Chapter 2 Hierarchy of Learning Targets for Mathematics

2.1 Learning Dimensions for Mathematics

The content of learning in Mathematics for both primary and secondary schools is divided into five Learning Dimensions. They are

- Number
- Measures
- Algebra
- Shape & Space
- Data Handling

However, as the topics in the ALGEBRA Dimension are quite abstract for pupils in P.1 to P.3 and there are very few related topics, the ALGEBRA Dimension is therefore not included at this stage of learning.

2.2 Hierarchy of Learning Targets

Learning targets describe what is to be learned and what will be assessed. They are organized progressively across four Key Stages in primary and secondary schooling, i.e. Key Stage 1 (Primary 1 to 3); Key Stage 2 (Primary 4 to 6); Key Stage 3 (Secondary 1 to 3) and Key Stage 4 (Secondary 4 to 5). In addition, at each Key Stage there is a hierarchy of targets from general and broad to specific.

In Mathematics, the target hierarchy is as follows:

Subject Learning Target

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Dimension Learning Targets for the Subject

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Dimension Learning Targets for each Key Stage

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Learning Objectives for each Key Stage

The Subject Learning Target and Dimension Learning Targets for Mathematics, and the Dimension Learning Targets and Learning Objectives for Key Stage 2 are listed below. For ease of reference, an overview of the Learning Targets and Objectives for Key Stages 1 and 2 can be found in Appendix A.

2.3 Subject Learning Target for Mathematics

To develop an ever-improving capability to conceptualize, inquire, communicate & reason mathematically, formulate & solve mathematical problems, appreciate the beauty of mathematics and apply mathematics to different contexts through the learning of the knowledge, concepts and skills/procedures in number, measures, algebra, shape & space and data handling.

2.4 Dimension Learning Targets and Learning Objectives

2.4.1 NUMBER Dimension

NUMBER Dimension learning Target

To develop an ever-improving capability to conceptualize, inquire, communicate & reason mathematically, formulate & solve mathematical problems, appreciate the beauty of mathematics and apply mathematics to different contexts through the learning of the knowledge, concepts and skills/procedures in manipulating numbers.

NUMBER Dimension Learning Targets for Key Stage 2

To develop an ever-improving capability to

- understand the concepts of different forms of numbers.
- interconvert numbers in different forms.
- manipulate numbers and check the reasonableness of results.
- understand and use properties of operations on numbers.
- apply the knowledge and concepts of manipulating numbers to formulate and solve problems.

NUMBER Dimension Learning Objectives for Key Stage 2

Learners

(1) (a) read, write, round off large numbers in everyday life and estimate large quantities.
(b) recognize prime numbers and composite numbers and find prime numbers within 150.
(c) use index notation to represent composite numbers.
(d) recognize the Chinese and Roman numeration systems.
(e) recognize the development of some calculating devices.

(2) (a) compute multiplication : a number up to 3 digits with a 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.

(b) understand and use the commutative, associative and distributive properties of multiplication.
(c) solve practical problems involving multiplication or division of whole numbers.
(d) solve simple mixed operations with integers and problems involving the four rules, including 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.

(4) (a) recognize the meaning of proper fractions, improper fractions, mixed numbers and equivalent 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.
(c) solve simple problems on fractions.

(5) (a) read, write and order decimals, and understand place values of decimals.
(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 or approximation.
(c) understand percentages and perform conversions between decimals, fractions and percentages.
(d) solve simple practical problems on decimals and percentages.

(6) recognize squares and square roots of whole numbers.

(7) (a) understand the idea of direct proportion and solve simple practical problems on direct proportion by unitary method.
(b) understand the idea of inverse proportion and solve simple practical problems on inverse proportion by unitary method.

(8) calculate the average of a small group of data, taking examples from everyday life

2.4.2 MEASURES Dimension

MEASURES Dimension Learning Target

To develop an ever-improving capability to conceptualize, inquire, communicate & reason mathematically, formulate & solve mathematical problems, appreciate the beauty of mathematics and apply mathematics to different contexts through the understanding and use of the concepts of measures and appreciation of the approximate nature of measurement.

MEASURES Dimension Learning Targets for Key Stage 2

To develop an ever-improving capability to

- choose and use a variety of non-standard and standard units of various measures in measuring objects.
- select and justify appropriate standard units of measurement for different situations.
- recognize the degree of accuracy and the approximate nature of measurement.
- inquire and use simple measurement formulas.
- integrate the knowledge of number, measures and shape & space to formulate and solve simple measurement problems.

Measures Dimension Learning Objectives for Key Stage 2

Learners

(1) understand the relationship between units of measurement in metric system.

(2) (a) understand the concept of area.
(b) use non-standard units of area to compare objects and recognize the need to use standard units.
(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.
(d) understand and use the formulas for areas of rectangles and squares.
(e) find areas of parallelograms, triangles and trapeziums by counting square and by formulas, and find areas of polygons.

(3) (a) recognize the relationship between diameters and circumferences of circles.
(b) recognize π and solve simple problems involving diameter, radius and circumference of a circle using $\pi = 3.14$ or $22/7$.

(4) (a) recognize and use millilitre.
(b) understand the concept of volume, and recognize and use cubic centimetre.
(c) recognize the relationship between litre/millilitre and cubic centimetre.
(d) recognize cubic metre and its use.
(e) understand and use the formulas for volumes of cubes and cuboids.
(f) find volumes of irregular solids.

(5) recognize the 24-hour clock and understand the relationship between the units of time and solve simple practical problems on 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)'.
(b) solve simple problems on speed.

(7) understand scale and use appropriate scale to draw plans.

(8) (a) compare and measure angles, and draw angles up to 360° using a protractor.
(b) make special angles by folding papers.

2.4.3 ALGEBRA Dimension

ALGEBRA Dimension Learning Target

To develop an ever-improving capability to conceptualize, inquire, communicate & reason mathematically, formulate & solve mathematical problems, appreciate the beauty of mathematics and apply mathematics to different contexts through the learning of the knowledge, concepts and skills/procedures in manipulating algebraic symbols and relations.

ALGEBRA Dimension Learning Targets for Key Stage 2

To develop an ever-improving capability to

- recognize the use of symbols to represent unknown numbers.
- communicate simple mathematical facts/relations using symbols.
- manipulate simple relations involving symbols, and apply these knowledge and skills to formulate and solve simple problems and check the validity of results.
- explore simple number patterns.

ALGEBRA Dimension Learning Objectives for Key Stage 2

Learners

(1) recognize the use of symbols to stand for unknown numbers.

(2) record facts using algebraic symbols.

(3) solve simple equations, limiting to those requiring at most two steps in the solution, and check answers.

(4) solve simple practical problems by equations.

(5) recognize and appreciate simple number patterns such as square numbers, triangular numbers and rectangular numbers.

2.4.4 SHAPE & SPACE Dimension

SHAPE & SPACE Dimension Learning Target

To develop an ever-improving capability to conceptualize, inquire, communicate & reason mathematically, formulate & solve mathematical problems, appreciate the beauty of mathematics and apply mathematics to different contexts through the learning of the concepts & properties of 2-dimensional & 3-dimensional shapes and language & techniques of geometry & trigonometry.

SHAPE & SPACE Dimension Learning Targets for Key Stage 2

To develop an ever-improving capability to

- understand intuitively the properties of 2-dimensional and 3-dimensional shapes, and make use of this understanding to classify and make 2-dimensional and 3-dimensional shapes.
- develop a more elaborate sense of position and direction.
- specify location by means of appropriate measurements.
- integrate the knowledge of measures and shape & space to formulate and solve 2-dimensional problems.

SHAPE & SPACE Dimension Learning Objectives for Key Stage 2

Learners

(1) (a) understand intuitively the properties of quadrilaterals and classify quadrilaterals.
(b) recognize the properties of circles.

(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.
(b) design nets and make simple solids.

(3) (a) recognize the directions N, E, S, W, NE, SE, NW and SW, and use them to describe directions.
(b) recognize and use bearings.
(c) perform simple surveying activities to find their positions of objects from the measurement of directions and distances.

2.4.5 DATA HANDLING Dimension

DATA HANDLING Dimension Learning Target

To develop an ever-improving capability to conceptualize, inquire, communicate & reason mathematically, formulate & solve mathematical problems, appreciate the beauty of mathematics and apply mathematics to different contexts through the learning of the knowledge, concepts and skills/procedures in handling statistical information and probability problems.

DATA HANDLING Dimension Learning Targets for Key Stage 2

To develop an ever-improving capability to

- select criteria for grouping and organizing discrete statistical data.
- apply simple arithmetic and appropriate scales in constructing and interpreting more complex statistical/line graphs.
- show relationships among data using a variety of statistical and graphical representations.
- recognize and use relationships and patterns from graphs.
- formulate and solve problems arising from collected data and constructed graphs

DATA HANDLING Dimension Learning Objectives for Key Stage 2

Learners

(1) collect and group data of greater frequency counts.

(2) (a) present and interpret pictograms using one-to-ten or one-to-hundred representation.
(b) present and interpret bar charts of large frequency counts using one-to-thousand or even smaller scales and compound bar charts.
(c) present and interpret line graphs.
(d) interpret pie charts.

(3) design and use suitable graphs to present data.

(4) understand average and make estimates from bar charts.

(5) solve problems on direct proportion by using straight line graphs.

(6) look for relationships, patterns or trends from graphs.