Chapter 3 Learning Objectives for Key Stage 2 with Illustrations

The Learning Objectives for Key Stage 2 have been listed in Chapter 2. They set out the knowledge, skills and attitudes that pupils are expected to develop in Mathematics. They are further elaborated below by the provision of illustrations and reference to specific syllabus topics in *Syllabuses for Primary Schools: Mathematics, 1983*. For ease of reference, the syllabus topics have been reorganized according to the different Learning Dimensions (while retaining the Unit Numbers used in the Syllabus) and are summarized in Appendix B.

(Please see next page)

3.1 NUMBER Dimension

Learning Objectives	Illustrations	Syllabus Reference
Learners (1) (a) read, write, round off large numbers in everyday life and estimate large quantities.	Recognize large numbers encountered in everyday life. Round off large numbers in thousands, ten thousands, hundred thousands or millions, using examples from everyday life. Estimate large quantities such as number of people in the playground and number of words in a book.	5.1 Large numbers
(b) recognize prime numbers and composite numbers and find prime numbers within 150.	Know that 2, 3, ... are prime numbers and $74 = 2 \times 37$ is a composite number. Find prime numbers within 100 by the Sieve of Eratosthenes.	5.2 Prime numbers and composite numbers 5.10 Factorization
(c) use index notation to represent composite numbers.	Know that $108 = 2^2 \times 3^3$.	5.10 Factorization
(d) recognize Chinese and Roman numeration systems.	Express 184 in Chinese numerals. Study the numbers: 4 IV 9 IX 40 XL 90 XC 5 V 10 X 50 L 100 C 6 VI 11 XI 60 LX 110 CX What do you notice?	6.1 Ancient numerals

Learning Objectives	Illustrations	Syllabus Reference
(e) recognize the development of some calculating devices.	Know the development of some calculating devices, such as counters, abaci, tables, slide rules and computers.	6.15 Stories of calculating devices
(2) (a) compute multiplication: a number up to 3 digits and another number up to 2 digits; and compute division: divisor up to 3 digits and dividend up to 4 digits, and check by approximation whether the answers are reasonable.	Use appropriate method to perform multiplication and division such as: (1) 234×12, (2) 13×314 (3) $3473 \div 223$.	4.3 Multiplication 4.12 Multiplication and division (with newly added content on 'multiplication': multiplier 3 digits, multiplicand up to 2 digits)
(b) understand and use the commutative, associative and distributive properties of multiplication.	Know that $20 \times 7 \times 5 = 20 \times 5 \times 7 = 100 \times 7 = 700$, and $4 \times 999 = 4 \times (1000 - 1) = 4000 - 4 = 3996$.	4.3 Multiplication 5.4 Distributive property of multiplication
(c) solve practical problems involving multiplication or division of whole numbers.	Solve problems such as: There are 35 pages in an exercise book. How many pages are there in 47 exercise books? 2952 kg of rice are put equally in 164 bags. How many kg of rice are put in a bag?	4.3 Multiplication 4.4 Division 4.12 Multiplication and division
(d) solve simple mixed operations and problems involving the four rules, including the use of simple brackets.	Calculate $(10 + 5) \times (6 - 4)$. Solve problems such as:	4.11 Brackets (not including square brackets) (with newly added 'mixed operations of the four rules')

Learning Objectives	Illustrations	Syllabus Reference
	John bought a pizza of $48 and 3 cups of soft drinks costing $4 each. He gave the cashier $100. How much change did he receive? The price of a sports shirt is $78 and that of a pair of sports trousers is $45. What is the total cost of buying 5 sets of these sports shirts and trousers? (List out working steps with the use of simple brackets.)	
(3) recognize and compute common multiples, common factors, lowest common multiple (L.C.M.) and highest common factor (H.C.F.) of not more than 3 numbers.	List the multiples of 18 and 48 and find their common multiples and the lowest common multiple. List the factors of 18 and 48 and find their common factors and the highest common factor. Use the method of factorization to find the H.C.F. of two numbers. Find the H.C.F. and L.C.M. of 105, 126 and 60 by short division.	4.1 Multiples 4.2 Factors 5.10 Factorization 6.3 Highest common factor and lowest common multiple

Learning Objectives	Illustrations	Syllabus Reference	
(4) (a) recognize the meaning of proper fractions, improper fractions, mixed numbers and equivalent fractions.	Know that $1\frac{1}{4} = \frac{5}{4}$, $\frac{1}{2} = \frac{2}{4}$ etc. Compare $\frac{1}{2}$ and $\frac{1}{3}$ by first finding their common denominator.	4.6 4.13	Fractions Fractions
(b) perform addition, subtraction, multiplication, division and simple mixed operations of simple fractions and reduce the answers to the simplest form, and check the results by estimation or approximation.	Calculate $\frac{2}{5}+\frac{1}{4}$, $\frac{2}{3}-\frac{1}{2}$, $\frac{5}{6}+\frac{3}{4}-\frac{7}{10}$. Calculate $3 \times 2\frac{1}{4}$, $2\frac{3}{5} \times \frac{5}{6}$ and $2\frac{1}{7} \div \frac{4}{7}$.	4.6 4.13 5.3	Fractions Fractions Fractions
(c) solve simple problems on fractions.	Solve problems such as: There are 25 pages in a book. David read 15 pages. What fraction of the book did David read? In a class of 40 pupils, $\frac{3}{8}$ of them wear glasses. How many pupils wear glasses?	4.6 4.13 5.3	Fractions Fractions Fractions
(5) (a) read, write and order decimals, and understand place values of decimals.	Know that $\frac{1}{10}=0.1$, $\frac{1}{100}=0.01$ and $6\frac{1}{2}=6.5$ Arrange 12.04, 12.4, 13.65, 11.73 in ascending order of magnitude.	4.7	Decimals

Learning Objectives	Illustrations	Syllabus Reference	
(b) perform addition, subtraction, multiplication, division and simple mixed operations of decimals up to two decimal places, apply the rounding off concept and check the results by estimation.	Work out 2.12×3.2 and $1.44 \div 0.24$.	4.7	Decimals
		4.14	Decimals
	Calculate $3.7 + 2.64 \times 7 - 0.8$.	5.12	Decimals
	Solve problems such as:		
	Peter spent \$4.20 for a hamburger and \$2.90 for a glass of orange juice. He gave the cashier \$10. How much change did he receive?		
	Recongize that $\frac{0.25 \times 83.4}{5.7}$ is about 3 or 4.		
(c) understand percentages and perform conversions between decimals, fractions and percentages.	Know that 40% is $\frac{40}{100}$.	5.12	Decimals
		5.14	Percentages
	Convert $\frac{1}{2}$, 0.25 to percentages, and 30% to fraction and decimal.		
(d) solve simple practical problems on decimals and percentages.	Solve simple problems such as:	4.7	Decimals
		4.14	Decimals
	Divide \$0.70 into equal shares of \$0.20. How many shares can be obtained? How much is left?	5.12	Decimals
		5.14	Percentages
		6.5	Percentages
	David sleeps for 8 hours a day. What percentage of a day is David asleep?		

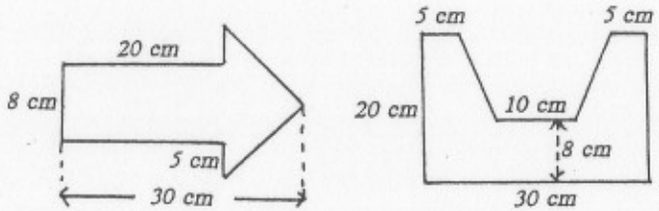
Learning Objectives	Illustrations	Syllabus Reference
	In a class of 45, 20% of the pupils wear glasses. How many of them wear glasses? A watch marked at the price of \$160 is sold at a discount of 20%. Find the selling price.	
(6) recognize squares and square roots of whole numbers.	Know that $13^2 = 169$, $\sqrt{36} = 6$, and $\sqrt{2^2 \times 3^4 \times 5^2} = 2 \times 3^2 \times 5$.	6.10 Squares and square roots
(7) (a) understand the idea of direct proportion and solve simple practical problems on direct proportion by unitary method.	Know that if 2 books cost \$10, then 3 books cost \$15. Solve simple problems such as: A motor car took 8 hours to travel 360 km. How far did it travel in 5 hours?	4.5 Direct proportion
(b) understand the idea of inverse proportion and solve simple practical problems on inverse proportion by unitary method.	Record the results and observe the relation when 8 pencils are shared by 1, 2, 4 and 8 boys.	5.11 Inverse proportion

No. of boys	No. of pencils each boy gets
1	8
2	4
4	2
8	1

Learning Objectives	Illustrations	Syllabus Reference
	Solve simple problems such as: I have a number of sweets. If I put 24 sweets into each bottle, I shall need 30 bottles. How many bottles shall I need if 36 sweets are put into each bottle?	
(8) calculate the average of a small group of data, taking examples from everyday life.	Calculate the average test mark of a pupil, the average height of a class of pupils, the average class size of a school, etc.	4.15 Averages

3.2 MEASURES Dimension

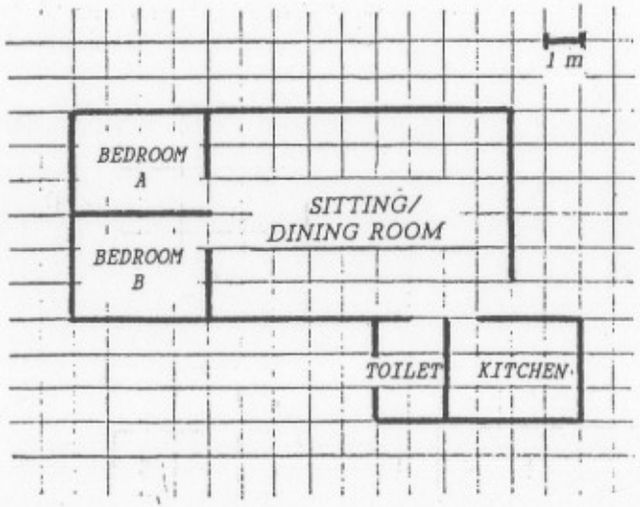
Learning Objectives	Illustrations	Syllabus Reference
Learners (1) understand the relationship between units of measurement in metric system.	Know the relationship between some units of measurement in metric system, such as: 1 litre = 1000 millilitre, 1 square metre = 10 000 square centimetre and 1 cubic metre = 1 000 000 cubic centimetre.	4.8 Capacity 4.19 Area 5.17 Volume
(2) (a) understand the concept of area.	Compare areas of leaves using a transparent square grid.	4.19 Area
(b) use non-standard units of area to compare objects and recognize the need to use standard units.	Use a palm, cardboard, etc. as measures	4.19 Area

Learning Objectives	Illustrations	Syllabus Reference	
(c) recognize and use square centimetre and square metre, and recognize that measurement is approximate in nature and choose the degree of accuracy appropriate for a particular purpose.	Suggest things which are commonly measured in cm^2 , m^2. Find the areas of shapes by counting squares.	4.19	Area
(d) understand and use the formulas for areas of rectangles and squares.	Solve simple problems such as: The length of a blackboard is 1.5 m and its width is 1 m. What is the area of the blackboard?	4.19	Area
(e) find areas of parallelograms, triangles and trapeziums by counting squares and by formulas, and find areas of polygons.	Find areas of figures such as:  	5.7	Area
(3) (a) recognize the relationship between diameters and circumferences of circles.	Measure and compare diameters and circumferences of circles and plot the circumference-diameter graph.	5.16 6.7	Circles Circumference

Learning Objectives	Illustrations	Syllabus Reference	
(b) recognize π and solve simple problems involving diameter, radius and circumference of a circle using $\pi = 3.14$ or $\frac{22}{7}$.	Know that π is approximately equal to 3.14. Use formula to find the circumference of a circle. Solve simple problems such as: The diameter of a bicycle wheel measures 50 cm. How far does it go when it makes 10 revolutions?	6.7	Circumference
(4) (a) recognize and use millilitre.	Suggest things which are commonly measured in mL. Calibrate containers to make measuring jugs.	4.8	Capacity
(b) understand the concept of volume, and recognize and use cubic centimetre.	Compare the volumes of solid shapes made from equal cubes. Suggest things which are commonly measured in cm^3.	5.17	Volume
(c) recognize the relationship between litre/millilitre and cubic centimetre.	Construct a 'litre box' (of sides 10 cm) with cardboard and understand that 1000 'cm cubes' can be contained in the litre box.	4.8 5.17	Capacity Volume
(d) recognize cubic metre and its use.	Suggest things which are commonly measured in m^3.	5.17	Volume

Learning Objectives	Illustrations	Syllabus Reference
(e) understand and use the formulas for volumes of cubes and cuboids.	Use the formula to find the volume of a cuboid.	5.17 Volume
(f) find the volumes of irregular solids.	Find the volume of irregular solids by displacement of water.	5.17 Volume
(5) recognize the 24-hour clock and understand the relationship between the units of time and solve simple practical problems on time.	Solve simple problems such as: John took 50 min to travel to school. Mary took 1 h 12 min. By how much was John faster than Mary?	5.15 Time
(6) (a) understand the concept of speed, and recognize and use the units 'metre per second (m/s)' and 'kilometre per hour (km/h)'.	Know that speed = $\frac{\text{distance}}{\text{time}}$.	6.13 Speed
(b) solve simple problems on speed.	Solve simple problems such as: Two cars started off at the same time from the same place in the same direction at 54 km/h and 70 km/h respectively. How far apart were they after 4 hours?	6.13 Speed 6.19 Graphs

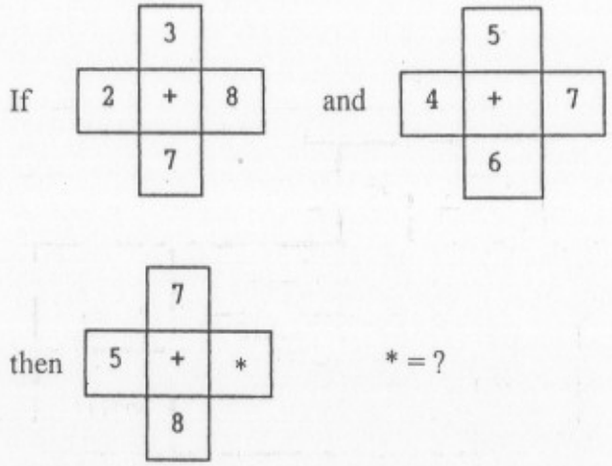
Learning Objectives	Illustrations	Syllabus Reference
(7) understand scale and use appropriate scale to draw plans.	Understand, draw and use the plan of a flat. The side of each square on the plan is ____ cm. The scale of the plan is 1 cm to ____ m. Bedroom A represented by ____ cm by ____ cm on the plan is actually ____ m by ____ m.	6.18 Simple surveying



(The actual length of the side of each small square should be 1 cm)

(8) (a) compare and measure angles, and draw angles up to 360° using a protractor.	Draw an angle of 72° using a protractor.	6.6 Angles
(b) make special angles by folding papers.	Make angles of 90°, 180°, 270°, 45°, and 135° by folding papers.	6.6 Angles

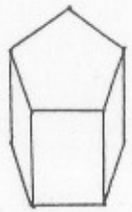
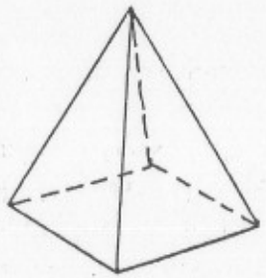
3.3 ALGEBRA Dimension

Learning Objectives	Illustrations	Syllabus Reference
Learners (1) recognize the use of symbols to stand for unknown numbers.	Solve problems like:  	4.16 Algebraic symbols
(2) record facts using algebraic symbols.	Express simple facts symbolically such as: I have m stamps, which are 3 times of my brother's collection. How many stamps has my brother got?	4.16 Algebraic symbols 5.5 Simple equations
(3) solve simple equations, limiting to those requiring at most two steps in the solution, and check answers.	Solve simple equations such as: $8p = 32$ $\frac{a}{2} - 14 = 7$ $3x + 2.5 = 6.7$	5.5 Simple equations 5.13 Simple equations 6.4 Simple equations

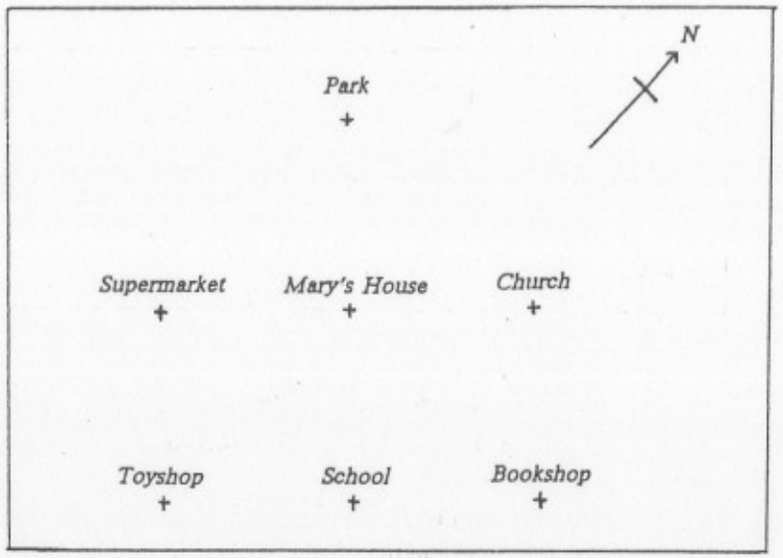
Learning Objectives	Illustrations	Syllabus Reference
(4) solve simple practical problems by equations.	Solve simple problems such as: If I double a number, then add 1, the result is 57. What is the number? The number of boys is $\frac{4}{5}$ of the number of girls in Brighton Primary School. How many girls are there if the number of boys is 40?	5.5 Simple equations 5.13 Simple equations 6.4 Simple equations
(5) recognize and appreciate simple number patterns, such as square numbers, triangular numbers and rectangular numbers.	List all the rectangular numbers from 71 to 80. Complete the sequence: 1, 3, 6, 10, ___, ___.	6.11 Number patterns

3.4 SHAPE & SPACE Dimension

Learning Objectives	Illustrations	Syllabus Reference
Learners (1) (a) understand intuitively the properties of quadrilaterals and classify quadrilaterals.	Classify quadrilaterals into kites, parallelograms, rectangles, rhombuses, and trapeziums. Compare the sides and angles of different quadrilaterals.	4.18 Quadrilaterals
(b) recognize the properties of circles.	Know the meanings of the terms: circle, circumference, centre, diameter and radius.	5.16 Circles

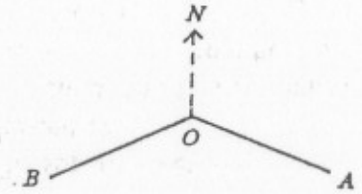
Learning Objectives	Illustrations	Syllabus Reference	
(2) (a) understand intuitively the properties of some pyramids & prisms and appreciate the relations between the number of edges, vertices and sides of bases of pyramids and prisms.	Solve problems such as: How many rectangular faces are there in the prism shown below? 	4.9	Solids
(b) design nets and make simple solids.	Make nets for the following pyramid with square base: 	4.9	Solids

Learning Objectives	Illustrations	Syllabus Reference
(3) (a) recognize the directions N, E, S, W, NE, SE, NW and SW, and use them to describe directions.	Describe directions in diagrams like:	5.8 Directions



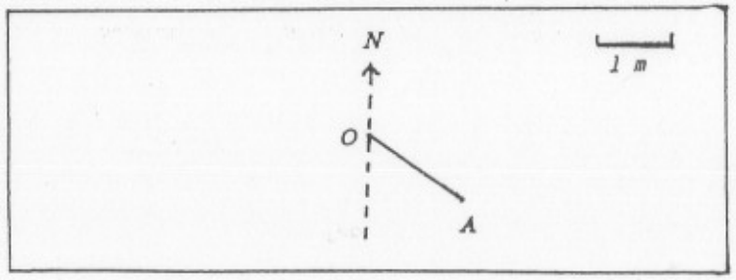
The church is _____ of Mary's house.
The supermarket is _____ of the church.
The direction Mary is going when she is travelling from her house to the school is _____.

Learning Objectives	Illustrations	Syllabus Reference
(b) recognize and use bearings.	What are the bearings of the points A and B from O?	6.18 Simple surveying



A is _____ from O.
B is _____ from O.

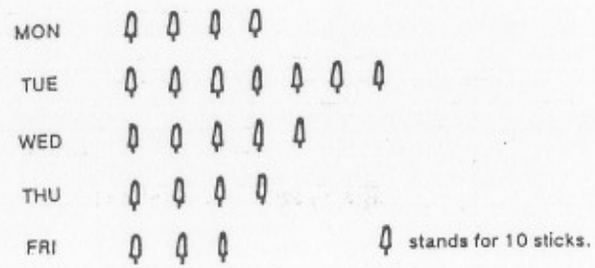
(c) perform simple surveying activities to find positions of objects from the measurement of directions and distances.	Find the position of a point A from O with the help of a compass and a ruler.	6.18 Simple surveying



3.5 DATA HANDLING Dimension

Learning Objectives	Illustrations	Syllabus Reference
Learners (1) collect and group data of greater frequency counts.	Conduct a survey on an issue such as finding the number of pupils participating in the school extra-curricular activities, and arrange appropriate grouping of items.	4.10 Pictograms 4.20 Compound bar graphs 5.9 Graphs 6.19 Graphs
(2) (a) present and interpret pictograms using one-to-ten or one-to-hundred representation.	Make pictograms on topics familiar to pupils such as:	4.10 Pictograms

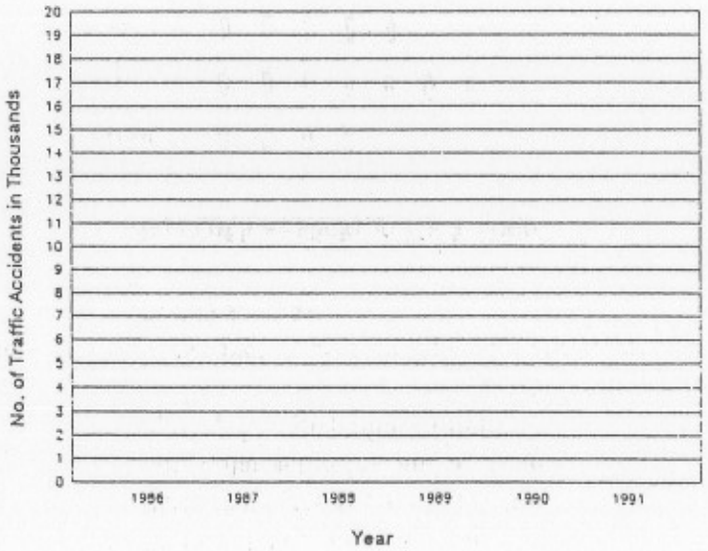
Sales of Ice–sticks in Tuck Shop



Learning Objectives	Illustrations	Syllabus Reference
(b) present and interpret bar charts of large frequency counts using one-to-thousand or even smaller scales and compound bar charts.	Complete the bar chart from following data.	4.20 Compound bar graphs 5.9 Graphs 6.19 Graphs

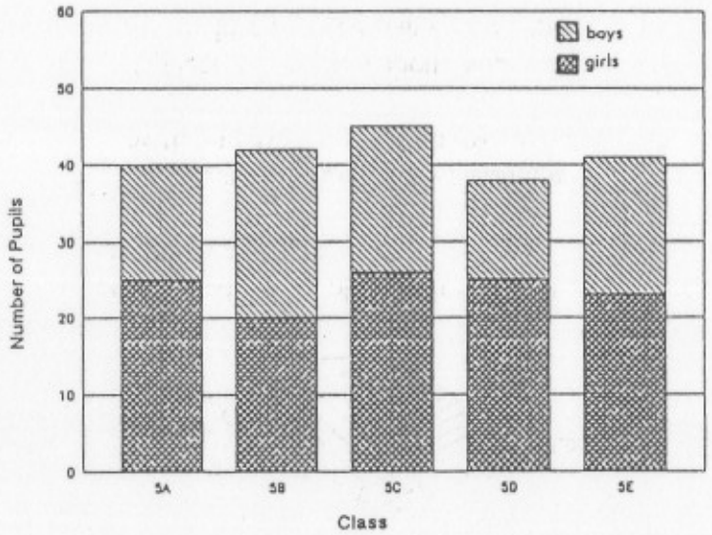
Year	No. of Traffic Accidents	No. in 1000s
1986	11 207	11
1987	13 829	
1988	16 050	
1989	18 105	
1990	17 321	
1991	19 765	

Traffic Accidents (1986 – 1991)



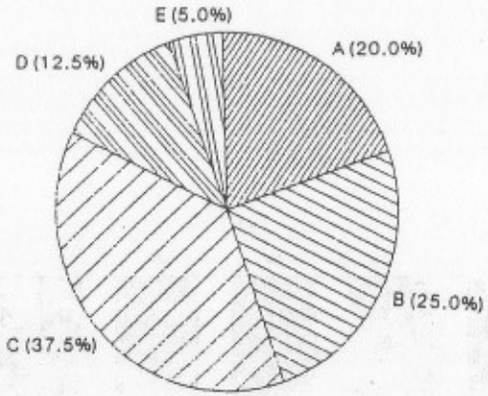
Learning Objectives	Illustrations	Syllabus Reference
	Construct a compound bar chart for the number of pupils in each of the P.5 classes.	

Number of Pupils in P.5 Classes

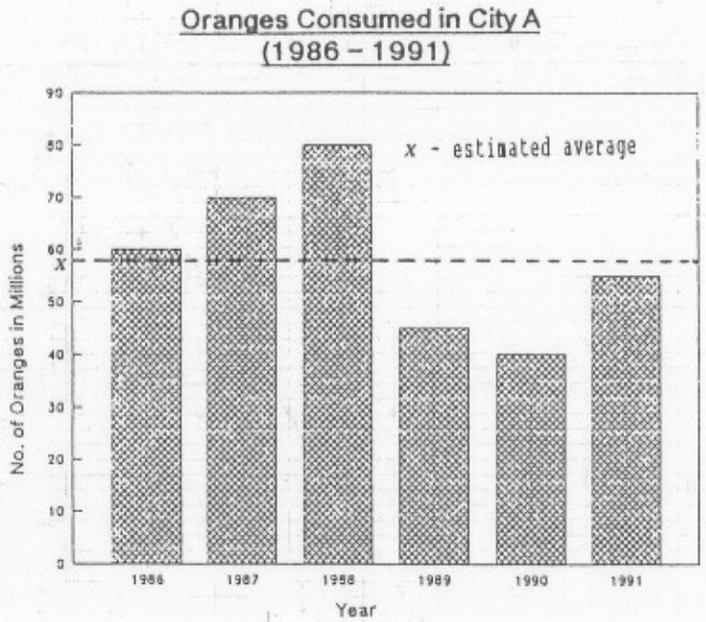


(c) present and interpret line graphs.

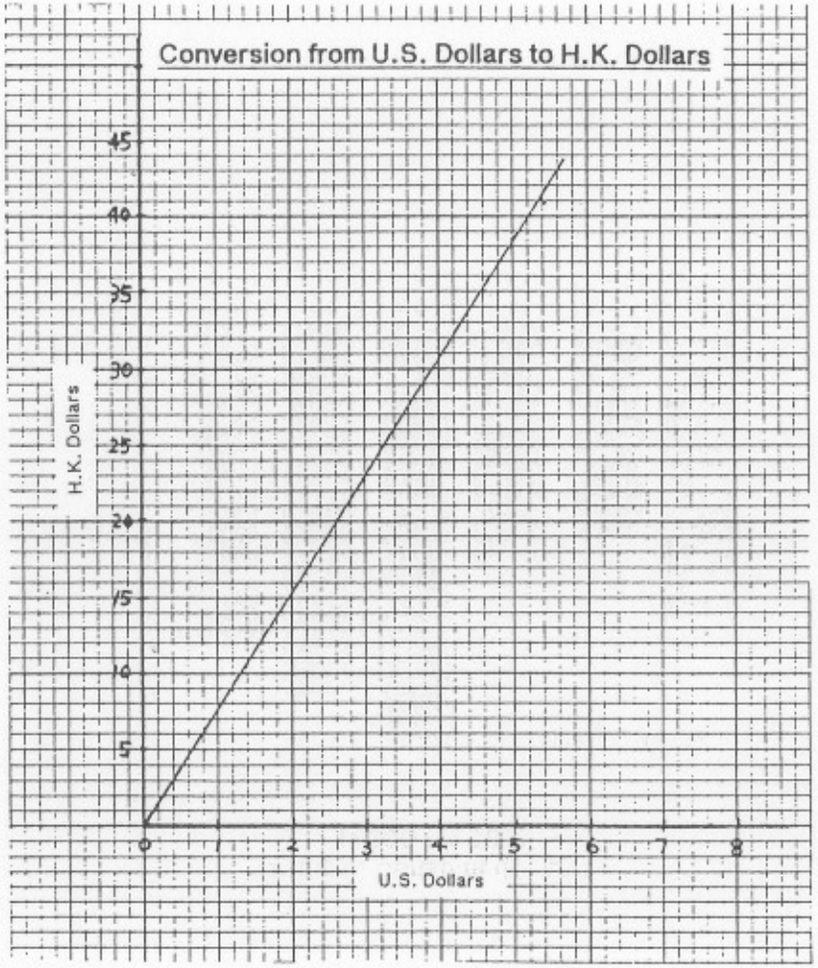
5.9 Graphs
5.18 Straight line graphs
6.19 Graphs

Learning Objectives	Illustrations	Syllabus Reference
(d) interpret pie charts.	Interpret pie charts like: **Grade Distribution in Mathematics in P.6A**  	6.9 Pie charts
(3) design and use suitable graphs to present data.	Design and use an observation sheet to collect data, such as: Conduct a survey of cars passing by with one, two, three .... passengers. Collect information about heights of the children in a certain age group. Present data with suitable charts.	6.19 Graphs

Learning Objectives	Illustrations	Syllabus Reference
(4) understand average and make estimates from bar charts.	Know that the average of 2 and 6 is $\frac{2+6}{2} = 4$ and make estimate from graphs like:	5.9 Graphs



Learning Objectives	Illustrations	Syllabus Reference
(5) solve problems on direct proportion by using straight line graphs.	Find solutions to problems arising from a given straight line graph.	5.18 Straight line graphs



Learning Objectives	Illustrations	Syllabus Reference
(6) look for relationships, patterns or trends from graphs.	Make and interpret graphs, using materials within pupils' knowledge and experience. Discuss in each case whether a bar chart or a continuous line graph is appropriate. Suggested topics include: (a) Gallup poll - favourite subjects, top ten TV programmes, shoe sizes. (b) Travel graphs. (c) Conversion graphs - Hong Kong dollars against foreign currencies, price of goods. (d) Graphs showing patterns or trends - population, temperature, heights of pupils. (e) Looking for relationships from graphs between two quantities like circumference/diameter, shadow/height, weight/stretch of spring balance.	6.19 Graphs