

# **AFNORTH International Elementary School**

## **Mathematics Curriculum**

Year of Implementation: 2006-07

## Preamble

In order to ensure national compatibility with school curricula, the school's programs of studies are periodically reviewed by the professional staff in the school. Teachers from each of the three nations are chosen to work on a committee that has as its purpose the revision of a particular curricular area. Meetings are conducted over a period of several months. At those meetings, they look at the "National" requirements of each nation. For example, the Americans bring the DoDDS curriculum and the American Standards, British teachers bring the English National Curriculum and the Canadians bring the curriculum of Ontario. The committee members look through the curricular guides and select those objectives considered essential at each year level and those objectives common to all three nations. There is an extremely high degree of congruence between the AFNORTH curriculum and that of each of the three nations. The result is that AFNORTH School has a curriculum that reflects the highest minimum requirement.

For official reporting, the categories of knowledge and skills are described as follows:

Knowledge and Understanding. Subject-specific content acquired in each grade (knowledge), and the comprehension of its meaning and significance (understanding).

Thinking and Communication. The use of critical and creative thinking skills and/or processes as follows:

- planning skills (e.g., understanding the problem, making a plan for solving the problem)
- processing skills (e.g., carrying out a plan, looking back at the solution)
- critical/creative thinking processes (e.g., inquiry, problem solving)
- the conveying of meaning through various oral, written, and visual forms (e.g., providing explanations of reasoning or justification of results orally or in writing)
- communicating mathematical ideas and solutions in writing, using numbers and algebraic symbols, and visually, using pictures, diagrams, charts, tables, graphs, and concrete materials.

Problem Solving and Application. The use of knowledge and skills to make connections within and between various contexts.

<b>Grades</b>			
<u>IY1</u>	<u>IY2</u>	<u>IY3</u>	<u>IY4</u>
<u>IY5</u>	<u>IY6</u>	<u>M1</u>	<u>M2</u>

# IY1 Mathematics

## Number and Operations

**Count, compare and order numbers, and describe relationships between them**

- Say and use the number names in order in familiar contexts
- Know that numbers identify how many objects are in a set
- Count reliably up to 10 everyday objects
- Estimate how many objects they can see and check by counting
- Count aloud in ones, twos, fives or tens
- Match then compare the numbers of objects in two sets
- Use language such as 'more' or 'less' to compare two numbers
- Use ordinal numbers in different contexts
- Recognize numerals 1 to 9

**Secure knowledge of number facts which can be recalled quickly and used and applied appropriately**

- Observe number relationships and patterns in the environment and use these to derive facts
- Find one more or one less than a number from 1 to 10
- Select two groups of objects to make a given total of objects

**Calculate efficiently and accurately**

- Begin to relate addition to combining two groups of objects and subtraction to 'taking away'
- In practical activities and discussion begin to use the vocabulary involved in adding and subtracting
- Count repeated groups of the same size
- Share objects into equal groups and count how many in each group

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## Using and Applying Thinking Skills

### **Problem Solving**

- Build new mathematical knowledge by developing, selecting, applying and monitoring problem-solving strategies as they pose and solve problems in a variety of practical situations.

### **Reasoning and Proof**

- Develop, apply and evaluate various types of reasoning skills and methods of proof.
- Develop and evaluate mathematical argument.
- Sort objects, making choices and justifying decisions

### **Communication**

- Communicate mathematical thinking coherently and clearly to others, orally, visually and in writing, using the language of mathematics and a variety of representations.
- Talk about, recognize and recreate simple patterns
- Describe solutions to practical problems, drawing on experience, talking about own ideas, methods and choices

### **Connections**

- Understand how mathematical concepts and procedures interconnect and build on one another.

- Recognise and apply mathematics in contexts outside of mathematics in every day situations.

### **Representation**

- Create and use a variety of representations to organize, record and communicate mathematical ideas and apply them to problem-solving situations.
- Match sets of objects to numerals that represent the number of objects

### **Selecting Tools and Computational Strategies**

- Select and use a variety of concrete, visual and electronic learning tools and appropriate computational strategies to investigate ideas and solve problems

### **Reflecting**

- Demonstrate thought process of evaluating work and monitoring thinking to help clarify understanding as problems are solved and investigations are carried out.

## **Algebra and Patterning**

- Sort, classify and order objects by one attribute
- Identify, copy, extend and create simple patterns or patterns of sounds, shapes and motions
- Recognize simple patterns in sets of objects
- Sort and compare groups of objects having equal or different numbers of objects, i.e. more than, less than, or equal to
- Recognize and identify a change in common objects, sounds or movements

## **Space/Geometry**

### **Position and transform shapes, recognize and use their properties to visualize and construct**

- Use familiar objects and common shapes to create and recreate patterns and build models
- Use language such as 'circle' or 'bigger' to describe the shape and size of solids and flat shapes
- Use everyday words to describe position

## **Measures**

### **Measure accurately using appropriate units, interpret and compare scales**

- Use language such as 'greater', 'smaller', 'heavier' or 'lighter' to compare quantities
- Use everyday language related to time; order and sequence familiar events and measure short periods of time with a non-standard unit.

## **Data Handling**

### **Process, present and interpret data to pose and answer questions**

- Use developing mathematical ideas and methods to solve practical problems
- Talk about, recognize and recreate simple patterns
- Sort familiar objects and count how many objects share a particular property, presenting results using pictures, drawings or numerals

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# IY2 Mathematics

## Thinking Skills

### **Problem Solving**

- Build new mathematical knowledge by developing, selecting, applying and monitoring problem-solving strategies as they pose and solve problems in a variety of situations.
- Solve problems involving counting, adding, subtracting, doubling or halving in the context of numbers, measures or money; recognise the value of coins.
- Describe a problem, using numbers, practical materials and diagrams; use these to solve the problem and set the solution back in the original context.

### **Reasoning and Proof**

- Develop, apply and evaluate various types of reasoning skills and methods of proof.
- Develop and evaluate mathematical argument.

### **Communication**

- Communicate mathematical thinking explaining choices coherently and clearly to others, orally, visually and in writing, using the language of mathematics and a variety of representations.

- Describe simple patterns and relationships involving numbers or shapes; decide whether examples satisfy given conditions in everyday contexts.

### **Connections**

- Understand how mathematical concepts and procedures interconnect and build on one another.
- Recognise and apply mathematics in contexts outside of mathematics in every day situations.

### **Representation**

- Create and use a variety of representations to organize, record and communicate mathematical ideas and apply them to problem-solving situations.
- Answer a question by selecting and using suitable equipment, and sorting information, shapes or objects; display results using tables and pictures

### **Selecting Tools and Computational Strategies**

- Select and use a variety of concrete, visual and electronic learning tools and appropriate computational strategies to investigate ideas and solve problems.

### **Reflecting**

- Demonstrate thought process of evaluating work and monitoring thinking to help clarify understanding as problems are solved and investigations are carried out.

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## **Number and Operations**

### **Count, compare and order numbers, and describe relationships between them**

- Count reliably at least 20 objects, recognizing that when they are rearranged the number of objects stays the same; relate addition to counting on and count on or back in ones, twos, fives and tens; estimate a number of objects, which can be checked by counting
- Compare and order numbers, using the related vocabulary; use the equals (=) sign
- Read and write numerals, numbers from 0 to at least 20 and the multiples of 10, and position these numbers on a number track and number line
- Say the number that is one more or less than any given number, and ten more or less for multiples of ten
- Use the vocabulary of halves and quarters in context

### **Secure knowledge of number facts which can be recalled quickly and used and applied appropriately**

- Derive and recall all pairs of numbers with a total of 10 and addition facts for totals to at least 5; work out the corresponding subtraction facts
- Use knowledge of counting in twos, fives and tens to derive the multiples of 2, 5 and 10 to the tenth multiple
- Recall the doubles of all numbers to at least 10

### **Calculate efficiently and accurately**

- Recognize that addition can be done in any order and use this to add mentally a one-digit number or a multiple of 10 to a one-digit or two-digit number
- Subtract one-digit numbers from one-digit and two-digit numbers and a multiple of 10 from a two-digit number; apply addition and subtraction strategies, e.g. counting on to find the difference
- Understand subtraction as both 'taking away' and 'difference' and use the related vocabulary and symbols to describe and record addition and subtraction number sentences
- Solve practical problems that involve combining groups of 2, 5 or 10, or sharing into equal groups

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## **Algebra and Patterning**

- Describe how objects are alike and different using one or two properties
- Sort, classify and order objects in more than one way
- Identify, create, copy and describe sequences of sounds, shapes, motions and numbers
- Describe, model and extend AB and ABC patterns
- Model a problem situation using actual objects recognize changes that are measurable

## **Space/Geometry**

- Visualize and name common 2-D shapes and 3-D solids and describe their features; use them to make patterns, pictures and models
- Identify objects that rotate; recognize and make whole, half and quarter turns
- Visualize and describe the positions of objects and direction and distance when moving them, e.g. when placing or moving objects on a games board

## **Measures**

- Estimate, measure, weigh and compare objects, choosing and using suitable uniform non-standard or standard units and measuring instruments, e.g. a lever balance, metre stick or measuring jug
- Use vocabulary related to time; order days of the week and months; read the time to the hour and half hour

## **Data Handling**

- Answer a question by recording information in lists and tables; present outcomes, using practical resources, pictures, block graphs or pictograms
- Use diagrams to sort objects into groups according to a given criterion; suggest a different criterion for grouping the same objects.

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# IY3 Mathematics

## Using and Applying Thinking Skills

### **Problem Solving**

- Build new mathematical knowledge by developing, selecting, applying and monitoring problem-solving strategies as they pose and solve problems in a variety of situations.
- Solve problems involving addition, subtraction, multiplication or division in contexts of numbers, measures or pounds, pence, dollars, or euros

### **Reasoning and Proof**

- Develop, apply and evaluate various types of reasoning skills and methods of proof.
- Develop and evaluate mathematical argument
- Identify and record the number sentences involved in a problem, carry out the calculations and check that the solution makes sense in the context of the problem
- Describe patterns and relationships involving numbers or shapes, make predictions and test these with examples

### **Communication**

- Communicate mathematical thinking coherently and clearly to others, orally, visually and in writing, using the language of mathematics and a variety of representations .i.e. symbols.

### **Connections**

- Understand how mathematical concepts and procedures interconnect and build on one another.
- Recognise and apply mathematics in contexts outside of mathematics in every day situations.

### **Representation**

- Create and use a variety of representations to organize, record and communicate mathematical ideas and apply them to problem-solving situations.
- Follow a line of enquiry; answer questions by selecting and using suitable equipment and information, and organising and presenting the information in lists, tables and simple diagrams

### **Selecting Tools and Computational Strategies**

- Select and use a variety of concrete, visual and electronic learning tools and appropriate computational strategies to investigate ideas and solve problems

### **Reflecting**

- Demonstrate thought process of evaluating work and monitoring thinking to help clarify understanding as problems are solved and investigations are carried out.

## Number and Operations

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### **Count, compare and order numbers, and describe relationships between them**

- Read and write two- and three-digit numbers in figures and words; describe and extend number sequences and recognize odd and even numbers
- Count up to 100 objects by grouping them and counting in tens, fives or twos; explain what each digit in a two-digit number represents, including numbers where 0 is a place holder; partition two-digit numbers in different ways, including into multiples of ten and one
- Order two-digit numbers and position them on a number line; use the greater than (>) and less than (<) signs
- Estimate a number of objects and round two-digit numbers to the nearest 10
- Find one-half, one-quarter and three-quarters of shapes and sets of objects;  $\frac{1}{4} = 25$

### **Calculate efficiently and accurately**

- Add or subtract mentally a single-digit number or a multiple of 10 to or from any two-digit number; use practical and informal written methods to support addition and subtraction of two-digit numbers
- Understand that subtraction is the reverse of addition and vice versa and use this to derive and record related addition and subtraction number sentences

- Represent repeated addition and arrays as multiplication, and sharing and repeated subtraction (grouping) as division; use practical and informal written methods and related vocabulary to support multiplication and division calculations, including those with remainders
- Use the symbols +, −, ×, ÷ and = to record and interpret number sentences involving all four operations; calculate the value of an unknown in a number sentence, e.g.  $30 - \square = 24$ ,  $\square \div 2 = 6$

### **Secure knowledge of number facts which can be recalled quickly and used and applied appropriately**

- Derive and recall all addition and subtraction facts for each number to at least 10, all pairs with totals to 20 and all pairs of multiples of 10 with totals up to 100
- Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20, and the corresponding halves
- Derive and recall multiplication facts for the 2, 5 and 10 times-tables and the related division facts; recognise multiples of 2, 5 and 10
- Use knowledge of number facts and operations to check answers to calculations

### **Algebra and Patterning**

- Sort, classify and order objects by two or more attributes and explain how objects were sorted.

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- Identify, describe, extend and create repeating patterns and number sequences.
- Solve open sentences using the commutative property of addition by representing an expression in more than one way.
- Write mathematical equations using symbols.
- Model and describe a problem situation using representations, i.e. words, objects, number phrase or sentence.
- Experiment with equivalency using concrete materials.
- Identify measurable changes that are predictable, e.g. Students grow taller, not shorter as they get older.
- Identify and create reflective symmetry in patterns and 2-D shapes and draw lines of symmetry in shapes
- Follow and give instructions involving position, direction and movement
- Recognise and use whole, half and quarter turns, both clockwise and anticlockwise; know that a right angle represents a quarter turn

### **Measures**

- Estimate, compare and measure lengths, masses and capacities, using standard units (m, cm, kg, litre) and suitable measuring instruments
- Read the numbered divisions on a scale, and interpret the divisions between them, e.g. on a scale from 0 to 25 with intervals of 1 shown but only the divisions 0, 5, 10, 15 and 20 numbered; use a ruler to draw and measure lines to the nearest centimeter.
- Use units of time (seconds, minutes, hours, days) and know the relationships between them; read the time to the quarter hour and identify time intervals, including those that cross the hour boundary.

### **Space/Geometry**

- Visualise common 2-D shapes and 3-D solids and identify them from structures, the environment and pictures of them in different positions and orientations; sort, make and describe shapes, referring to their properties; faces, edges, corners

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# IY4 Mathematics

## Using and Applying Thinking Skills

### **Problem Solving**

- Build new mathematical knowledge by developing, selecting, applying and monitoring problem-solving strategies as they pose and solve problems in a variety of situations.
- Solve one- and two-step problems involving numbers, money or measures, including time, choosing and carrying out appropriate calculations
- Represent the information in a problem, using numbers and images; use these to find a solution and present it in context, where appropriate using £.p \$ euro notation or units of measure

### **Reasoning and Proof**

- Develop, apply and evaluate various types of reasoning skills and methods of proof.
- Develop and evaluate mathematical argument.

### **Communication**

- Communicate mathematical thinking coherently and clearly to others, orally, visually and in writing, using the language of mathematics and a variety of representations i.e. pictures and diagrams

### **Connections**

- Understand how mathematical concepts and procedures interconnect and build on one another.
- Recognise and apply mathematics in contexts outside of mathematics in every day situations.

### **Representation**

- Create and use a variety of representations to organize, record and communicate mathematical ideas and apply them to problem-solving situations.
- Use patterns, properties of and relationships between numbers or shapes to identify similarities and differences, and to solve puzzles
- Follow a line of enquiry by deciding what information is important; make and use lists, tables and graphs to organize and interpret the information

### **Selecting Tools and Computational Strategies**

- Select and use a variety of concrete, visual and electronic learning tools and appropriate computational strategies to investigate ideas and solve problems

### **Reflecting**

- Demonstrate thought process of evaluating work and monitoring thinking to help clarify understanding as problems are solved and investigations are carried out.

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## **Number and Operations**

### **Count, compare and order numbers, and describe relationships between them**

- Order whole numbers to at least 1000 and position them on a number line
- Partition three-digit numbers in different ways, including into multiples of one hundred, ten and one
- Round two- or three-digit numbers to the nearest 10 or 100 and give estimates and approximations to their sums and differences
- Read and write proper fractions, e.g.  $\frac{3}{7}$ ,  $\frac{9}{10}$ , interpreting the denominator as the parts of a whole and the numerator as the number of parts in the whole; identify fractions of shapes and use diagrams to compare fractions and establish equivalents.

### **Secure knowledge of number facts which can be recalled quickly and used and applied appropriately**

- Derive and recall all addition and subtraction facts for each number to 20, sums and differences of multiples of 10 and number pairs that total 100
- Derive and recall multiplication facts for the 2, 3, 4, 5, 6 and 10 times-tables and the corresponding division facts
- Use knowledge of number operations and corresponding inverses to check calculations

### **Calculate efficiently and accurately**

- Add or subtract mentally combinations of one-digit and two-digit numbers
- Develop and refine written methods to support, record or explain the addition and subtraction of two-digit and three-digit numbers
- Multiply one- and two-digit numbers by 10 or 100, and describe the effect
- Use practical and informal written methods to support multiplication and division of two-digit numbers (e.g.  $13 \times 3$ ,  $30 \div 4$ ); round remainders up or down, depending on the context
- Understand that division is the reverse of multiplication and vice versa and use to derive and record related multiplication and division number sentences
- Find unit fractions of numbers and quantities, e.g.  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$  and  $1 \frac{1}{6}$  of 12 litres

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## **Algebra and Patterning**

- Create and describe patterns with multiple attributes use patterns to make generalizations and predictions in real life contexts by determining the rule and/or identifying missing elements in a pattern and justifying their inclusion
- Use symbols to represent unknown quantities and identify values for symbols
- Represent equivalence and extend the concept to situations involving symbols i.e.  $\hat{+} = 10$
- Solve open sentences by representing an expression in more than one way using the associative property of addition
- Model and describe a problem situation using symbols and operations
- Describe qualitative changes
- Describe quantitative changes, especially those involving addition and subtraction

## **Space/Geometry**

- Relate 2-D shapes and 3-D solids to drawings of them, and describe, classify, draw and make the shapes
- Draw and complete shapes with reflective symmetry and draw the reflection of a shape in a mirror line along one side

- Read and record the vocabulary of position, direction and movement, using the four compass directions to describe movement about a grid
- Use a set-square to draw right angles and to identify right angles in 2-D shapes; compare angles with a right angle; recognize that two right angles can form a straight line.

## **Measures**

- Know the relationships between kilometres and metres, metres and centimeters, kilograms and grams, litres and millilitres; choose and use appropriate units to estimate, measure, and record measurements
- Read, to the nearest division and half-division, scales that are numbered or partially numbered; use the information to measure and draw to a suitable degree of accuracy.
- Read the time on a 12-hour digital clock and to the nearest five minutes on an analogue clock; calculate time intervals and find start or end times for a given time interval.

## **Data Handling**

- Answer a question by organising, representing and interpreting data; use tally charts, frequency tables, pictograms and bar charts to highlight results and observations; use ICT to create a simple bar chart
- Use Venn diagrams or Carroll diagrams to sort data and objects, using more than one criterion

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# IY5 Mathematics

## **Problem Solving Thinking Skills**

- Build new mathematical knowledge by developing, selecting, applying and monitoring problem-solving strategies as they pose and solve problems in a variety of situations.
- Solve one- and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate

## **Reasoning and Proof**

- Develop, apply and evaluate various types of reasoning skills and methods of proof.
- Develop and evaluate mathematical argument.
- Use knowledge of numbers and shapes to identify patterns, properties and relationships, and apply them to unfamiliar situations; investigate a statement involving numbers and test it with examples

## **Communication**

- Communicate mathematical thinking coherently and clearly to others, orally, visually and in writing, using the language of mathematics and a variety of representations.
- Report solutions to problems, explanations and reasoning orally and in writing

## **Connections**

- Understand how mathematical concepts and procedures interconnect and build on one another.
- Recognise and apply mathematics in contexts outside of mathematics in every day situations.

## **Representation**

- Create and use a variety of representations to organize, record and communicate mathematical ideas and apply them to problem-solving situations.
- Represent a problem, using number sentences and diagrams; use these to find a strategy to solve the problem and present the solution in the context of the problem
- Suggest a line of enquiry and the strategy needed to pursue it; collect, organise and interpret selected information to find answers

## **Selecting Tools and Computational Strategies**

- Select and use a variety of concrete, visual and electronic learning tools and appropriate computational strategies to investigate ideas and solve problems

## **Reflecting**

- Demonstrate thought process of evaluating work and monitoring thinking to help clarify understanding as problems are solved and investigations are carried out

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## Number and Operations

### **Count, compare and order numbers, and describe relationships between them**

- Use positive and negative numbers in context; position on a number line and state inequalities, using the symbols  $<$  and  $>$ , e.g.  $-3 > -5$ ,  $-1 < +1$
- Use decimal notation for tenths and hundredths, relating the notation to money and measurement; position one- and two-place decimals on a number line.
- Recognise the equivalence between decimal and fraction forms of tenths and hundredths
- Use fractions to identify subsets of a set of objects; use diagrams to identify equivalent fractions, e.g.  $\frac{6}{8}$  and  $\frac{3}{4}$ , or  $\frac{70}{100}$  and  $\frac{7}{10}$ ; interpret mixed numbers, e.g.  $3\frac{1}{2}$ , and position them on a number line
- Use the vocabulary of ratio and proportion to describe the relationship between two quantities, e.g. 2 to every 3, and between part and whole, e.g. 2 in every 5; estimate proportion, e.g. 'For every one red car there are about four silver cars,' or 'I'm asleep for about one-third of the day.'
- Use place values to read, model, compare/order and interpret whole numbers through thousands and decimals through hundredths; explain the values of the digits
- Explain the relationship of commonly used fractions to their equivalent forms, and explain their relationship to a whole

- Identify and describe numbers according to their characteristics such as even, odd, multiples, and/or factors
- Read and print in words whole numbers to one hundred, using meaningful contexts
- Compose and decompose three-digit numbers into hundreds, tens, and ones in a variety of ways, using concrete materials
- Round two-digit numbers to the nearest ten, in problems arising from real-life situations; count forward and backwards by 1's, 2's, 5's, 10's, and 100's to 1000 from various starting points, and by 25's to 1000 starting from multiples of 25, using a variety of tools and strategies.

### **Secure knowledge of number facts which can be recalled quickly and used and applied appropriately**

- Use knowledge of addition & subtraction facts and place value to derive sums: differences of pairs of multiples of 10, 100 or 1000
- Identify doubles of two-digit numbers; use to calculate doubles of multiples of 10 and 100 and derive the corresponding halves.
- Derive and recall multiplication facts up to  $10 \times 10$ , the corresponding division facts and multiples of numbers to 10 up to the tenth multiple.
- Use knowledge of rounding, number operations and inverses to check calculations
- Identify pairs of fractions that total 1

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### **Calculate efficiently and accurately**

- Add/subtract mentally pairs of 2-digit whole numbers, e.g.  $47 + 58$ ,  $91 - 35$
- Use standard written methods for addition & subtraction of 2-digit and 3-digit whole numbers and calculations with £, p, \$, euro
- Multiply/divide numbers to 1000 by 10, then 100 (whole-number answers), understanding the effect; relate to scaling up or down
- Develop and refine written methods for multiplying and dividing a two-digit number by a one-digit number, to include division
- Find fractions of numbers, quantities or shapes, e.g.  $\frac{1}{5}$  of 30 plums,  $\frac{3}{8}$  of a 6 by 4 rectangle
- Use a calculator to carry out one- and two-step calculations involving all four operations; recognise negative numbers in the display, correct mistaken entries and interpret the display correctly in the context of money
- Explain and use addition, subtraction, multiplication, and division to show equivalent whole numbers
- use properties of operations on whole numbers, i.e., commutativity and associativity

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## **Algebra and Patterning**

- identify, describe, and extend the rules of multiplicative, growing and shrinking patterns;
- make predictions, identify relationships, and solve problems by using the concept of patterns;
- express mathematical relationships as equations or inequalities with appropriate symbols;
- solve open sentences by representing an expression in more than one way using the commutative and associative properties for addition and multiplication
- organize and order data in labeled tables to discover patterns and rules
- represent mathematical situations to solve problems using equations or inequalities
- recognize patterns and make predictions based on collected data
- describe the difference between qualitative and quantitative changes
- identify, extend, and create a repeating pattern involving two attributes (e.g., size, colour, orientation, number), using a variety of tools (e.g., pattern blocks, attribute blocks, drawings
- identify and describe, through investigation, number patterns involving addition, subtraction, and multiplication, represented on a number line, on a calendar, and on a hundreds chart
- create a number pattern involving addition or subtraction, given a pattern represented on a number line or a pattern rule expressed in words
- represent simple geometric patterns using a number sequence, a number line, or a bar graph
- determine, the missing number in equations involving addition and subtraction of one- and two-digit numbers, using a variety of tools and strategies
- identify, through investigation, the properties of zero and 1 in multiplication (i.e., any number multiplied by zero equals zero; any number multiplied by 1 equals the original number)

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## Measures

- Use standard metric units/customary units and their abbreviations when estimating, measuring, recording length, mass, capacity; know the meaning of kilo-, centi- and milli and, where appropriate, use decimal notation to record measurements, e.g. 1.3 m or 0.6 kg
- Interpret intervals and divisions on partially numbered scales and record readings accurately, where appropriate to the nearest tenth of a unit.
- Draw and measure regular polygons, and calculate their perimeters, find the area of shapes drawn on a square grid by counting squares
- Read time to the nearest minute; use am, pm and 12-hour clock notation; calculate time intervals from clocks and timetables
- Select and apply appropriate standard units and tools to compare the measurable attributes of a variety of objects
- Develop strategies for estimating the perimeter of irregular shapes
- Use models to estimate perimeter and area
- Calculate the area and perimeter of regular shapes
- estimate, read (i.e., using a thermometer), and record positive temperatures to the nearest degree Celsius (i.e., using a number line; using appropriate notation)
- identify benchmarks for freezing, cold, cool, warm, hot, and boiling temperatures as they relate to water and for cold, cool, warm, and hot temperatures as they relate to air

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## **DATA MANAGEMENT AND PROBABILITY**

- Determine the data needed to answer a specific question; organise, present,
- analyse and interpret the data in tables, diagrams, tally charts, pictograms and bar charts, using ICT where appropriate
- Compare the impact of representations where scales have intervals of differing step size
- develop and implement a plan to collect and organize data to address a given question
- translate information from one data representation to another, i.e., graph to table
- support a conclusion or a prediction with evidence from data
- organize and graphically display data using a variety of forms, categories and intervals (i.e. tables, diagrams, tally charts, pictograms, bar graphs)
- describe the characteristics of graphically represented data, i.e., identify the mode
- examine graphs and tables that display the same set of data to identify what each representation contributes to the interpretation of data and conclusions drawn
- select a question for study, predict possible outcomes, conduct simple experiments, and compare results to predictions.
- demonstrate an understanding of mode
- predict the frequency of an outcome in a simple probability experiment or game
- demonstrate, through investigation, an understanding of fairness in a game and relate this to the occurrence of equally likely outcomes

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## **Space/Geometry**

- Draw two-dimensional shapes/ polygons and classify them by identifying their properties
- Visualise 3-D objects from 2-D drawings and make nets of common solids
- Know that angles are measured in degrees and that one whole Use coordinate systems to specify locations and describe paths
- Verify symmetry by drawing lines of symmetry in shapes and objects
- Compare, describe, name and sort prisms and pyramids by geometric properties
- Describe movement from one location to another using a grid map
- Identify flips, slides, and turns, through investigation using concrete materials and physical motion, and name flips, slides, and turns as reflections, translations, and rotations

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# IY6 Mathematics

## Using and Applying Thinking Processes

### **Problem Solving**

- Build new mathematical knowledge by developing, selecting, applying and monitoring problem-solving strategies as they pose and solve problems in a variety of situations.
- Solve one and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate methods, including calculator use
- Represent a problem by identifying and recording the calculations needed to solve it; find possible solutions and confirm them in the context of the problem

### **Reasoning and Proof**

- Develop, apply and evaluate various types of reasoning skills and methods of proof.
- Develop and evaluate mathematical argument.
- Plan and pursue an enquiry; present evidence by collecting, organising and interpreting information; suggest extensions to the enquiry

- Explore patterns, properties and relationships and propose a general statement involving numbers or shapes; identify examples for which the statement is true or false

### **Communication**

- Communicate mathematical thinking coherently and clearly to others, orally, visually and in writing, using the language of mathematics and a variety of representations.

### **Connections**

- Understand how mathematical concepts and procedures interconnect and build on one another.
- Recognise and apply mathematics in contexts outside of mathematics in every day situations

### **Representation**

- Create and use a variety of representations to organize, record and communicate mathematical ideas and apply them to problem-solving situations.
- Explain reasoning, using diagrams, graphs and text

### **Selecting Tools and Computational Strategies**

- Select and use a variety of concrete, visual and electronic learning tools and appropriate computational strategies to investigate ideas and solve problems

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## Reflecting

- Demonstrate thought process of evaluating work and monitoring thinking to help clarify understanding as problems are solved and investigations are carried out.

## Number and Operations

### Count, compare and order numbers, and describe relationships between them

- Count from any given number in whole-number steps, fraction steps and decimal-number steps, extending beyond zero when counting backwards; relate the numbers to their positions on a number line
- Explain what each digit represents in whole numbers and numbers with up to two decimal places, and partition these numbers
- Use sequences to scale numbers up or down; solve problems involving proportions of quantities and measurements, e.g. increase or decrease quantities in a recipe designed to feed six people in order to feed more or fewer people
- Express a smaller whole number as a fraction of a larger one; find equivalent fractions, including equivalent improper fractions and mixed numbers; relate fractions to their decimal representations
- Understand percentage as the number of parts in every 100 and express tenths and hundredths as percentages
- identify and describe numbers according to their characteristics including primes, composites, and perfect squares
- round four-digit whole numbers to the nearest ten, hundred, and thousand, in problems arising from real-life situations
- compare and order fractions, and compare fractions to the benchmarks of 0,  $\frac{1}{2}$ , and 1 (e.g.,  $\frac{1}{8}$  is closer to 0 than  $\frac{1}{2}$ ;  $\frac{3}{5}$  more than  $\frac{1}{2}$ )
- read and represent money amounts to \$100 (e.g., five dollars, two quarters, one nickel, and four cents is \$5.59)

### Secure knowledge of number facts which can be recalled quickly and used and applied appropriately

- Use knowledge of place value and addition and subtraction of four-digit numbers to derive sums and differences, doubles and halves of decimals, e.g.  $6.5 \pm 2.7$ , halve 5.6, double 0.34
- Recall quickly multiplication facts up to  $10 \times 10$ , use to multiply pairs of multiples of 10 and 100 and derive corresponding division facts quickly
- Identify pairs of factors of two-digit whole numbers and find common multiples, e.g. for 6 and 9
- Use knowledge of number facts, inverse operations, place value and rounding to estimate and to check calculations
- demonstrate proficiency in basic facts for all operations

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## Calculate efficiently and accurately

- Multiply mentally  $TU \times U$ ; use mental methods in special cases, e.g. to subtract 1995 from 6007, to multiply 18 by 25
- Use the standard written methods for addition and subtraction of whole numbers and decimals with up to three places
- Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 or 1000
- Use the standard written methods for multiplication and division calculations of  $HTU \times U$ ,  $U.t \times U$ ,  $TU \times TU$  and  $HTU \div U$
- Find fractions using division, e.g.  $\frac{1}{100}$  of 5 kg, and percentages of numbers and quantities, e.g. 10%, 5% and 15% of £80
- Use a calculator to solve problems, including those involving decimals or fractions, e.g. to find  $\frac{3}{4}$  of 150 g;
- interpret the display correctly in the context of measurement
- model division problems and explore the meaning of remainders
- use models, benchmarks, and equivalence to add and subtract fractions with like denominators

## Algebra and Patterning

- Express a general rule for a pattern or a function by using visual representations, words, tables, or graphs;
- Explain the concept of variable;
- Use variables as unknown quantities in general rules when describing mathematical patterns and relationships;
- Apply algebraic order of operations and the commutative, associative and distributive properties to algebraic expressions, equations, and inequalities;
- Construct tables and graphs that accurately represent the relationship between two variables;
- Identify, describe, and compare situations that represent constant or varying rates of change.
- Create, identify, and extend numeric and geometric patterns, using a variety of tools (e.g., concrete materials, paper and pencil, calculators, spreadsheets)
- Build a model to represent a number pattern presented in a table of values that shows the term number and the term
- Make a table of values for a pattern that is generated by adding or subtracting a number (i.e., a constant) to get the next term, or by multiplying or dividing by a constant to get the next term, given either the sequence (e.g., 12, 17, 22, 27, 32, ...) or the pattern rule in words (e.g., start with 12 and add 5 to each term to get the next term)

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- Make predictions related to growing and shrinking geometric and numeric patterns

## **Measurement**

- Use standard metric units of measure and convert between units, using decimals to two places notation, e.g. change 2.75 litres to 2750 ml, or vice versa
  - Measure and calculate, using imperial/customary units still in everyday use; know their approximate equivalent metric values
  - Read scales and record results to a required degree of accuracy, recognising that the measurement made is approximate
  - Calculate perimeters and areas of rectilinear shapes; estimate the area of an irregular shape by counting squares
  - Extend the recognition of measurable attributes to include volume (cubic units);
  - Develop strategies for estimating the volume/capacity of various shapes
  - extend the use of appropriate standard tools and units to include measures of volume/capacity and angle size
  - Develop strategies to determine the surface areas and volumes/capacities of rectangular solids
- Differentiate between units of measurement for two- and three-dimensional objects and use appropriately
  - Estimate, measure (i.e., using an analogue clock), and represent time intervals to the nearest second
  - Estimate and determine elapsed time, with and without using a time line, given the durations of events expressed in minutes, hours, days, weeks, months, or years

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## **Shape and Geometry**

- Describe, identify and visualise faces, edges, vertices and bases and use these properties to classify and construct 2-D shapes and 3-D solids
- Make, draw and construct shapes with increasing accuracy and apply knowledge of their properties (e.g. Prisms and pyramids)
- Visualise and draw on grids of different types where a shape will be after reflection, after translation or after rotation about its centre or one of its vertices
- identify and plot ordered pairs in the first quadrant of a coordinate system
- Use coordinates in the first quadrant to draw and locate shapes
- Use a protractor to estimate, measure and draw angles, on their own and in shapes; calculate and construct angles in a triangle or around a point
- Compare grid systems commonly used on maps (i.e., the use of numbers and letters to identify an area; the use of a coordinate system based on the cardinal directions to describe a specific location)
- identify and classify acute, right, obtuse, and straight angles
- identify triangles (i.e., acute, right, obtuse, scalene, isosceles, equilateral), and classify them according to angle and side properties

## **Data Management and Probability**

- Describe and predict theoretical and experimental outcomes from data, using the language of chance or likelihood
- Solve problems involving collecting, processing, presenting and interpreting data, using ICT where appropriate; construct and interpret frequency tables, bar charts with grouped discrete data and line graphs; interpret pie charts
- Describe and interpret results and solutions to problems, using the mode, range, median and mean
- Recognize samples as subsets of larger populations
- Use a sample to make projections for a larger population

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# M1 Mathematics

## Using and Applying Thinking Skills

### **Problem Solving**

- Build new mathematical knowledge by developing, selecting, applying and monitoring problem-solving strategies as they pose and solve multi-step problems in a variety of situations using efficient methods including use of calculator.
- Represent a problem by identifying and recording the calculations needed to solve it, using symbols for unknown quantities where appropriate; set solutions in the original context and check their accuracy

### **Reasoning and Proof**

- Develop, apply and evaluate various types of reasoning skills and methods of proof.
- Recognise and use sequences, patterns and relationships involving numbers and shapes; suggest hypotheses and test them systematically
- Explain reasoning and conclusions, using symbols where appropriate
- Develop and evaluate mathematical argument.

### **Communication**

- Communicate mathematical thinking coherently and clearly to others, orally, visually and in writing, using the language of mathematics and a variety of representations.

### **Connections**

- Understand how mathematical concepts and procedures interconnect and build on one another.
- Recognise and apply mathematics in contexts outside of mathematics in every day situations.

### **Representation**

- Create and use a variety of representations to organize, record and communicate mathematical ideas and apply them to problem-solving situations.
- Suggest, plan and develop lines of enquiry; collect, organize and represent information, interpret results and review methods; identify and answer related questions

### **Selecting Tools and Computational Strategies**

- Select and use a variety of concrete, visual and electronic learning tools and appropriate computational strategies to investigate ideas and solve problems

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## Reflecting

- Demonstrate thought process of evaluating work and monitoring thinking to help clarify understanding as problems are solved and investigations are carried out.

## Number and Operations

### Count, compare and order numbers, and describe relationships between them

- Find the difference between a positive and a negative integer, or two negative integers, in context
- Use decimal notation for tenths, hundredths and thousandths, partition and order numbers with up to three decimal places (including whole numbers) and position them on the number line
- Round numbers, including those with up to three decimal places
- Use fractions, percentages and the vocabulary of ratio and proportion to describe the relationships between two quantities and solve problems, e.g. identify the quantities needed to make a fruit drink by mixing water and juice in a given ratio
- Express a larger whole number as a fraction of a smaller one;
- simplify fractions;

- order a set of fractions by converting them to fractions with a common denominator
- Express one quantity as a percentage of another, e.g. express £400 as a percentage of £1000;
- find equivalent percentages, decimals and fractions
- read and print in words whole numbers to ten thousand, using meaningful contexts (e.g., newspapers, magazines)
- Read and write money amounts to \$1000 (e.g., \$455.35 is 455 dollars and 35 cents, or four hundred fifty-five dollars and thirty-five cents)

### Secure knowledge of number facts which can be recalled quickly and used and applied appropriately

- Use knowledge of place value and multiplication facts to  $10 \times 10$  to derive related multiplication and division facts involving decimal numbers, e.g.  $0.8 \times 7$ ,  $4.8 \div 6$
- Use knowledge of multiplication facts to derive squares of numbers to  $12 \times 12$  and the corresponding squares of multiples of 10 quickly
- Recognise that prime numbers have only two factors and identify prime numbers less than 100; find the prime factors of two-digit whole numbers
- Use approximations and apply tests of divisibility to check results

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### **Calculate efficiently and accurately**

- Calculate mentally whole numbers and decimals e.g.  $U.t \pm U.t$ ,  $TU \times U$ ,  $U.t \times U$ ,  $HTU \div U$ ,  $U.t \div U$
- Consolidate the use of standard written methods to add, subtract, multiply and divide integers and decimal numbers; calculate the answer to  $HTU \div U$  and  $U.t \div U$  to one or two decimal places
- Find fractions and percentages of whole-number quantities, e.g.  $\frac{5}{8}$  of 96, 65% of £260
- Use a calculator to solve problems involving multi-step calculations;
- carry out calculations involving time by converting hours and minutes to minutes
- Multiply two-digit whole numbers by two-digit whole numbers, using estimation, student-generated algorithms, and standard algorithms
- Identify and use the distributive properties to simplify and/or perform computations
- use order of operations, including the use of parentheses, to simplify numerical expressions
- Understand the concept of multiplication and division of fractions
- Understand and compute positive integer powers of nonnegative integers as repeated multiplication
- Demonstrate proficiency with two-digit divisors
- Use models and equivalent forms to add and subtract fractions with like and unlike denominators expressing answers in simplest form
- Compute and perform simple multiplication and division of fractions and decimals

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## **Algebra and Patterning**

- Express a general rule for a pattern or a function by using visual representations, words, tables, or graphs;
- Explain the concept of variable;
- Use variables as unknown quantities in general rules when describing mathematical patterns and relationships;
- Apply algebraic order of operations and the commutative, associative and distributive properties to algebraic expressions, equations, and inequalities;
- Construct tables and graphs that accurately represent the relationship between two variables;
- Identify, describe, and compare situations that represent constant or varying rates of change.
- Create, identify, and extend numeric and geometric patterns, using a variety of tools (e.g., concrete materials, paper and pencil, calculators, spreadsheets)
- Build a model to represent a number pattern presented in a table of values that shows the term number and the term
- Make a table of values for a pattern that is generated by adding or subtracting a number (i.e. a constant) to get the next term, or by multiplying or dividing by a constant to get the next term, given either the sequence (e.g., 12, 17, 22, 27, 32, ...) or the pattern rule in words (e.g., start with 12 and add 5 to each term to get the next term).
- Make predictions related to growing and shrinking geometric and numeric patterns

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## **Measurement**

- Use standard metric units of measure and convert between units, using decimals to two places notation, e.g. change 2.75 litres to 2750 ml, or vice versa
- Measure and calculate, using imperial/customary units still in everyday use; know their approximate equivalent metric values
- Read scales and record results to a required degree of accuracy, recognising that the measurement made is approximate
- Calculate perimeters and areas of rectilinear shapes; estimate the area of an irregular shape by counting squares
- extend the recognition of measurable attributes to include volume (cubic units);
- Develop strategies for estimating the volume/capacity of various shapes
- Extend the use of appropriate standard tools and units to include measures of volume/capacity and angle size
- Develop strategies to determine the surface areas and volumes/capacities of rectangular solids
- Differentiate between units of measurement for two- and three-dimensional objects and use appropriately
- Estimate, measure (i.e., using an analogue clock), and represent time intervals to the nearest second
- Estimate and determine elapsed time, with and without using a time line, given the durations of events expressed in minutes, hours, days, weeks, months, or years

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## **Shape and Geometry**

- Describe, identify and visualise faces, edges, vertices and bases and use these properties to classify and construct 2-D shapes and 3-D solids
- Make, draw and construct shapes with increasing accuracy and apply knowledge of their properties (e.g. Prisms and pyramids)
- Visualise and draw on grids of different types where a shape will be after reflection, after translation or after rotation about its centre or one of its vertices
- identify and plot ordered pairs in the first quadrant of a coordinate system
- Use coordinates in the first quadrant to draw and locate shapes
- Use a protractor to estimate, measure and draw angles, on their own and in shapes; calculate and construct angles in a triangle or around a point
- Compare grid systems commonly used on maps (i.e., the use of numbers and letters to identify an area; the use of a coordinate system based on the cardinal directions to describe a specific location)

- Identify and classify acute, right, obtuse, and straight angles
- Identify triangles (i.e., acute, right, obtuse, scalene, isosceles, equilateral), and classify them according to angle and side properties

## **Data Management and Probability**

- Describe and predict theoretical and experimental outcomes from data, using the language of chance or likelihood
- Solve problems involving collecting, processing, presenting and interpreting data, using ICT where appropriate; construct and interpret frequency tables, bar charts with grouped discrete data and line graphs; interpret pie charts
- Describe and interpret results and solutions to problems, using the mode, range, median and mean
- Recognize samples as subsets of larger populations
- Use a sample to make projections for a larger population

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# M2 Mathematics

## Using and Applying Thinking Skills

### Problem Solving

- build new mathematical knowledge by developing, selecting, applying, and monitoring problem-solving strategies as they pose and solve problems in various situations

### Reasoning and Proof

- develop, apply, and evaluate various types of reasoning skills and methods of proof
- develop and evaluate mathematical arguments and proofs

### Communication

- communicate mathematical thinking coherently and clearly to others, orally, visually, and in writing, using the language of mathematics and a variety of representations

### Connections

- understand how mathematical concepts and procedures interconnect and build on one another
- recognize and apply mathematics in contexts outside of mathematics in every day situations

### Representation

- create and use a variety of representations to organize, record, and communicate mathematical ideas and apply them to problem solving

### Selecting Tools and Computational Strategies

- select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate ideas and solve problems

### Reflecting

- demonstrate thought process of evaluating work and monitoring thinking to help clarify understanding as problems are solved and investigations are carried out

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## **Number and Operations**

### **Whole numbers – positive and negative**

- demonstrate an understanding of place value in whole numbers (+ & -)
- read, represent, compare, and order whole numbers (positive and negative) to one million
- read and print in words whole numbers to one hundred thousand
- decompose and recompose whole number using factors and exponents
- identify and explain composite and prime numbers
- find and use prime factorizations of composite numbers

### **Decimals / Fractions / Percentages**

- demonstrate an understanding of place value in decimals from 0.001 to 1
- read, represent, compare and order positive and negative decimals and fractions and find location on number line
- represent, compare and order fractional amounts with unlike denominators, including a mix of proper and improper fractions and mixed numbers
- determine and explain the relationships among fractions, decimal numbers, and percents

- select appropriate methods and tools when computing with fractions and decimals
- perform fraction and decimal computations in all four operations, estimate reasonableness of solutions and justify solutions
- interpret and use ratios in different contexts to show relative sizes of quantities in real life contexts
- estimate quantities using benchmarks of 10%, 25%, 50%, 75%, and 100%

### **Order of operations**

- explain need for standard order of operations and investigate impact of changing order
- use order of operations, including the use of exponents, decimals, and rational numbers, to simplify numerical expressions

### **Operational sense**

- use a variety of mental strategies to solve +, -, X, div. problems involving whole numbers and decimals
- complete equations using all four operations (ex. mult. & div. - four digit by two digit) and use estimation to justify solutions
- use simple expressions involving integers to represent and solve problems that arise from real life situations – involving numbers to one million
- represent relationships using unit rates

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## **Data Management and Probability**

- read, describe, and interpret data, and explain relationships between sets of data
- read and use graphical representations from primary and secondary data to make predictions and/or draw conclusions about how well a set of data represents a population, on the basis of the method used to collect data
- formulate questions, design a study (conduct a survey or experiment), collect primary and secondary data, and evaluate the data to reach a conclusion about characteristics shared by two populations or different characteristics that exist within a population
  - select and construct using technology an appropriate type of graph to represent a set of data, interpret and justify the choice of graph
  - display data in charts, tables and graphs that appropriate titles, labels, and scales
  - demonstrate an understanding of how data from charts, tables, and graphs can be used to make inferences and convincing arguments
  - explain the effects of scales and/or interval changes in graphs that can influence conclusions and lead to misunderstandings
  - compare different graphical representations of the same data
- demonstrate an understanding of mean, median, and mode
- identify the measures of central tendency and spread of all data set to describe what it indicates about the data set
- describe and model all possible outcomes of simple events using tree diagrams, organized lists, etc.
- express theoretical probability as a ratio of the number of favorable outcomes to the total number of possible outcomes
- represent the probability of an event, using the value from the range of 0 (impossible) to 1 (certain) and ratios between 0 and 1
- predict the frequency of an outcome of a simple probability experiment or game, by calculating and using the theoretical probability of that outcome
- explain why the sum of the probabilities of all possible outcomes of a particular event is one

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## **Measurement**

- estimate, measure, and record length, area, mass, capacity, and volume, using the metric and customary measurement systems
- demonstrate an understanding of the relationship between estimated and precise measurements and determine and justify when each kind is appropriate
- investigate the precision of measurements required for tasks as well as the capability/accuracy of the instruments
- select and justify the appropriate measurement units for each measurement system
- solve problems requiring conversion from larger to smaller units and from smaller to larger units
- determine relationship between units of measurement used to measure area, i.e. meters to centimeters or yards to feet
- identify rate as a form of measurement based on time, i.e. mph, rpm, etc.
- develop, estimate, and use formulas to find the perimeters and areas of triangles and quadrilaterals
- determine through investigation how the area of one shape can help determine the area of another, i.e. area of a rectangle and the areas of parallelograms and triangles
- explain the relationship between area and perimeter of a rectangle when one attribute is changed and the other remains constant
- construct a rectangle, a square, a triangle, and a parallelogram given the area and/or perimeter
- find the perimeter and area of irregular polygons
- find area and circumference of circles
- determine the relationship between the height, the area of the base, and the volume of a triangular prism and develop the formula
- estimate and calculate the surface area and volume of triangular and rectangular prisms

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## **Algebra and Patterning**

- describe and represent relationships in growing and shrinking patterns and investigate repeating patterns
- identify geometric patterns and represent them numerically
- make tables of values, for growing patterns given pattern rules and plot point in the first quadrant
- determine the term number of a given position (term) in a growing pattern that is represented by a pattern rule
- identify pattern rules which include changing the constant by using one of the four operations
- determine a term, given its term number by extending growing and shrinking patterns
- extend and create repeating pattern
- recognize and generate equivalent forms of simple algebraic expressions and equations to describe relationships
- demonstrate an understanding of different ways in which variables are used
- explain how the commutative, associative, and distributive properties generate equivalent forms
- solve simple linear equations and inequalities
- solve problems that use two or three symbols or letters as variables to represent different unknown quantities
- evaluate simple expressions by replacing variables with given values and use formulas in problem-solving situations
- create and compare representations that display constant and varying rates of change
- create and interpret tables and graphs to draw conclusions and make predictions

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## **Shape and Geometry**

- measure and construct up to 180 degrees, using a protractor, and classify as acute, right, obtuse, or straight angles
- describe and classify/sort shapes and polygons using their defining properties, such as lines of symmetry, angles, and sides
- describe and use properties of similarity and congruency to solve problems
- describe sizes, positions, orientations of shapes after rotations (turn) – clockwise and counterclockwise, reflections (flip), and translations (slides)
- identify and construct geometric figures with specific side length or angle measure
- create and analyze designs made from movements above by 90 or 180 degrees
- recognize, explain, and perform up to two transformations on shapes
- describe and classify using their defining properties
- build and sketch models
- identify, explain, and plot points on a coordinate plane in all quadrants

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