Year 7 – Sequences

Keywords

Term: a single number or variable

Position: The place something is located

Rule: Instructions that relates two variables

Linear: The difference between terms increases or decreases by the same value each time

Non-linear: the difference between terms increases or decreases in different amounts

Difference: the gap between two terms

Arithmetic: a sequence where the difference between the terms is constant

Geometric: a sequence where each term is found by multiplying the previous one

Dr Frost Key Skills

135 - Introduction to sequences
202- Distinguishing between different type of sequences
203a-p - Describing, generating and continuing sequences using term to term rules

Learning Journey

Year 7
- Continue Linear Sequence
- Continue Non Linear Sequence
- Explain the term to term rule

Year 8
- Generate sequences given a rule in words
- Generate sequences given a simple algebraic rule

Generate sequences given a complex algebraic rule
Find the rule for the nth term of a linear sequence

Year 9
- Using table of values

Year 10/Year 11
- Describe and continue arithmetic and geometric sequences
- Describe and continue sequences involving surds
- Find the rule for the nth term of a linear sequence

Find the rule for the nth term of a quadratic sequence

Key knowledge

Examples of Linear Sequence

1 , 3 , 5 , 7, 9 ← The rule in this sequence is add 4 because the difference between each number is 4

5 , 2, -1 , -4 ← The rule in this sequence is subtract 3 because the difference between each number is 3

Examples of Non-Linear Sequence

5 , 10, 15, 20 ← The rule in this sequence is multiply by 2 because the numbers are doubling

50, 25, 12.5 , 6.25 ← The rule in this sequence is dividing by 2 because the numbers are halving

Example of Fibonacci Sequence

1, 1 , 2 , 3, 5 ← The rule in this sequence is by adding the 2 previous terms together

Year 7 – Algebraic Notation

Keywords

Function:
A relationship that instructs how to get from an input to an output.

Input:
The number/ symbol put into a function.

Output:
The number/ expression that comes out of a function.

Operation:
A mathematical process

Inverse:
The operation that undoes what was done by the previous operation.

Commutative:
The order of the operations do not matter.

Substitute:
Replace one variable with a number or new variable.

Expression:
A maths sentence with a minimum of two numbers and at least one math operation

Evaluate:
work out

Dr Frost Key Skills

133 Function Machines
195 Function Machines involving decimals, negative numbers and algebraic inputs
432 Function notation and calculating outputs
136 Basic Substitution with Positive Integers
196 Further Substitution with Positive Integers

Learning Journey

Year 7
- Given the input, find the output of a single function machine
- Use inverse operations to find the input given the output
- Use letters to generalise number
- Find functions from expressions
- Substitute values into single operation expressions
- Solving one step equations

Year 8
- Solving equations and inequalities
- Solving Unknowns on both sides

Year 9
- One and two step equations and inequalities
- Solve equations and inequalities with unknowns on both side
- Substituting into Formulae and equations

Key knowledge

Using Letters to generalise number operations

g multiplied with three = g x 3 = **3g**

Three multiplied with g = 3 x g = **3g**

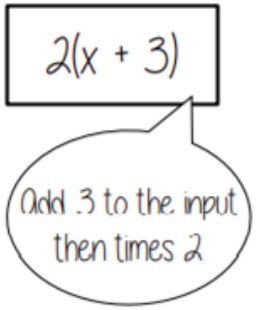
5 more than g = **5 + g or g + 5**

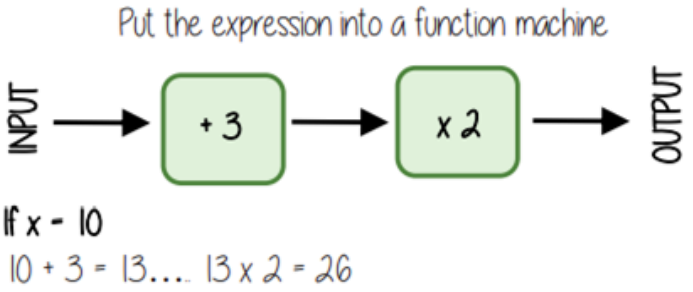
5 less than g = **g – 5**

g divided by 2 = $\frac{g}{2}$

2 divided by g = $\frac{2}{g}$

Substitute into expressions





Year 7 – Equality and Equivalence

Keywords

Equality – two expressions that have the same value.

Equation – a mathematical statement that two things are equal.

Solution – the set or value that satisfies the equation.

Solve – to find the solution

Inverse – the operation that undoes what was done by the previous operation.

Term – a single number or variable.

Like – variables that contain the same letters and the same powers.

Coefficient – the number in front of the letters within a term.

Expression – a maths sentence with a minimum of two numbers and at least one math operation.

Dr Frost Key Skills

193a-f Collecting Like terms

199a-h Solving Equations

Learning Journey

Year 7

- Simplifying expressions
- Solving one and two step equations

Key Knowledge

Like Term	Unlike Term
$3x + 4x$	$3x + 4y$
$7y^2 + 5y^2$	$7w^2 + 5v^2$
$10w + 8w$	$10x + 8z^2$
$10t^3 + 8t^3$	$3t^3 + 7t^5$
$56s^5 + 78s^5$	$69g^5 + 96s^7$

Solving equations

$$3x + 6 = 18$$
$$-6 \qquad -6$$
$$3x = 12$$
$$\div 3 \qquad \div 3$$
$$x = 4$$

Simplifying expressions

Example 1

$$3x + 4x = 7x$$

Example 2

$$4y + x - y + 3x = 3y + 4x$$

Things to remember:

- The sign stays with the term after it.
- You can only simplify something if it has the same letter and power.

Year 7 – Place Value & Ordering Integers and decimals.

Keywords

Integer – a whole number that is positive or negative

Interval – between two points or values

Place value – the value of a digit depending on its place in a number.

Range – The difference between the largest and smallest number in a set.

Median – the middle value when a list is put in ascending order

Ascending – from smallest to largest value

Descending – from largest to smallest value

Dr Frost Key Skills

6a-f	Positive numbers on number line.
34f-l	Solving Equations
69a-l	Place value
70c-g	Multiplying and dividing by powers of 10

Learning Journey

Year 7

- Understand place values up to a billion
- Understand decimals place values
- Use inequalities to describe numbers
- Find intervals between values on a number line.
- Find range and median of a set of numbers

Year 8

- Use inequalities to show the range between two values (error intervals)

Key Knowledge

Equality and Inequality

larger $>$ smaller

$=$ equal	$>$ greater than
$\neq$ not equal	$\geq$ greater than or equal
	$<$ less than
	$\leq$ less than or equal

Place value tables

HM	TM	M	HTh	TTh	Th	H	T	O
			3	0	0	0	0	0

Ones	Tenths	Hundredths	Thousandths
0	0	0	3

Range from a set of values

$$3, 7, 8, 10, 2, 5$$

We subtract the smallest value from the largest value

$$10 - 2 = 8$$

$$\boldsymbol{Range = 8}$$

Median from a set of values

$$3, 7, 8, 10, 2, 5$$

We ***order*** *the values, then find the middle value*

$$2, 3, \boxed{5, 7}, 8, 10$$

$$\frac{5 + 7}{2} = 6$$

$$\boldsymbol{Median = 6}$$

Year 7 – Fraction, decimal and percentage equivalence

Keywords

Fraction – A number that is part of a whole number with numerator and denominator.

Decimal – place value of numbers that are smaller than an integer.

Percentage – value of proportion that is out of 100.

Equivalence – numbers which have the exact same value

Mixed number – showing both integer and fractional values to represent a number

Improper Fraction – a fraction which includes whole numbers.

Dr Frost Key Skills

98a-g	Fractional equivalence
101a-b	Converting between mixed numbers and improper fractions
172a-k	Converting between Fractions, Decimals and Percentages

Learning Journey

Year 7

- Develop fluency with fractional, decimal and percentage numbers.
- Convert between mixed numbers and improper fractions fluently
- Find equivalent values from fractions, decimals and percentages. Year 8
- Embedded skills in problem-solving.

Key Knowledge

Fractional equivalence

$$\frac{1}{2} \overset{\times 5}{=} \frac{5}{10}$$

$$\frac{2}{3} \overset{\times 2,\ \times 4}{=} \frac{4}{6} \overset{\times 2,\ \times 4}{=} \frac{8}{12}$$

Converting between F,D,P

Fraction	Decimal	Percentage
$\frac{2}{10}$	0.2	20%
$\frac{47}{100}$	0.47	47%
$\frac{3}{100}$	0.03	3%

Convert Fractions, Decimals and Percents

Fractions		Decimals		Percents
$\frac{3}{4}$	Divide numerator by denominator	0.75	Multiply by 100	75%
$\frac{2}{5}$	Write as fraction and simplify	0.4	Divide by 100	40%

Year 7 – Solving Problems with Addition and Subtraction

Keywords

Commutative: changing the order of the operations does not change the result

Associative: when you add or multiply you can do so regardless of how the numbers are grouped

Inverse: the operation that undoes what was done by the previous operation. (The opposite operation)

Placeholder: a number that occupies a position to give value

Perimeter: the distance/ length around a 2D object
Polygon: a 2D shape made with straight lines

Balance: in financial questions – the amount of money in a bank account

Credit: money that goes into a bank account Debit: money that leaves a bank account

Dr Frost Key Skills

40 a-h Column addition

74 b-e Adding/Subtracting decimal numbers

79 a,c,f Perimeter of 2D shapes

238b Two-way tables

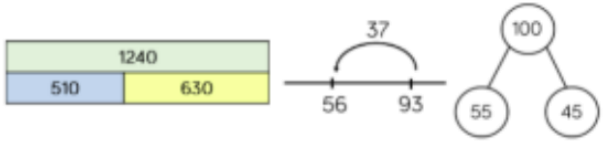
Learning Journey

Year 7

- Formal and mental methods for addition and subtraction
- Solving financial problems using addition and subtraction
- Solving geometric problems of perimeter with addition and subtraction
- Solving tables and timings with addition and subtraction

Key Knowledge

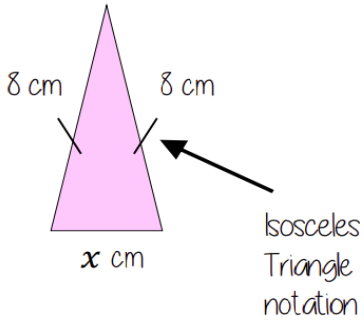
Addition and subtraction



Models for addition/subtraction

- Bar models
- Number lines
- Part/Whole diagrams

Perimeter



The triangle has a perimeter of 25 cm.
Find the length of x.

$$8\ cm + 8\ cm + x\ cm = 25\ cm$$
$$16\ cm + x\ cm = 25\ cm$$
$$x\ cm = 9\ cm$$

Formal methods

	H	T	O
	1	8	7
+	5	4	2

	H	T	O
	4	2	7
–	2	4	9

Column method helps us Accurately calculate over place values.

Year 7 – Solving Problems with Multiplication and Division

Keywords

Multiples: found by multiplying any number by positive integers (times table)

Factor: integers that multiply together to get another number.

Integer: a whole number.

Decimal: A number with place values smaller than one.

Powers: the number of times a number is used as a factor in a multiplication problem.

Order of Operations: using $+ \times \div -$, powers and brackets in the right order.

Area: the number of unit squares that fit into a 2D shape.

Perpendicular – a right angle between two objects.

Dr Frost Key Skills

53 a-b, 95 Factors

52, 94 Multiples

138 Area of rectangles

140 Area of triangles

Learning Journey

Year 7

- Understanding and distinguishing factors and multiples
- Multiplying and dividing by powers of ten and decimal powers of ten
- Multiplication and division of integers and decimals
- Working with Order of Operations
- Applying multiplication and division to area of rectangles and triangles

Key Knowledge

EXAMPLE

Factors of 10

$1, 2, 5, 10$

There are four factors of the number 10.

They can be worked out as pairs:

$1 \times 10 = 10$

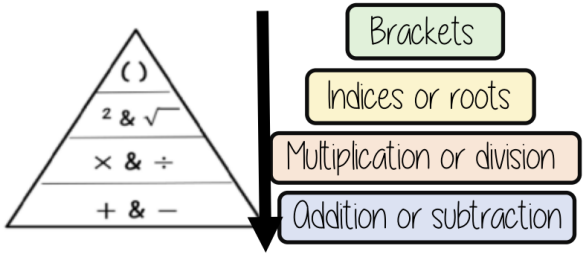
$2 \times 5 = 10$

Multiples of 10

$10, 20, 30, 40, 50, \ldots$

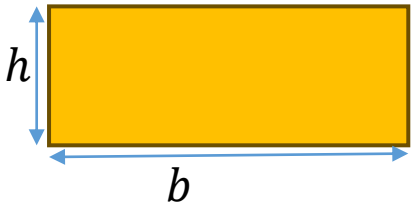
Multiples of ten can go on like multiplication tables

Order of operations



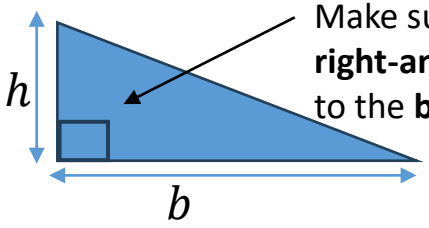
When given calculations with multiple operations, we calculated in the order from top to bottom on the order of operations triangle.

Area of Rectangles



$Area = base\ (b) \times height\ (h)$

Area of Triangles



Make sure the **height** is at a **right-angle** (perpendicular) to the **base**

$Area = base\ (b) \times height\ (h) \div 2$

Year 7 – Fractions of Percentage of Amounts

Keywords

Fraction: How many parts of a whole.

Ascending Order: Place in order, smallest to largest.

Descending order: Place in order, largest to smallest.

Integer: Whole number

Percentage: Parts Per 100

Equivalent: Of equal value

Bar Model: A pictorial representation of a problem or concept where bars or boxes are used to represent the known and unknown quantities.

Dr Frost Key Skills

57 Fractions of an amount

130 Calculating a simple percentage of an amount using Chunking

171 Problem Solving Involving Fraction of amount

219 Percentage of an amount, using decimal multipliers

Learning Journey

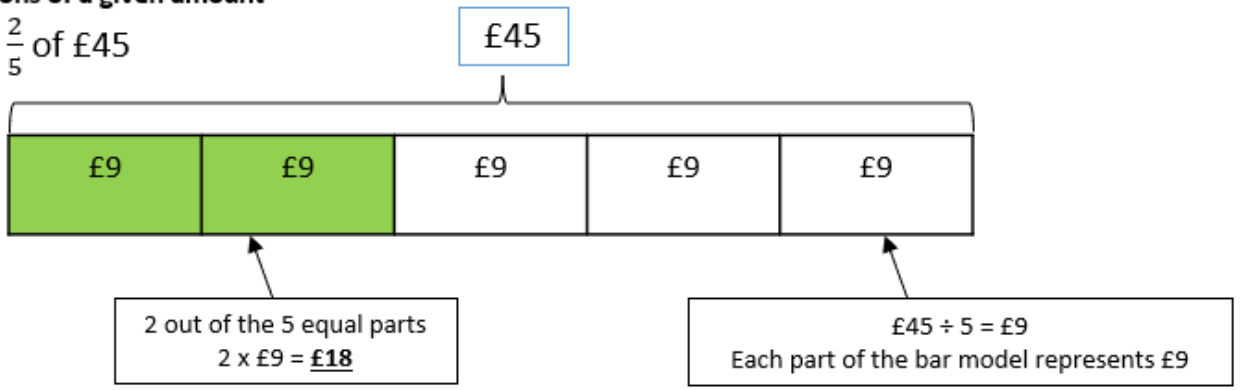
Year 7

- Fractions of an amount
- Reverse Fractions (Finding the original amount)
- Percentage of an amount (Mental Method)
- Percentage of an amount (Proportion Method)

Key Knowledge

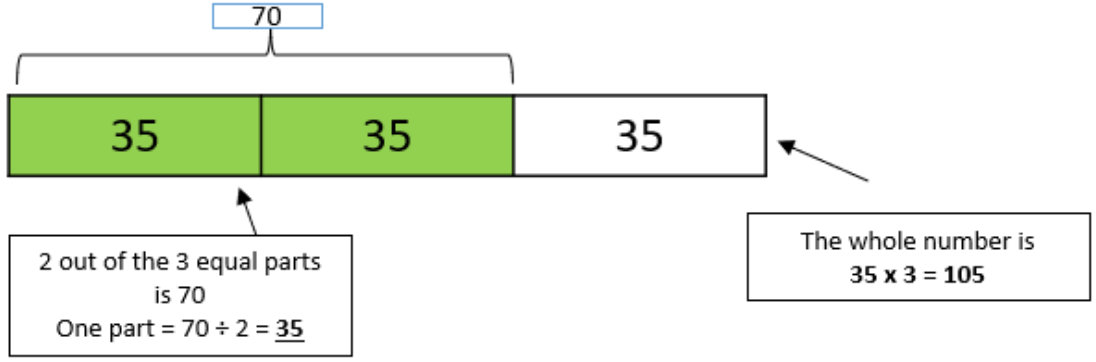
Fractions of a given amount

Find $\frac{2}{5}$ of £45



Reverse Fractions (Finding the original amount)

$\frac{2}{3}$ of a value is 70. What is the whole number?



Year 7 – Operations and Equations with Directed Number

Keywords

Inverse : The opposite or reverse operation

Negative: Any number less than zero, written with a minus sign

Product: The result when two numbers are multiplied

Square: To multiply a number, term or expression by itself

Square root: A number when multiplied by itself gives the original number

Substitute: Replacing the variables (letters) in an algebraic expression with their numerical values.

Order of operation: A set of rules that tells us what operation to do first in an expression with multiple operations.

Dr Frost Key Skills

136 Basic substitution with positive integers

155 Adding or Subtracting a mixture of positive and negative numbers

156 Multiplying or dividing a mixture of positive and negative numbers

196 Further Substitution including powers and roots

197e Substitution with negative integers

199 Solving linear equations where the variable appears on one side of the equation

Learning Journey

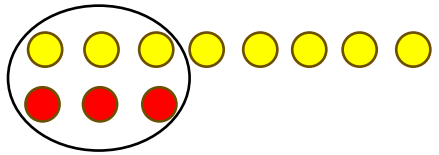
Year 7

- Representing and directing directed numbers
- Calculations that cross 0
- Adding and subtracting directed numbers
- Multiplying and dividing directed numbers
- Substitution with negative numbers
- Solving Two-Step equations
- Order of Operations

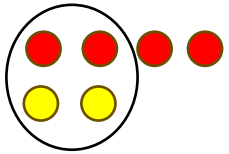
Key Knowledge

Add Directed Numbers

$8 + -3 = 5$



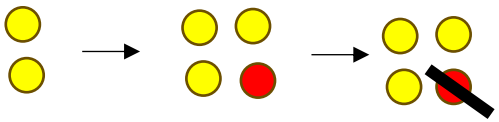
$-4 + 2 = -2$



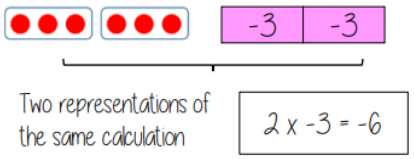
Subtract Directed Numbers

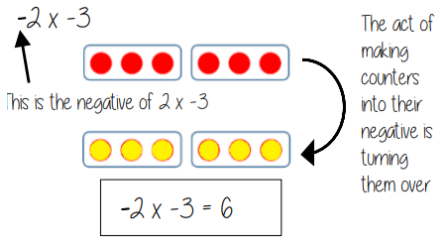
$2 - -1 = 3$

We must **produce a Zero Pair** as **initially** there wasn't any red counters so we can't take away



Multiply/ Divide Negative Numbers





Year 7 – Addition and Subtraction of Fractions

Keywords

Numerator: This is the top number in a fraction

Denominator: This is the bottom number of a fraction.

Simplify: Cancel a fraction down to give the smallest numbers possible.

Equivalence: Two fractions are equivalent if one is a multiple of the other.

Mixed Fraction: A mix of whole numbers and a fraction together.

Improper fractions: A fraction with a bigger numerator than denominators

Equivalent: Of equal value

Dr Frost Key Skills

56 Adding and subtracting fractions with the same denominator

96 Lowest common multiple from listing

100 Adding and subtracting fractions where the denominators are multiples of each other

101 Converting between mixed numbers and improper fraction

117 Adding and subtracting fractions with any denominators

118 Adding and subtracting mixed fractions with different denominators

Learning Journey

Year 7

Mixed numbers and improper fraction
Adding and subtracting fractions with the same denominator
Lowest common multiple
Adding and subtracting fractions with different denominator
Adding and subtracting mixed fractions

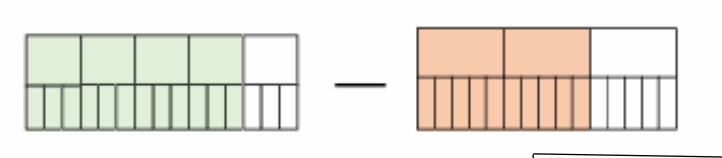
Key Knowledge

Adding and Subtracting fractions with different denominator

Calculate

$$\frac{4}{5} - \frac{2}{3} \longrightarrow \frac{4}{5}\times\frac{3}{3} \quad \frac{2}{3}\times\frac{5}{5} \longrightarrow \frac{12}{15} - \frac{10}{15} = \frac{2}{15}$$

Before adding or subtracting fractions. The denominators needs to be the same value

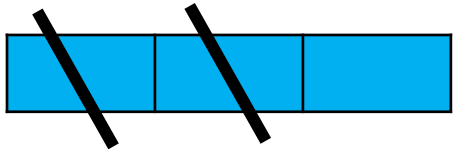


Adding and subtracting fractions from integers

Calculate

$1 - \frac{2}{3}$

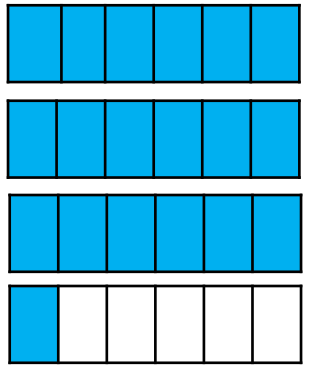
The denominator indicates the number of parts a whole is made up of.
Here the whole is made up of 3 parts.



$= \frac{1}{3}$

Calculate

$3 + \frac{1}{6}$



Year 7 – Constructing, Measuring and Using Geometric Notation

Keywords

Polygon: A 2D shape made with straight lines

Scalene triangle: A triangle with all different sides and angles.

Isosceles triangle: A triangle with two angles the same size and two angles the same size

Right-angled triangle: a triangle with a right angle

Rotation: Turn in a given direction

Protractor: Equipment used to measure angles

Compass: Equipment used to draw arcs and circles

Obtuse Angle: Angle that is greater than 90 degrees but less than 180 degrees

Acute Angle: Angle that is smaller than 90 degrees

Reflex Angle: Angle that is greater than 180 degrees but less than 360

Dr Frost Key Skills

77 Types of Quadrilateral and Triangles

78 Properties of Polygons

109 Measuring and Drawing non-reflex angles with a protractor

111 Measuring and drawing reflex angles in degrees with a protractor

131 Pie charts with simple fraction and percentages

246 Pie chart with any proportion

Learning Journey

Year 7

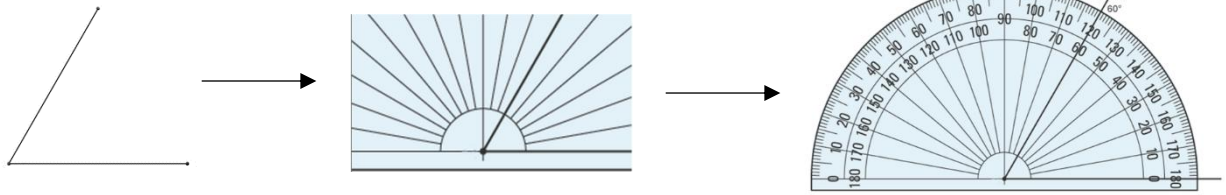
Angle and shape notation
Understanding and classifying angles
Measuring angles
Using a protractor to draw angles

Identify types of quadrilaterals and triangles
Constructing Triangles SSS, SAS, ASA
Interpreting Pie Charts
Drawing Pie Charts

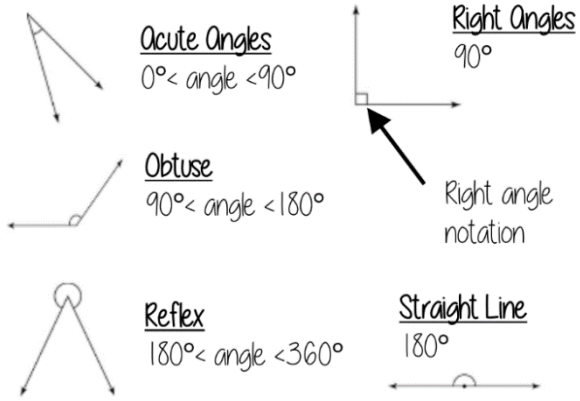
Key Knowledge

Measure angles using a protractor

1. Line up the vertex of the angle with the dot at the center of the protractor.
2. Line up one side of the angle with 0 degrees on the protractor.
3. Read the protractor to see where the other side of the angle crosses the number scale Start from 0.



Classify Angles



Name of Polygons

3- Triangle
4- Quadrilateral
5- Pentagon
6- Hexagon
7- Heptagon
8- Octagon
9- Nonagon
10- Decagon

If all the sides and angles are the same, it is a **regular** polygon

Year 7 – Developing Geometric Reasoning

Keywords

Vertically Opposite Angles: Angles formed when two or more straight lines cross at a point

Interior Angles: Angles inside the shape

Polygon: A 2D shape made with straight lines

Scalene triangle: A triangle with all different sides and angle.

Isosceles triangle: A triangle with two angles the same size and two angles the same size

Right-angled triangle: A triangle with a right angle

Sum: Another word for Total. This is where you add all the interior angles together

Dr Frost Key Skills

- 110 Sum of the angles on a straight line and angles around a point
- 147 Vertically Opposite Angles
- 149 Sum of angles in a triangle
- 151 Sum of angles in a quadrilateral
- 261 Interior angles of regular and irregular polygon

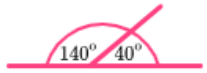
Learning Journey

Year 7

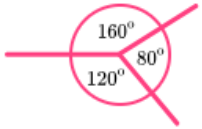
- Angles on a straight line, around a point and vertically opposite angles
- Angles in a Triangle
- Angles in a Quadrilateral
- Angles in any Polygon

Key Knowledge

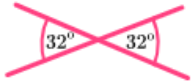
Key Angle Facts



Angles on a straight line adds up to 180°



Angles around a point add up to 360°

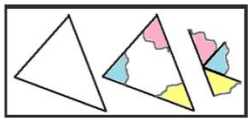


Opposite Angles are Equal

Interior angles in a triangle add up to 180°

Interior angles in a quadrilateral add up to 360°

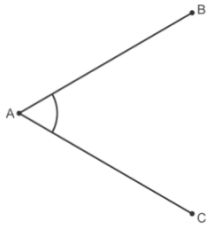
Why does a triangle add up to 180°?



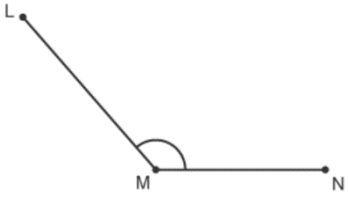
Have a go!
Tearing the corners from triangles forms a straight line which is therefore 180°

Angle Notation

Three letters are often used to describe an angle



This angle is called **Angle BAC or Angle CAB** as the angle is between two Lines AB and AC



This angle is called **Angle LMN or Angle NML** as the angle is between two Lines AB and AC

Year 7 – Developing Number Sense

Keywords

Round: Making a number simpler but keeping its value close to what it was

Significant: Place value of importance

Decimal: Place holders after the decimal point

Overestimate: Rounding up – gives a solution higher than the actual value

Underestimate: Rounding down – gives a solution lower than the actual value.

Estimate: An approximate calculation or judgement of the value

Dr Frost Key Skills

37 Rounding a number the nearest 10, 100, 1000 and beyond

48 Related number facts with place value

75 Rounding a number to a given number of decimal places

187 Rounding a number to a given number of significant figures

188 Estimating the result of a calculation by first rounding each number

Learning Journey

Year 7

- Rounding to significant figures
- Estimating Calculations
- Related Calculations

Key Knowledge

Estimate the calculation

$4.2 + 6.7 \approx 4 + 7 = 11$ ← This is an overestimate because the 6.7 was rounded up more

$21.4 \times 3.1 \approx 20 \times 3$ ← This is an underestimate because both numbers are rounded down

Rounding to significant figures

Round 53871 to 1 significant figure

This is our first significant figure which is in the **ten thousands.** Therefore, you need to round this number to the nearest ten thousand → 53871 → 50000

Round 0.005089 to 1 significant figure

0.005089

Our first significant figure here is 5. Therefore, round this to the **nearest thousandths**

Round 53871 to 2 significant figure

This time, our second significant figure is in the thousands. Therefore, you need to round this number to the **nearest thousand**. → 53871 → 54000

Year 7 – Sets and Probability

Keywords

Set: Collection of things

Element: Each item in a set is called an element

Intersection: The overlapping part of a Venn diagram

Probability: Likelihood of an event happening

Sample Space: A diagram used to display all possible outcomes

Certain: An event or outcome that is guaranteed to happen

Evens: An equal chance of an event happening as there is of it not happening

Likely: An outcome with a probability between 0.5 and 1.

Impossible: An event or outcome that is not going to happen

Random: Something happens by chance and is unable to be predicted.

Dr Frost Key Skills

247 Probability Scale

249 Sample Space Diagrams

355 Probability from Venn Diagrams

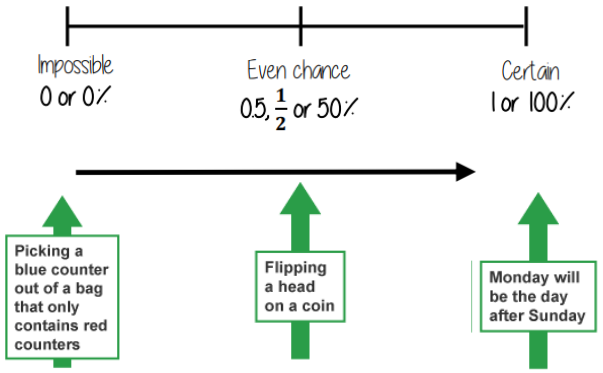
Learning Journey

Year 7

Language of probability
Sample Space
Single event probability
Probability Scale

Key Knowledge

The probability scale



The more likely an event the further up the probability it will be in comparison to another event
(It will have a probability closer to 1)

Sample Space

A sample space represents all the possible outcomes of an event.

A sample space for rolling a six-sided dice is S = {1, 2, 3, 4, 5, 6}

A sample space for this spinner is S = {Pink, Blue, Yellow}

You may be asked to draw a sample space diagram!

Example

A restaurant offers a set menu with a choice of three starters - soup (S), prawn cocktail (P) or bruschetta (B), and three main courses - lamb (L), hake (H) or chicker (C).

Draw a **sample space diagram** for **all** the **possible combinations** of meals that customers of the restaurant could order.

	Soup	Prawn cocktail	Bruschetta
Lamb	S,L	P,L	B,L
Hake	S,H	P,H	B,H
Chicken	S,C	P,C	B,C

This represents all the combinations

Year 7 – Primes. Number and Proof

Keywords

Multiples: Found by multiplying any number by positive integers

Factor: Integers that multiply together to get another number.

Prime: An integer with only 2 factors.

Conjecture: A statement that might be true (based on reasoning) but is not proven.

Counterexample: A special type of example that disproves a statement.

Expression: A maths sentence with a minimum of two numbers and at least one math operation (no equals sign)

HCF: Highest common factor (biggest factor two or more numbers share)

LCM: Lowest common multiple (the first time the times table of two or more numbers match)

Dr Frost Key Skills

96 Highest Common Factor and Lowest Common Multiple

97 Prime numbers

202 Distinguishing between different types of sequences

162 Highest Common Factor and Lowest Common Multiple by Prime Factorisation

242 Construct Venn Diagrams

Learning Journey

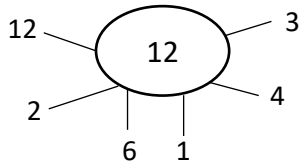
Year 7

- Identify squares, cube, prime, triangular numbers
- HCF and LCM
- Write a number as a product of its prime factors
- Venn Diagrams for HCF/LCM
- Investigate conjectures
- Use counter examples to disprove a conjecture

Key Knowledge

Factors and Multiples

What are the factors of 12?



What are the multiples of 12?

12 x 1 = 12
12 x 2 = 24
12 x 3 = 36
12 x 4 = 48

Multiples are the list of times tables.

Prime numbers

This is a number that has exactly 2 factors; 1 and itself.

Examples

2, 3, 5, 7, 11, 13, 17

Non Examples

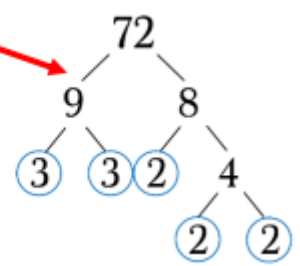
4 , 6, 8, 9, 12, 15

We can make 15 with different factors
1 and 15
3 and 5

Prime Factorisation

This is when we split a number into its prime factors using a factor tree.
We circle the prime factors.

We need to find pairs of numbers that multiply to give the number above.



72 = 3 x 3 x 2 x 2 x 2 or $3^2 \times 2^3$