONT'D) **INTEGERS**	1.11.2 compare and order integers	Comparing and ordering integers	Guide pupils to use the number line to compare integers. Guide pupils to arrange three or more integers in ascending or descending order. Guide pupils to use the symbols for greater than (>) and less than (<) to compare integers	compare and order two or more given integers
	1.11.3 add integers	Addition of integers	Introduce how to find the sum of integers using practical situations. E.g. adding loans and savings. Guide pupils to find the sum of two integers using the number line (both horizontal and vertical representation) Guide pupils to establish the commutative and associative properties of integers Introduce the zero property (identity) of addition. E.g.(– 5) + 0 = 0 + (– 5) = – 5 Introduce the inverse property of addition. E.g. (– 3) + 3 = 3 + (– 3) = 0.	solve problems involving addition of integers
	1.11.4 subtract positive integers from integers	Subtraction of positive integers	Guide pupils to recognize that '-1' can represent the operation 'subtract 1' or the directed number 'negative 1'. Guide pupils to subtract a positive integer and zero from an integer. • Use practical situations such as the use of the number line, counters, etc. • Use the property that a + 0 = a; – a + 0 = – a; 4 + 0 = 4 and – 4 + 0 = – 4.	subtract positive integers solve word problems involving subtraction of positive integers

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:		Pose problems, which call for the application of subtraction of positive integers for pupils to solve.	Let pupils:
UNIT 1.11 (CONT'D) **INTEGERS**	1.11.5 multiply and divide Integers by positive integers	multiplication and Division of integers	Guide pupils to multiply integers by positive integers. E.g. $(+2) \times 3 = 6$ or $2 \times 3 = 6$ $-2 \times (+3) = -6$ or $-2 \times 3 = -6$ Guide pupils to divide integers by positive integers without a remainder. E.g. $-15 \div 5 = -3$ and $+15 \div 5 = 3$. Introduce pupils to the use of calculators in solving more challenging problems involving integers.	solve simple problems involving multiplication and division of integers without using calculators use calculators to solve more challenging problems E.g. (i) $(-26) \times 15$ (ii) $\frac{252}{30} \times \frac{(-20)}{30}$
UNIT 1.12 **DECIMAL FRACTIONS**	1.12.1 express fractions with powers of ten in their denominators as decimals	Converting common fractions to decimal fractions	Revise with pupils the concept of decimal fractions with a number line marked in tenths. E.g. $\frac{6}{10} = 0.6$ (read as six-tenths equals zero point six). Guide pupils to find decimal fractions from common fractions with powers of ten as their denominators. E.g. We may state (i) $\frac{7}{10} = 7 \div 10 = 0.7$ (ii) $\frac{3}{100} = 3 \div 100 = 0.03$ (iii) $\frac{4}{1000} = 4 \div 100 = 0.004$. Guide pupils to find decimal fractions from fractions with their denominators expressed in	convert common fractions with powers of ten as their denominators to decimal

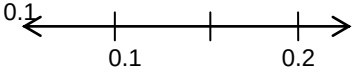
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.12 (CONT'D) **DECIMAL FRACTIONS**	The pupil will be able to:		different forms using equivalent fractions to get denominator a power of 10 E.g. $\frac{2}{5} = \frac{2\times 2}{5\times 2} = \frac{4}{10} = 0.4$	Let pupils:
	1.12.2 convert decimal fractions to common fractions	Converting decimal fractions to common fractions	Guide pupils to find common fractions from decimal fractions E.g. $0.3 = \frac{3}{10}$, $0.6 = \frac{6}{10} = \frac{3}{5}$ **Note:** Use practical situations such as the conversion of currencies.	convert common fractions to decimals and vice versa
	1.12.3 compare and order decimal fractions	Ordering decimal fractions	Guide pupils to write decimal fractions as common fractions and order them	order decimal fractions
	1.12.4 carry out the four operations on decimal fractions	Operations on decimal fractions	Guide pupils to add decimal fractions in tenths, hundredths and thousandths Guide pupils to subtract decimal fractions up to 3 decimal places Guide pupils to multiply decimal fractions E.g. $0.3 \times 0.7 = \frac{3}{10}\times\frac{7}{10} = \frac{21}{100} = 0.21$ Guide pupils to divide decimal fractions E.g. (i) $0.48 \div 0.2 = \frac{48}{100}\div\frac{2}{10}$ $= \frac{48}{100}\times\frac{10}{2} = \frac{24}{10} = 2.4$ (ii) $0.5 \div 0.5 = \frac{5}{10}\div\frac{5}{10} = \frac{5}{10}\times\frac{10}{5} = 1$ **Note:** You may encourage the use of calculators to check answers	add decimal fractions up to decimals in hundredths subtract decimal fractions in thousandths solve problems on multiplication of decimal fractions

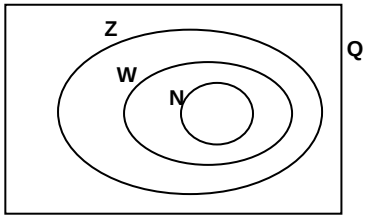
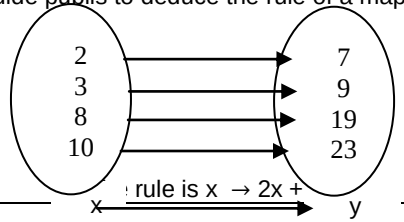
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 1.12 (CONT'D) **DECIMAL FRACTIONS**	1.12.5 correct decimal fractions to a given number of decimal places	Approximation	Guide pupils to write decimal fractions and correct them to a given number of decimal places Introduce the pupils to the rule for rounding up or down	round up or down decimals to given number of decimal places
	1.12.6 express numbers in standard form	Standard form	Guide pupils to establish the fact that standard form is used when dealing with very large or small numbers and the number is always written as a number between 1 and 10 multiplied by a power of 10. E.g. 6284.56 = 6.28456 $\times$ 10	convert numbers to the standard form
UNIT 1.13 **PERCENTAGES**	1.13.1 find the percentage of a given quantity	Finding percentage of a given quantity	**TLMs:** multi base block (flats), square grid paper Revise the idea of percentages as a fraction expressed in hundredths, E.g. $\frac{1}{4} = \frac{1\times100}{4\times100} = \frac{100}{4}\left(\frac{1}{100}\right) = \frac{25}{100}$ = 25% Revise changing percentages to common fractions. E.g. 25% = $\frac{25}{100} = \frac{25\times1}{25\times4} = \frac{1}{4}$ Guide pupils to find a percentage of a given quantity. E.g. 12½ % of GH¢300 i.e. $\frac{25}{2} \times \frac{1}{100} \times$ GH¢300 = GH¢ 37.50	find a percentage of a given quantity
	1.13.2 express one quantity as a percentage of a similar quantity	Expressing one quantity as a percentage of a similar quantity	Guide pupils to express one quantity as a percentage of a similar quantity. E.g. What percentage of 120 is 48	express one quantity as a percentage of another quantity

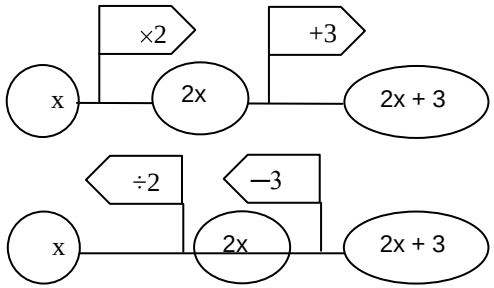
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:		i.e. $\frac{48}{120}\times\frac{100}{100} = 4\left(\frac{10}{100}\right) = \frac{40}{100} = 40\%$	Let pupils:
UNIT 1.13 (CONT'D) **PERCENTAGES**			guide pupils to establish that the process is shortened as $\frac{48}{120}$ x 100%	
	1.13.3 solve problems involving profit or loss as a percentage in a transaction	Solving problems involving profit/loss percent	Guide pupils to find the profit/loss in a given transaction Guide pupils to express profit/loss as a percentage of the capital/cost price, as; Profit percent = $\frac{profit}{capital}\times 100$ Loss percent = $\frac{loss}{capital}\times 100$	find the profit/loss percent of a real life transaction
UNIT 1.14 **COLLECTING AND HANDLING DATA (DISCRETE)**	1.14.1 collect data from a simple survey and/or from data tables	Collecting data	**TLMs:** newspapers, school records, exercise books, register Guide pupils to carry out simple surveys to collect data, such as marks scored in an exercise, months of birth of pupils, etc	collect data from news papers, sporting activities, etc and record them
	1.14.2 organize data into simple tables	Handling Data	Guide pupils to organize the data collected into simple frequency distribution tables	organize data in table form
	1.14.3 find the Mode, Median and Mean of a set of data	Mode, Median and Mean	Guide pupils to find the mode, median and the mean of discrete data collected. Brainstorm with pupils to find out which of the measures is the best average in a given situation (use practical examples).	calculate the mode, median and mean from a discrete data

JUNIOR HIGH SCHOOL 2

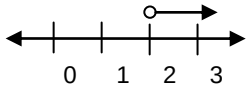
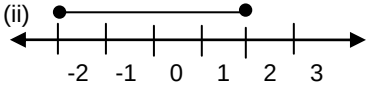
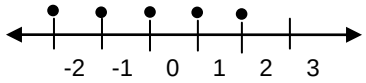
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.1 **STATISTICS**	The pupil will be able to: 2.1.1 identify and collect data from various sources	Sources of data	Guide pupils through discussions to identify various sources of collecting data E.g. examination results, rainfall in a month, import and exports, etc	Let pupils : state various sources of collecting data
	2.1.2 construct frequency table for a given data	Frequency table	Assist pupils to make frequency tables by tallying in groups of five and write the frequencies.	prepare a frequency table for given data
	2.1.3 draw the pie chart, bar chart and the block graph to represent data	Graphical representation of data • pie chart • bar chart • block graph • stem and leaf plot	Guide pupils to draw the pie chart, bar chart and the block graph from frequency tables. Guide pupils to draw a bar chart for a data presented by a pie chart, Guide pupils to represent a given data using the stem and leaf plot.	draw various graphs to represent data
	2.1.4 read and interpret frequency tables and charts	Interpreting tables and graphs	Guide pupils to read and interpret frequency tables and graphs by answering questions relating to tables and charts/graphs	interpret given tables and charts E.g. answer questions from: 1. frequency table 2. pie chart 3. bar chart, etc

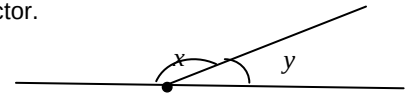
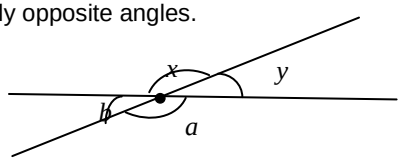
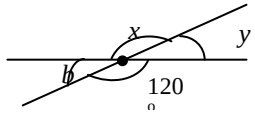
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.2 **RATIONAL NUMBERS**	2.2.1. identify rational numbers	Rational numbers	Guide pupils to identify rational numbers as numbers that can be written in the form $\frac{a}{b}$; b ≠ 0 E.g. –2 is a rational number because it can be written in the form –2 = $\frac{4}{-2}$ or $\frac{-10}{5}$	identify rational numbers
	2.2.2. represent rational numbers on the number line	Rational numbers on the number line	Assist pupils to locate rational numbers on the number line E.g. – 1.5, 0.2, 10%, $\frac{2}{3}$ 10% = 0.1  	Locate a given rational number on the number line
	2.2.3. distinguish between rational and non-rational numbers	Rational and non-rational numbers	Guide pupils to express given common fractions as decimals fractions. Assist pupils to identify terminating, non-terminating and repeating decimals. Guide pupils to recognise decimal fractions that are non-terminating and non-repeating as numbers that are not rational	explain why 0.333 is a rational number but π is not
	2.2.4. compare and order rational numbers	Comparing and ordering rational numbers	Guide pupils to compare and order two or more rational numbers.	arrange a set of rational numbers in ascending or descending order

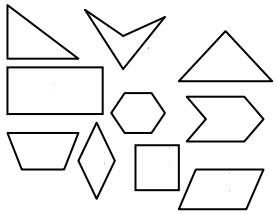
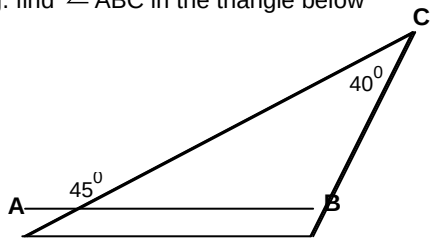
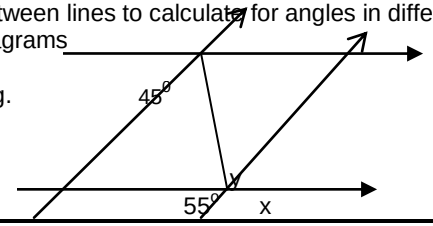
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
	2.2.5. perform operations on rational numbers	Operations on rational numbers	Guide pupils to add, subtract, multiply and divide rational numbers.	add and subtract rational numbers multiply and divide rational numbers
UNIT 2.2 (CONT'D) **RATIONAL NUMBERS**	2.2.6. identify subsets of the set of rational numbers	Subsets of rational numbers	Guide pupils to list the members of number systems which are subsets of rational numbers: {Natural numbers} = {1, 2, 3,…} denoted by N {Whole numbers} = {0, 1, 2, 3,…} denoted by W. {Integers} = {…-2, -1, 0, 1, 2,…} denoted by Z {Rational numbers} denoted by Q. Guide pupils to explain the relationship between the subsets of rational numbers by using the Venn diagram  Assist pupils to find the union and intersection of the subsets. E.g. N ∩ W = N.	find the intersection and union of subsets of rational numbers
UNIT 2.3 MAPPING	2.3.1. identify mapping as a special relation	Idea of mapping	Revise the idea of a relation between a pair of sets. Guide pupils to identify a mapping as a correspondence between two sets.	explain mapping using real life situations
	2.3.2. deduce the rule for a mapping	Rule for mapping	Guide pupils to deduce the rule of a mapping.  	i. find the rule for a given mapping i. R is a relation (or mapping) defined by R = {(1,2), (2,5), (5,26), (10, 101)}. What is the

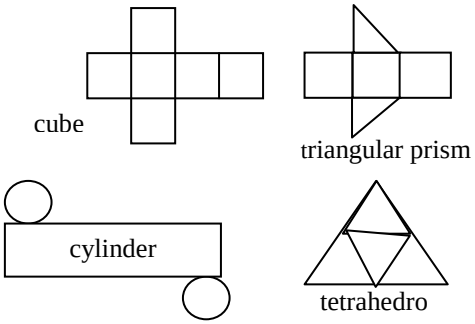
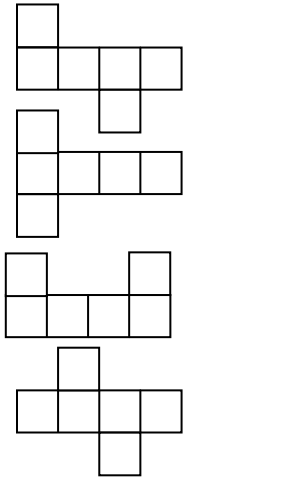
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils : rule for the relation?
UNIT 2.3 (CONT'D) **MAPPING**	2.3.3. find the inverse of a given mapping	Inverse mapping	Guide pupils to discover that inverse mapping is (i) going backwards from the second set to the first set. (ii) reversing the operations and their order in a rule. Use the flag diagram in this case. E.g. y = 2x + 3  ∴ inverse rule is $\frac{x-3}{2}$	find the inverse of a mapping
	2.3.4. make a table of values for a rule of a mapping	Making a table of values for a given rule	Guide students to make tables of values by substituting a set of values into a given rule E.g. y = 2x + 3 **x** | **2x + 3** | **y** 1 | 2(1) + 3 | 5 2 | 2(2) + 3 | 7 3 | 2(3) + 3 | 9	make a table of values for a given rule of a mapping

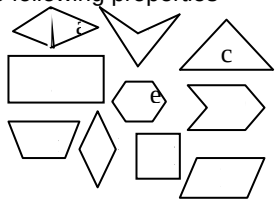
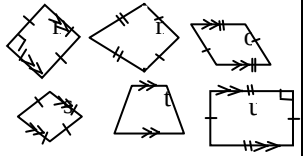
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.4 **LINEAR EQUATIONS AND INEQUALITIES**	2.4.1. translate word problems to linear equations in one variable and vice versa	Linear equations • mathematical sentences for word problems	Guide pupils to write mathematical sentences from word problems involving linear equations in one variable. E.g. the sum of the ages of two friends is 25, and the elder one is 4 times older than the younger one. Write this as a mathematical sentence? i.e. let the age of the younger one be x ∴ age of elder one = 4x 4x + x = 25	write mathematical sentences from given word problems involving linear equations in one variable
		• word problems for given linear equations	Guide pupils to write word problems from given mathematical sentences E.g. x + x = 15 i.e. the sum of two equal numbers is 15	write word problems for given mathematical sentences
	2.4.2. solve linear equations in one variable	Solving linear equations in one variable	Using the idea of balance, assist pupils to solve simple linear equations E.g. 3x + 5 = 20 i.e. 3x + 5 – 5 = 20 – 5 3x = 15 x = 5 Note: flag diagrams can also be used	solve simple linear equations
	2.4.3. translate word problems to linear inequalities	Making mathematical sentences involving linear inequalities from word problems	Guide pupils to write mathematical sentences involving linear inequalities from word problems. E.g. think of a whole number less than 17 i.e. x < 17	write mathematical sentences involving linear inequalities from word problems

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
	2.4.4. solve linear inequalities	Solving linear inequalities	Using the idea of balancing, guide pupils to solve linear inequalities E.g. $2p + 4 < 16$ $2p + 4 - 4 < 16 - 4$ $2p < 12$ $p < 6$	solve linear inequalities
UNIT 2.4 (CONT'D) **LINEAR EQUATIONS AND INEQUALITIE**	2.4.5. determine solution sets of linear inequalities in given domains	Solution sets of linear in equalities in given domains	Guide pupils to determine solution sets of linear inequalities in given domains. E.g. if $x < 4$ for whole numbers, then the domain is whole numbers and the solution set = {0, 1, 2, 3}	determine the solution sets of linear inequalities in given domains
	2.4.6. illustrate solution sets of linear inequalities on the number line	Illustrating solution sets of linear inequalities on the number line	Assist pupils to illustrate solution sets on the real number line. E.g. (i)  $x > 2$ (ii)  $-2 \leq x \leq 2$ Explain to pupils that the illustration of solution sets will look different when given another domain, e.g. integers (iii)  $-2 \leq x \leq 2$	illustrate solution sets of linear inequalities on the number line

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.5 **ANGLES**	2.5.1. discover that the sum of angles on a straight line is 180^o and angles at a point is 360^o	Angles on a straight line; Angles on at a point	**TLMs:** Protractor, Cut-out triangles Introduce pupils to the various parts of the protractor (E.g., the base line, centre and divisions marked in the opposite directions) Guide pupils to draw a straight line to a point on a line and measure the two angles formed using the protractor.  Guide pupils to add their results and discover that $x + y = 180^o$ Guide pupils to extend the line and measure the vertically opposite angles.  Guide pupils to measure the vertically opposite angles and use the results to see that angles at a point is 360^o	find the value of *y* in the figure; find the value of $x + b$ in the figure 
	2.5.2. identify and classify shapes by types of angles	Types of angles	Guide pupils to relate square corner to right angles (i.e. 90^o) Guide pupils to identify and classify shapes which have: • acute angles • right angles • obtuse angles	Which of the shapes below i. have acute angles? ii. have right angles? iii. have reflex angles? iv. are symmetrical

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:		• reflex angles 	Let pupils :
UNIT 2.5 (CONT'D) **ANGLES**	2.5.3. discover why the sum of the angles in a triangle is 180^o	Sum of angles in a triangle	Using cut-out angles from triangles, guide pupils to discover the sum of angles in a triangle Guide pupils to draw triangles and use the protractor to measure the interior angles and find the sum	measure and find the sum of angles in given triangles
	2.5.4. calculate the size of angles in triangles	Solving for angles in a triangle	Using the idea of sum of angles in a triangle, guide pupils to solve for angles in a given triangle. E.g. find $\angle$ ABC in the triangle below 	find the sizes of angles in given triangles
	2.5.5. calculate the sizes of angles between parallel lines	Angles between lines • vertically opposite angles • corresponding angles • alternate angles	Assist pupils to demonstrate practically that: 1. vertically opposite angles are equal 2. corresponding angles are equal 3. alternate angles are equal Assist pupils to apply the knowledge of angles between lines to calculate for angles in different diagrams E.g. 	find the sizes of angles between lines Calculate for angles in different diagrams

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to: 2.5.6. calculate the exterior angles of a triangle	Exterior angles of triangles	Guide pupils to use the concept of straight angles to calculate exterior angles of a given triangle	Let pupils : calculate exterior angles of triangles
UNIT 2.6 **SHAPE AND SPACE**	2.6.1 construct common solids from their nets	Common solids and their nets: Cube, cuboid, tetrahedron, prisms, pyramids, cylinders cones	**TLMs:** Cube, Cuboids, Pyramids, Cones, Cylinders. Revise nets and cross sections of solids with pupils. Guide pupils to identify the nets of common solids by opening the various shapes.  Guide pupils to add flaps to the nets, fold them and glue them to form the solids.	Make solid shapes from nets Which of these cannot be folded into a cube? 

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to: 2.6.2 identify and classify quadrilaterals by their properties	Properties of quadrilateral: square, rectangle, parallelogram, kite, trapezium and rhombus	Guide pupils to identify and classify according to one or combination of the following properties – • diagonals • congruent sides • congruent angles • parallel sides • right angles • symmetries  Given that P = {parallelograms}, Q = {quadrilaterals with all sides equal} and R = {rectangles}; if R, P and Q are subsets of the set U = {**m, n, o, s**, **t** and **u}** illustrated in the box. What is (i) $P \cap Q$? and (ii) $P \cup R'$? 	Let pupils : Which of quadrilaterals ii. have no acute angles? iii. H ave reflex angles? iv. P airs of parallel sides v. H ave diagonals bisecting at $90°$ vi. are symmetrical List the labels of the set B, where B={quadrilaterals with two lines of symmetry}

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.7 **GEOMETRIC CONSTRUCTIONS**	2.7.1 explain a locus	The idea of locus	Demonstrate the idea of locus as the path of points obeying a given condition	describe the locus of real life activities(E.g. high jumper, 400m runner, etc)
	2.7.2 construct simple locus	Constructing: - circles	Guide pupils to construct the circle as a locus (i.e. tracing the path of a point P which moves in such a way that its distance from a fixed point, say O is always the same).	describe the locus of a circle Let pupils: bisect a given line
		- perpendicular bisector	Guide pupils to construct a perpendicular bisector as a locus (i.e. tracing the path of a point P which moves in such a way that its distance from two fixed points [say A and B] is always equal).	bisect a given angle
		- bisector of an angle	Guide pupils to construct an angle bisector as a locus of points equidistant from two lines that meet.	
		-parallel lines	Guide pupils to construct parallel lines as a locus (i.e. tracing the path of a point say P which moves in such a way that its distance from the line AB is always the same). Perpendicular bisector, equidistant, locus Perpendicular bisector, equidistant, locus	construct a parallel to a given line :

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.7 (CONT'D) **GEOMETRIC CONSTRUCTIONS**	2.7.3 copy an angle	Copying an angle	Guide pupils to copy an angle equal to a given angle using straight edges and a pair of compasses only	copy a given angle
	2.7.4 construct angles of 90^O, 45^O, 60^O and 30^O	Constructing angles of: 90^O, 45^O, 60^O, and 30^O	Guide pupils to use the pair of compasses and a straight edge only to construct 90^O and 60^O. Guide pupils to bisect 90^O and 60^O to get 45^O and 30^O respectively.	construct angles: 90^O, 60^O, 45^O and 30^O
	2.7.5 construct triangles under given conditions	Constructing triangles	Guide pupils to use a pair of compasses and a straight edge only to construct: • Equilateral triangle • Isosceles triangle • Scalene triangle • A triangle given two angles and one side • A triangle given one side and two angles • A triangle given two sides and the included angle	construct a triangle with given conditions
	2.7.6 construct a regular hexagon	Constructing a regular hexagon	Guide pupils to construct a regular hexagon.	construct a regular hexagon with a given side
UNIT 2.8 **NUMBER PLANE**	2.8.1 identify and label axes of the number plane	Axes of the number plane	**TLMs:** Graph Paper, graph board, board instruments Guide pupils to draw the horizontal and vertical axes on a graph sheet and label their point of intersection as the origin (O). Guide pupils to mark and label each of the axes with numbers of equal intervals and divisions.	draw number planes and label the axes

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.8 (CONT'D) **NUMBER PLANE**	2.8.2 assign coordinates to points in the number plane	Coordinates of points [ordered pair (x, y)]	Assist pupils to identify the coordinates of a point and write them as ordered pair (x, y), where the first co-ordinate represent x the distance of the point from the origin along the horizontal axis and the second co-ordinate represent y its distance along the vertical axes.	write down the coordinates of points shown on the number plane
	2.8.3 locate and plot points for given coordinates	Locating and plotting points	Assist pupils to locate and plot points on the number plane for given coordinates.	plot given coordinates on the number plane
	2.8.4 draw graph of set of points lying on a line 2.8.5 draw graph of two linear questions in two variables 2.8.6 find the gradient of a line	The graph of a line	Guide pupils to plot points (lying on a straight line) and join them with a straight edge to give the graph of a straight line. E.g. plot the points (0, 0) (1, 1) (2, 2) (3, 3) on the graph sheet and join them with a straight edge. Guide pupils to find the gradient of the line drawn.	draw the graph of a straight line given a set of points calculate the gradient of a line i. from a graph of a line ii. Given two points
UNIT 2.9 **VECTORS**	2.9.1 locate the position of a point given its bearing and distance from a given point	Bearing of a point from another point	**TLMs:** Graph sheet, Protractor, Ruler Guide pupils to describe bearing of the cardinal points, North, East, South and West as $000^0(360^0)$, 090^0, 180^0 and 270^0 respectively. Guide pupils to locate the positions of points given their bearings from a given point.	determine the bearing of a point from another point

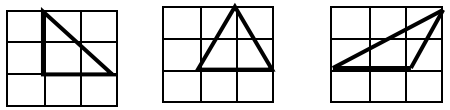
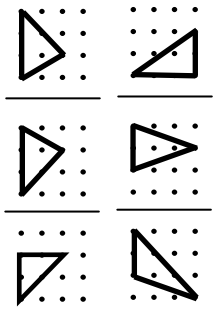
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.9 (CONT'D) **VECTORS**	2.9.2 identify the length and bearing of a vector	Idea of a vector	Guide pupils to identify a vector as a movement (distance) along a given bearing. Guide pupils to take the distance along a vector as its length and the 3 – digit clockwise angle from the north as its bearing	draw a vector given its length and bearing measure the length and bearing of a vector
	2.9.3 identify a zero vector	Zero vector	Guide pupils to identify a zero vector as point where no movement has taken place.	
	2.9.4 identify the components of a vector in the number plane	Components of a vector	Guide pupils to demonstrate graphically the number plane to develop the concept of component s of a vector *AB* as the horizontal and vertical distances travelled from A to B E.g. $\overrightarrow{AB} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$	find the components of vectors
	2.9.5 identify equal vectors	Equal vectors	Guide pupils to identify equal vectors as • having the same magnitude (length) • having the same direction • the **x** - components are the same • the **y** - components are the same.	identify equal vectors
	2.9.6 add two vectors in component form	Addition of two vectors	Guide pupils to add vectors using the graphical method Guide pupils to discover that If $\overrightarrow{AB} = \begin{pmatrix} a \\ b \end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix} c \\ d \end{pmatrix}$ then $\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC}$ $= \begin{pmatrix} a \\ b \end{pmatrix} + \begin{pmatrix} c \\ d \end{pmatrix} = \begin{pmatrix} a+c \\ b+d \end{pmatrix}$	find the sum of vectors in component form

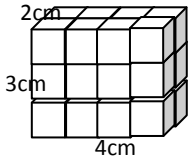
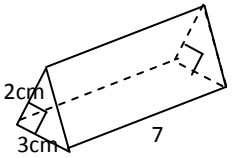
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.10 **PROPERTIES OF QUADRILATERALS**	2.10.1 identify the properties of rectangle, parallelogram, kite, trapezium and rhombus	Quadrilaterals	**TLMs:** Cut-out shapes (rectangles, parallelograms, kites, trapeziums and rhombus) Rectangle: Guide pupils to discover that a rectangle is a four-sided plane shape with each pair of opposite sides equal and parallel and the four interior angles are right angles. Let pupils also identify that a square is a rectangle with all sides equal. **Parallelogram** Guide pupils to discover that a parallelogram is a four-sided plane shape with each pair of opposite sides equal and parallel and each pair of interior opposite angles are equal. Note: Let pupils recognise that a rectangle is also a parallelogram. **Kite** Guide pupils to discover that a kite is a four-sided plane with each pair of adjacent sides equal. **Trapezium** Guide pupils to discover that a Trapezium is a four-sided plane shape with only one pair of opposite sides parallel. **Rhombus** Guide pupils to discover that a Rhombus is a four-sided plane shape with all four sides equal. **Note:** Differentiate between the square and other types of Rhombus by using the interior angles.	identify types of quadrilaterals from a number of given shapes

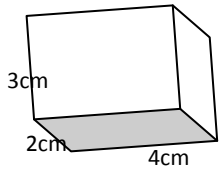
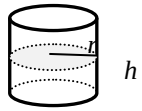
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils :
UNIT 2.11 **RATIO AND PROPORTION**	2.11.1 express two similar quantities as a ratio	Comparing two quantities in the form a : b	Guide pupils to compare two similar quantities by finding how many times one is of the other and write this as a ratio in the form a : b E.g. Express 12km and 18km as a ratio i.e. 12 : 18 = $\frac{12}{18} = \frac{2}{3}$ = 2 : 3	find the ratio of one given quantity to another
	2.11.2 express two equal ratios as a proportion	Expressing two equal ratios as a proportion	Guide pupils to express two equal ratios as a proportion. E.g. 12km, 18km and 6 hours, 9 hours can be expressed as a proportion as follows; 12km : 18km = 6 hours : 9 hours 2 : 3 = 2 : 3 i.e. $\frac{12km}{18km} = \frac{6hours}{9hours}$	express given ratios as a proportion
	2.11.3 solve problems involving direct and indirect proportions	Direct and Indirect proportions	Guide pupils to solve problems involving direct proportion using: (a) Unitary method E.g. If the cost of 6 items is GH¢1800, find the cost of 10 items; i.e. Cost of 1 = GH ¢ $\frac{1800}{6}$ = GH¢300 ∴ cost of 10 = GH¢300 x 10 = GH¢3000 (b) Ratio method	solve real life problems involving direct and indirect proportions

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.11 CONT'D) **RATIO AND PROPORTION**	The pupil will be able to:		Express the two quantities / ratios as proportion. The ratios are 6 : 10 = 1800 : n $\frac{6}{10} = \frac{1800}{n}$ $n = \frac{10 \times 1800}{6}$ n = 10 x 300 n = GH¢3000	Let pupils :
	2.11.4 share a quantity according to a given proportion	Application of proportion	Guide pupils to apply proportions in sharing quantities among themselves. E.g. Ahmed and Ernest shared the profit gained from their business venture according to the proportion of the capital each contributed. If Ahmed contributed GH¢100 and Ernest contributed GH¢800 and Ernest's share of the profit was GH¢100, how much of the profit did Ahmed receive?	apply proportions to solve word problems
	2.11.5 use proportion to find lengths, distances and heights involving scale drawing	Scale drawing using proportions	Guide pupils to find lengths, distances and heights involving scale drawings. E.g. The height of a tower of a church building in scale drawing is 2cm. If the scale is 1cm to 20m. How tall is the actual tower? i.e. 1m = 100cm $\therefore$ 20m = 2000cm 1 : 2000 = 2 : h $\frac{1}{2000} = \frac{2}{h}$ h = 2 x 2000	find the actual distances from scale drawings E.g. maps

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.11 (CONT'D) RATIO AND PROPORTIONS	The pupil will be able to:		= 4000cm ∴ actual height = 40m.	Let pupils :
UNIT 2.12 **RATES**	2.12.1 express two quantities as a rate	Rate as a ratio of one given quantity to another given quantity	Guide pupils to recognise rate as the ratio of one given quantity to another given quantity. E.g. A car consumes 63 litres of petrol per week. i.e. 9 litres per day. Explain other examples of rates E.g. bank rates, discount rates etc.	express two quantities used in everyday life as a rate
	2.12.2 solve problems involving rates	Simple interest, Discount and Commission	Guide pupils to solve problems involving: (a) <u>Simple Interest</u> E.g. Calculate the simple interest on savings of GH¢1000 for one year at 20% interest rate. i.e. GH¢1000 x $\frac{20}{100}$ = GH¢20 (b) <u>Discount</u> E.g. A discount of 10% is allowed on goods worth GH¢6000. What is the new price? i.e. $\frac{10}{100}$ x 6000 = GH¢600 ∴ discount = GH¢600 New price = GH¢5400 (c) <u>Comission</u> E.g. Calculate 15% commission on a sale of GH¢1000 i.e. $\frac{15}{100}$ x 1000 = GH¢150	find the simple interest on savings find commission on sales calculate the discount and new price of goods

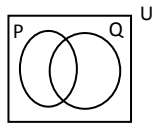
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.13 **AREA AND VOLUME**	The pupils will able to: 2.13.1 find the area of a triangle	Area of a triangle	**TLMs:** Cut out shapes: (triangles, rectangles, cubes, cuboids, circles, cylinder), Geoboard Using the geoboard, guide pupils to discover the area of a triangle from the rectangle. Guide stuents to use the relation to find the area of triangles. i.e. Area of triangle = $\frac{1}{2}bh$ Guide pupils to draw triangles with given areas in square grids. E.g. Draw triangles with area $2cm^2$ in a 3×3 square grid .  A B C Guide pupils to recognise the area of each triangle is half the product of the base (b) and the height (h). Guide pupils to identify the base and heights of different triangles drawn in square grids and find their areas. Ask pupils to draw triangles which have the same area as a given rectangle.	Let pupils: find the area of a given triangle Draw a triangle with area $2cm^2$ in a 4×4 square grid Find the area of each triangle in the 1×1 square grid 

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.13 (CONT'D) **AREA AND VOLUME**	The pupil will be able to: 2.13.2 find the area of a circle	Area of a circle	Guide pupils in groups to discover the area of a circle in relation to the area of a rectangle. Through practical activities, guide pupils to discover that when a circle is cut-out into tiny sectors, it can be re-arranged into a rectangle; whose length is $\frac{1}{2}$ the circumference "$\frac{1}{2}C$" and width "***r***" Guide pupils to use the idea of area of rectagle to establish the rule for the area of a circle: $\text{length} = \frac{1}{2}C = \frac{1}{2}\pi D = \frac{1}{2}\pi \times 2r = \pi r$ $A = \frac{1}{2}C \times r$ $= \pi r \times r = \pi r^2$ width = r	Let pupils: find the area of a given circle
	2.13.3 calculate the volume of a cube and a cuboid	Volume of a cuboid	Guide pupils to investigate cuboids of different dimensions that can be made with twenty-four 1cm^3 cubes. This is a sketch of one of the cuboids that can be built with its dimensions.  How many more cuboids can be made with 24 cubes? indicating the dimensions and the total surface area of each. Guide pupils to demonstrate practically to establish the relation between the volume and the dimensions of a cuboid/cube. Guide pupils to find the volume of a cuboid/cube.	find the volume of a cuboid/cube state the dimensions of the different cuboids that can be made with 30 cubes. find the volume of the triangular prism? 

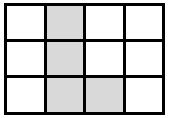
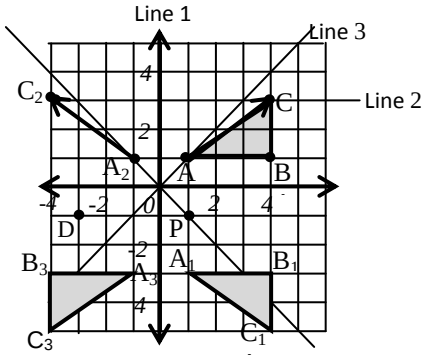
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.13 (CONT'D) **AREA AND VOLUME**	The pupil will be able to:		Guide pupils to relate volume of a prism to the the number of cubes in the uniform cross-section times the height (i.e. number of layers).  Volume (V) of cuboid or Rectangular Prism is given by the uniform cross-sectional area (A) times the height (h), i.e. $V = A \times h = l \times w \times h$ Guide pupils to calculate volume of triangular prisms and compoumd shape that can be divided into rectangles	Let pupils:
	2.13.4 calculate the volume of a cylinder	Volume of a cylinder	Guide pupils to discover the relationship between the volume, base area (circle) and the height of a cylinder. Guide pupils to deduce the rule for the volume of a cylinder by seeing a cylinder as a special prism whose uniform cross-section is a circle.  Guide pupils to discover the rule for volume of a cylinder as area of the circuluar uniform cross-section (i.e. πr^2) times the height (i.e. h), i.e. $V = \pi^2 h$ Guide pupils to calculate the volume of a cylinder using the formula $v = \pi r^2 h$	calculate the volume of a given cylinder
	2.13.5 solve word problems involving area and volume	Word problems involving area and volume	Guide pupils to solve word problems involving area and volume of shapes.	solve word problems involving area and volume of shapes

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.14 **PROBABILITY**	The pupil will be able to: 2.14.1 identify outcomes which are equally likely	Outcomes of an experiment (equally likely outcomes)	Guide pupils to identify random experiments. E.g. Tossing a coin, tossing a die or dice. Let pupils take the results of an experiment as outcomes. Let pupils identify outcomes of a random experiment with same chance of occurring as equally likely outcomes.	Let pupils: list all the possible equally likely outcomes of a given experiment
	2.14.2 find the probability of an outcome	Probability of an outcome	Guide pupils to define the probability of an outcome. i.e. Probability is $\frac{\text{No. of successes}}{\text{Total No. of Possible outcomes}}$	find the probability of an outcome

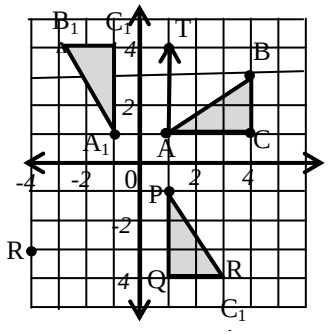
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.1 **APPLICATION OF SETS**	The pupil will be able to:			Let pupils:
	3.1.1 list the members of sets of numbers	Sets of numbers	**TLMs:** graph sheet, mirrors, indelible ink, cut out shapes Guide pupils to revise and list special sets of numbers – E.g. A = {first five prime numbers} B = {factors of 12} C = {prime factors of 12} D= {first five square numbers}; etc. Guide pupils to investigate elements which are not members of given sets.	List the elements of the following sets A = {triangular numbers less than 20} B = {multiples of 3 less than 20} Which is the odd element in the following sets: i. 1, 3, 5, 7, 9, 11, ii. triangle, Kite, square, rhombus, trapezium iii. pie chart, mean, mode, median, frequency iv. 2x, x + x, 4x – 2x, 3x -1, 2(3x- 2x) v. 100cm, 1m, 100dm, 1000mm
		Two set problems	Guide pupils to determine the universal set of two sets Guide pupils to represent two sets on a Venn diagram and use it to find union and intersection of the sets	list the members of two sets defined for a given universal set, and draw a Venn diagram to illustrate the set. E.g. Given that P = {first five prime numbers} and Q = {prime factors of 12} are

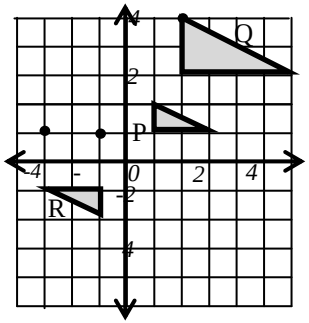
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.1 APPLICATION OF SETS CONT'D)	The pupil will able to: 3.1.2 draw and use Venn diagrams to solve simple two set problems		Guide pupils to find the complement of a set and identify the compliment from a Venn diagram Guide pupils to use the Venn diagram to solve two set problems E.g. At a party 28 people were served with a bottle of beer each; 49 people were also served with tinned minerals. But in all, there were 61 people at the party. Can you explain why?	Let pupils: members of the set U = {first five whole numbers}, copy the Venn diagram. Write the members of the sets P and Q in the appropriate regions. Find P∩Q and P∪Q solve two set problems using Venn diagrams 
	3.1.3 find and write the number of subsets in a set with up to 5 elements	Number of subsets	Guide pupils to write all the subsets of sets with elements up to 5	list the subsets of given sets with elements up to 4
	3.1.4 find the rule for the number of subsets in a set		Guide pupils to find the number of subsets in a set with (i) one element and (ii) two elements, etc. Guide pupils to deduce the pattern made by the number of subsets in sets with various number of elements (0, 1, 2,…, n) as $\mathbf{2^n}$ **Note:** • the empty set is a subset of every set • every set is a subset of itself	use the rule to find the number of subsets in a given set

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils
UNIT 3.2 **RIGID MOTION**	3.2.1 identify an object (shape) and its image under a translation in a coordinate plane	Translation by a given vector	Revise the components of a vector in the number plane and ask them to trace or draw the path of a vector that take one point to another (its image) in the plane using graph sheets (or square paper). Guide pupils to translate given points using a given translation vector Guide pupils to see in the figure the single movement or transformation that takes the point A to the point (image) B translation by the vector $\binom{3}{1}$. Guide pupils to find the single transformation that takes (i) the point B to C (ii) the line AB to PQ, and (iii) shape XYZ to its image $X_1Y_1Z_1$ Guide pupils to draw a shape and its image under a translation by a given vector. Guide pupils to discuss the properties of objects under reflection with respect to its similarity, congruence and orientation.	draw a shape and its image under a translation by a given vector given points, lines and shapes in a plane, fiind the single trannslation movement that takes (i) a point (ii) a line and/or (iii) shape to its image, and stating the points/coordinates of the image given a translation vector and the points/coordinates of the image of a shape, draw the original shape in the coordinates plane.

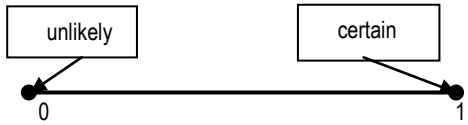
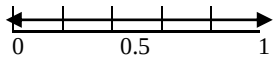
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.2 (CONTD) **RIGID MOTION**	The pupil will be able to:			Let pupils:
	3.2.2 identify objects (shapes) that have reflectional (or fold) symmetries	Reflection	Let pupils give examples of designs (or objects) in everyday life that have reflectional (or fold) symmetries Guide pupils to identify the line(s) of reflection (or fold) objects/designs Guide pupils to sort objects/designs into those with reflectional designs and those without.	draw and describe the line(s) of symmetry of a given geometric shape identify designs in everyday life with reflectional symmetries (e.g. adinkra symbols, logos, etc.) How many different ways can one more square be shaded in this shape to have a line of symmetry. 
	3.2.3 identify an object (shape) and its image under reflection in the major axes of the coordinate plane.	Reflection in the axes	Ask pupils to draw and label the axes of the coordinate plane using graph sheets (or square paper) and ask them to label the lines. E.g. Line 1 is y-axis or x = 0; line 2 is y = 3 and Line 3 is 	state the object points/ coordinates and its corresponding image points/coordinates in a given reflection draw and state points/coordinates of the image of i. points, ii. lines or iii. shape in reflection in given axes in the coordinate planes

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.2 (CONTD) **RIGID MOTION**	The pupil will be able to:		Guide pupils to locate points which are images to point(s) in given lines under reflection . E.g. In the figure, point A_2 is the image of point A under a reflection in the y axis (or line x=0). Also the point P is the image of point A under a reflection in the x axis (or line y=0). Guide pupils to find from the major diagonal (or y=x) the figure that a single transformation takes (i) the point P to its image A_2; (ii) the triangle $A_1B_1C_1$ to its image triangle $A_3B_3C_3$. Guide pupils to identify or draw the images of i. points, ii. lines or iii. shapes in reflection(s) in given axes in the coordinate planes x-axis and y-axis. Guide pupils to discuss the properties of objects under reflection with respect to its similarity, congruence and orientation.	Let pupils: given points/coordinates of the image of a shape under reflection in a given line, draw the original shape in the coordinates plane.
	3.2.4 identify a rotation of an object (shape) about a centre and through a given angle of rotation	Rotation	Let pupils give examples of objects that turn in everyday life to explain rotation as an amount of turning about a fixed point called centre of rotation. Guide pupils to rotate different shapes and observe the center (origin) and the angle of rotation. Guide pupils to observe the differences between clockwise and anti-clockwise rotations. Guide pupils to rotate objects (shapes) about a point (origin) and observe the number of times the object will return to its original position within 360^o.	state the rotational symmetry of a given geometric shape identify designs in everyday life with rotational symmetries (e.g. adinkra symbols, logos, etc.)

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.2 (CONTD) RIGID MOTION	The pupil will be able to: 3.2.5 identify a rotation of an object (shape) about a centre and through a given angle of rotation	Rotation	Guide pupils to rotate a shape (object) through a given centre and angle of rotation using graph sheets or square paper  Guide pupils to state the object points and its corresponding image points under a given rotation E.g. In the figure, point A_1 is the image of point A under an anticlockwise rotation of 90^o about the origin (or an anticlockwise rotation of 270^o about the origin). Also the line PQ is the image of line AC under a clockwise rotation of 90^o about the origin (or an anticlockwise rotation of 270^o about the origin). Guide pupils to locate points which are images to shape(s) under anticlockwise rotation through the angles 90^o, 180^o, and 270^o about the origin (and repeat for clockwise rotation). E.g. the triangle $A_1B_1C_1$ to its image triangle ABC under a clockwise rotation through the angles 90^o. Guide pupils to draw and state the points/coordinates of the images of given i. points, ii. lines or iii. shapes under a anticlockwise or clockwise rotation through the angles $90^o, 180^o$ and 270^o. Guide pupils to discuss the properties of objects under rotation, with respect to its similarity, congruence and orientation.	Let pupils: state the object points/ coordinates and its corresponding image points/coordinates in a given rotation draw and state points/coordinates of the image of i. points, ii. lines or iii. shape under a anticlockwise or clockwise rotation through the angles $90^o, 180^o$ and 270^o. given the points/coordinates of the image of a shape under rotation through a given angle about the origin (90^o, 180^o, and 270^o), draw the original shape in the coordinates plane.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.3 (ENLARGEMENTS AND SIMILARITIES	The pupil will be able to: 3.3.1 carry out an enlargement on a geometrical shape given a scale factor	Enlargement of geometrical shapes	Guide pupils to draw the enlargement of a geometrical figure with a given scale factor (E.g. triangles, rectangles)  **Note:** In an enlargement there is a centre of enlargement and a scale factor. Ask students to state the single transformation that i. maps triangle P onto triangle P ii. maps triangle P onto triangle R in the figure	Let pupils: draw an enlargement of a shape using a given scale factor
	3.3.2 determine the scale factor given an object and its image	Finding scale factor	Guide pupils to find the scale factor by determining the ratio of the sides of an image to the corresponding sides of the object.	find the scale factor of an enlargement
	3.3.3 state the properties of enlargements , with respect to its similarity, congruence and orientation	Properties of enlargement	Guide pupils to investigate the characteristies of enlargements under the following conditions of the scale factor: • if the scale factor (**K**) is negative; • if the scale factor (**K**) is greater than 1 or less than – 1; • if the scale factor (**K**) is between – 1 and 1 (i.e. a fraction); Guide pupils to discuss the properties of objects under translation with respect to its similarity, congruence and orientation	state properties of enlargement
UNIT 3.3 (CONT'D)	The pupil will be able to:			Let pupils:

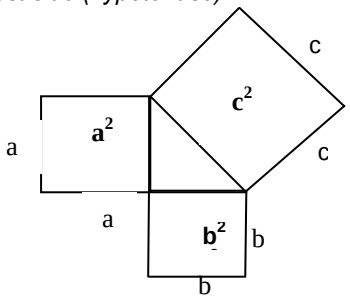
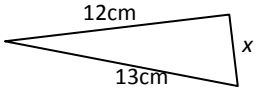
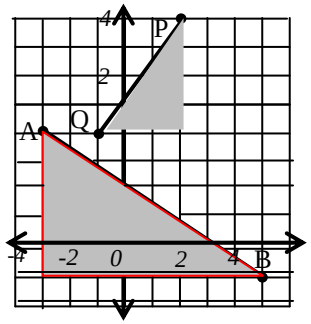
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
(ENLARGEMENTS AND SIMILARITIES	3.3.4 identify an object and its image as similar figures and write a proportion involving the sides of the two figures	Similar figures	Guide pupils to observe that the corresponding sides of similar figures are proportional Guide pupils to identify an object and its image as similar Guide pupils to determine a proportion involving the sides of two similar figures	identify similar figures in the environment (as a project) solve problems on proportion involving the sides of similar figures
	3.3.5 draw a plan (or model) of object(s) using a given scale	Scale drawing as a reduction	Guide pupils to identify scale drawing as a reduction of a figure. (E.g. scale drawing in map reading) Guide pupils to convert the sizes of real objects to scale. Guide pupils to draw real objects (plane shapes) to scale.	Get the dimensions of a house (by measuring) and draw it using an appropriate scale Calculate real distances on a on a building plan or map using scales on them
UNIT 3.4 **HANDLING DATA AND PROBABILITY**	3.4.1 read and interpret information presented in tables	Reading and interpreting data in tabular form	Guide pupils to read, process and interpret data presented tables like rainfall charts and VAT/currency conversion tables. Guide pupils to perform experiments and make frequency tables of the results of a random survey or experiment (e.g throwing dice for a given number of times and taking traffic census) Guide pupils to calculate mode, median and mean from frequency distribution tables.	process data in tables by finding the • minimum • maximum • range • mode • median • mean and using it to interpret and draw conclusions on a given chart
	3.4.2 use probability vocabulary (i.e. likely, unlikely, very likely etc.) to state the chance of events occurring in everyday life	Probability terms	Assist students to put probability vocabulary in order of likeliness on a probability scale – impossible, likely, unlikely, equally likely, certain, very likely etc.	Below are statements about real events in our everyday lives. A. A new born baby will be a girl B. It will rain in Winneba in the first week of January On the number line below,

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.4 (CONT'D) **HANDLING DATA AND PROBABILITY**	The pupil will be able to:		 Guide pupils to use probability vocabulary to state the chance of events occurring in everyday life. E.g. What is the chance of the following events occurring in everyday life: A. A coin lands Heads side up (i.e. equally likely) B. The day after Monday will be Tuesday (i.e. unlikely)	Let pupils: use the letters A and B, to mark the point that indicate the chance of the Let pupils: event occurring on a probability scale. 
	3.4.3 find the relative frequency of a given event	Probability-relative frequency	Guide pupils to discuss the meaning of relative frequency (i.e. *the number of outcomes of a given event out of the total number of outcomes of an experiment*) *or* (*dividing a frequency by the total frquency*) Guide pupils to determine the relative frequency of an event. E.g. the relative frequency of an even number showing when a die is thown is 3 out of 6.	calculate the probability of simple events E.g. probability of hitting a number on a dart
	3.4.4 find the probability of a given event	Probability of a given event	Guide pupils to carry out various experiments and find out the possible outcomes. Guide pupils to determine the probability of an event. E.g. the probability of a 3 showing up when a die is thrown is $\frac{1}{6}$. Guide pupils to calculate probability from frequency distribution tables.	determine the relative frequency of an event using frequency distribution tables

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 3.5 **MONEY AND TAXES**	3.5.1 calculate wages and salaries	Calculating wages and salaries	**TLMs:** currency in the various denominations, VAT receipts/bills. Guide pupils to identify and explain wages and salaries. Guide pupils to calculate wages and salaries of workers.	calculate the daily and weekly wages of a worker calculate the monthly and annual salaries of a worker
	3.5.2 identify and explain various transactions and services at the bank	Transactions and services provided by banks	Guide pupils to identify the basic transactions and services provided by a bank. Guide pupils to find out the meaning of interest rates. Guide pupils to calculate: • Interest rates • Simple interest on savings and loans Guide pupils to calculate charges for certain services at the bank (E.g. Bank drafts, Payment order, etc)	calculate: • Interest rates • Simple interest on savings • Interest on loans • Other bank charges
	3.5.3 identify and explain types of insurance and calculate insurance premiums	Insurance (premiums and benefits)	Guide pupils to identify types of insurance policies. Guide pupils to calculate insurance premiums and benefits.	calculate total premium paid for an insurance coverage over a given period of time
	3.5.4 find and explain the income tax payable on a given income	Income Tax	Guide pupils to identify the government agency responsible for collecting income tax. Discuss with pupils incomes that are taxable. Guide pupils to calculate income tax payable by a person earning a given income.	calculate the income tax for a given income

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 3.5 (CONT'D) MONEY AND TAXES	3.5.5 calculate VAT/NHIS on goods and services	Calculating VAT/NHIS	**TLMs:** currencies in the various denominations, VAT receipts/bills Guide pupils to identify VAT/NHIL as a sales-tax added to the price of goods and services. Guide pupils to identify goods and services attracting VAT/NHIL. Guide pupils to calculate VAT/NHIL on goods and services.	calculate VAT/ NHIL on given goods and services
UNIT 3.6 ALGEBRAIC EXPRESSIONS	3.6.1 change the subject of a formula, substitute values for given variables and simplify	Change of subject Substitution of values	**TLMs:** cut-out, algebra tiles Guide pupils to change subjects of formulae that involve the inverses of the four basic operations. E.g. • make ***h*** the subject of the formula ***v = πr²h*** • make ***x*** the subject of the formula ***p = 2 (x + y)*** Guide pupils to substitute values of given variables into algebraic expressions E.g. Given that $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ find R if $R_1 = 1$ and $R_2 = 3$	make a variable a subject of a given formula substitute given values into a formula and simplify
	3.6.2 multiply two simple binomial expressions	Binomial expansion	Revise addition and multiplication of integers with pupils Guide pupils to multiply two simple binomials using algebra tiles or semi-concrete materials (drawings). E.g. • (a + 2)(a + 3) • (a – 2)(a + 3) • (a – 2)(a – 3)	expand the product of two simple binomials

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.6 (CONT'D)	The pupil will be able to:			Let pupils:
ALGEBRAIC EXPRESSIONS	3.6.3 factorize expressions that have simple binomial as a factor	Factorization	Guide pupils to find the binomial which is a factor in expressions and factorize. E.g. $3(b + c) – 2a(b + c) = (b + c)(3 – 2a)$ Guide pupils to regroup terms and factorize the binomial that is the common factor. E.g. $ab + ac + bd + cd$ $= (ab + ac) + (bd + cd)$ $= a(b + c) + d(b + c)$ $= (b + c)(a+d)$	solve problems involving factorisation of simple binomials
UNIT 3.7 PROPERTIES OF POLYGONS	3.7.1 sort triangles by their common properties	Types of triangles	**TLMs:** Cut-out plane shapes, Protractor, Scissors and Graph sheets Revise the angle properties of triangles with pupils Guide pupils to perform activities to identify and draw the different types of triangles. Guide pupils to state the differences in the triangles in terms of size of angle and length of the sides.	classify given triangles
	3.7.1 determine the sum of interior angles of a given polygon	Interior angles of polygons	**Revision:** Guide pupils to revise the sum of the interior angles of a triangle. Guide pupils to determine the number of triangles in a given polygon Guide pupils to relate the sum of interior angles of a triangle and the number of triangles in a polygon to determine the sum of inerior angles in polygons. Guide pupils to determine the relation between the number of sides (***n***) and the sum (**S**) of the interior angles of regular polygons. i.e. $\mathbf{S} = (n – 2) \times 180^0$ Pose word problems involving the sum of interior angles of a polygon for pupils to solve.	• the size of an interior angle of a regular polygon given the number of sides and the sum of the interior angles • sum of interior angles given the number of sides • number of sides given the sum of interior angles

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
	The pupil will be able to:			Let pupils:
UNIT 3.7 (CONT'D) PROPERTIES OF POLYGONS	3.7.2 determine the exterior angles of a polygon	Exterior angles of regular polygons	Guide pupils to identify the exterior angle of a polygon using practical activities Guide pupils to discover that the sum of the exterior angles of any polygon is 360^0. Guide pupils to calculate the size of exterior angles of given regular polygons.	find the size of exterior angle of a given regular polygon
	3.7.3 use the Pythagoras theorem to find missing side of a right-angled triangle (limit to only the Pythagorean triples)	Pythagoras theorem	Guide pupils to carry out practical activities to establish that *"the sum of the squares of the lengths of the two shorter sides of a right-angled triangle is equal to the squares of the length of the longest side (hypotenuse)".*  Guide pupils to form squares on the three sides and compare the areas by arranging unit squares in them and see the relationship $c^2 = a^2 + b^2$) Guide pupils to use the Pythagoras theorem to find missing side of a right-angled triangle; Guide pupils to use the Pythagoras theorem to calculate distance between two points, length of lines in the number plane, towns on a map with a square grid background.	use the Pythagorean theorem to solve problems on right-angled triangle E.g. Find the value of x in the triangle.  In the number plane, (i) find the distance between the points P and Q; (ii) find the length of line $\overline{AB}$ 

THE MATHEMATICS PANEL

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