Y11 FOUNDATION HT1 Algebra 1

Using letters to represent numbers

5 + 5 + 5	y + y + y + y	20 - h
3 x 5	y x 4	$\frac{20}{h}$
5 x 3	4 x y	
	4y	
Addition and multiplication can be done in any order	4 lots of 'y'	20 shared into 'h' number of groups

Commutative calculations

Substitution into expressions

4y ← 4 lots of 'y'

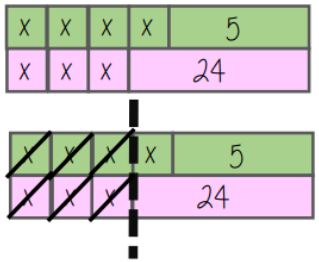
If y = 7 this means the expression is asking for 4 'lots of' 7

4 x 7 OR 7 + 7 + 7 + 7 OR 7 x 4 = 28

e.g. $y - 2$
$= 7 - 2 = 5$

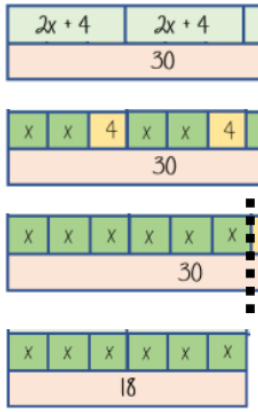
Equations with unknown on both sides

$4x + 5 = 3x + 24$
$-3x \quad -3x$
$x + 5 = 24$
$-5 \quad -5$
$x = 19$



Solve equations with brackets

R



$3(2x + 4) = 30$

Expand the brackets

$6x + 12 = 30$
$-12 \quad -12$
$6x = 18$
$\div 6 \quad \div 6$
$x = 3$

x
3

Formulae and Equations

Formulae – all expressed in symbols → Substitute in values → Equations – include numbers and can be solved

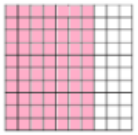
Keywords

Inverse: the operation that undoes what was done by the previous operation. (The opposite operation)
Commutative: the order of the operations do not matter.
Substitute: replace one variable with a number or new variable.
Evaluate: work out

Simplify: grouping and combining similar terms
Equivalent: something of equal value
Coefficient: a number used to multiply a variable
Solve: find a numerical value that satisfies an equation

Y11 FOUNDATION HT1 Fractions, Decimals, Percentages

Convert FDP

$\frac{70}{100}$ → This also means 70 ÷ 100 → 70 out of 100 squares → 70 "hundredths" = 7 "tenths" = 0.7 →  → 70 hundredths = 70%

Using a calculator

■/□ → S⇌D → Convert to a decimal

This will give you the answer in the simplest form

× 100 converts to a percentage

Be careful of recurring decimals

e.g $\frac{1}{3}$ = 0.3333333 = $0.\dot{3}$

The dot above the 3

Percentage change

I bought a phone for £200. A year later sold it for £125.

100%

£200

£125

All values of change compare to the ORIGINAL value

Percentage loss

$\frac{75}{200} \times 100 = 37.5\%$

$\frac{\text{Difference in value}}{\text{Original value}} \times 100$

I bought a house for £180,000, I later sold it for £216,000.

100%

£180,000

Percentage profit

Money made (profit value) $\frac{36000}{180000} \times 100 = 20\%$

Find the percentage of an amount (Calculator methods)

Using a multiplier

Find 65% of 80

Fraction, decimal, percentage conversion

65% = $\frac{65}{100}$ = 0.65 ← The multiplier

0.65 × 80 = 52

Using the percent button

Find 65% of 80

This brings up the % button on screen You will see 65%

Type 65

Press SHIFT ((%)

Press × 80 and then press =

You can also use the calculator to support non calculator methods and find 1% or 10% then add percentages together

"of" can represent '×' in calculator methods

Find the percentage of an amount (Mental methods)

The **whole** represents 100%

10% = $\frac{1}{10}$ of the whole

0% 20% 40% 60% 80% 100%

10% = $\frac{1}{10}$ of the whole

50% = $\frac{5}{10} = \frac{1}{2}$ of the whole

20% = $\frac{2}{10} = \frac{1}{5}$ of the whole

5% = $\frac{1}{20}$ of the whole

Find 65% of 80

80

8 8 8 8 8 8 8 8 8 8

For bigger percentages it is sometimes easier to take away from 100%

Method 1:
65% = 10% × 6 + 5%
= (8 × 6) + 4
= 52

Method 2:
65% = 50% + 10% + 5%
= 40 + 8 + 4
= 52

Keywords

Fraction: how many parts of a whole we have

Decimal: a number with a decimal point used to separate ones, tenths, hundredths etc.

Percentage: a proportion of a whole represented as a number between 0 and 100

Convert: change into an equivalent representation, often fraction to decimal to a percentage cycle.

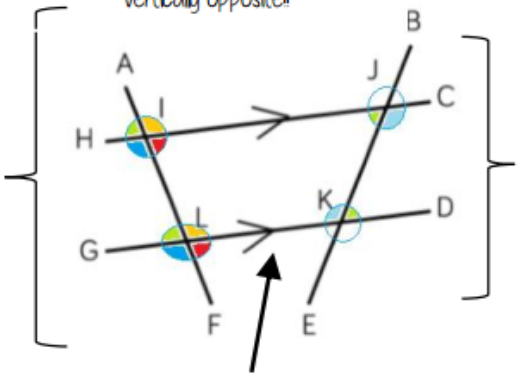
Y11 FOUNDATION HT1 Shape 1a

Parallel lines

Still remember to look for angles on straight lines, around a point and vertically opposite!!

Lines QF and BE are **transversals** (lines that bisect the parallel lines)

Corresponding angles often identified by their **"F shape"** in position.



Alternate angles often identified by their **"Z shape"** in position

This notation identifies parallel lines

Basic angle rules and notation

R

Acute Angles
0° < angle < 90°

Right Angles
90°

Obtuse
90° < angle < 180°

Right angle notation

Reflex
180° < angle < 360°

Straight Line
180°

Vertically opposite angles
Equal

Angles around a point
360°

The letter in the middle is the angle
The arc represents the part of the angle

Angle Notation: three letters ABC
This is the angle at B = 113°
Line Notation: two letters EC
The line that joins E to C.

Properties of Quadrilaterals

Square
All sides equal size
All angles 90°
Opposite sides are parallel

Rectangle
All angles 90°
Opposite sides are parallel

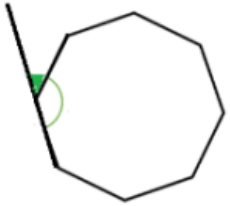
Rhombus
All sides equal size
Opposite angles are equal

Parallelogram
Opposite sides are parallel
Opposite angles are equal
Co-interior angles

Trapezium
One pair of parallel lines

Kite
No parallel lines
Equal lengths on top sides
Equal lengths on bottom sides
One pair of equal angles

Missing angles in regular polygons



Exterior angle = 360 ÷ 8 = **45°**

Interior angle = $\frac{(8-2) \times 180}{8} = \frac{6 \times 180}{8} = 135°$

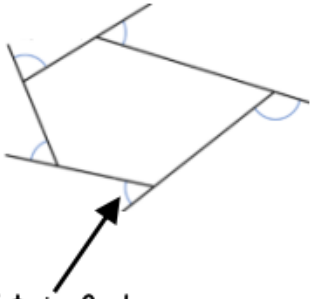
Exterior angles in regular polygons = 360° ÷ number of sides

Interior angles in regular polygons = $\frac{(\text{number of sides} - 2) \times 180}{\text{number of sides}}$

Y11 FOUNDATION HT1 Shape 1b

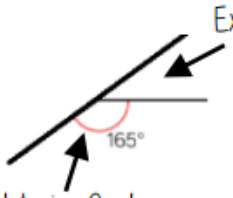
Sum of exterior angles

Exterior angles all add up to 360°



Exterior Angles
Are the angle formed from the straight-line extension at the side of the shape

Using exterior angles



Interior angle + Exterior angle = straight line = 180°
Exterior angle = 180 – 165 = 15°

Number of sides = 360° ÷ exterior angle
Number of sides = 360 ÷ 15 = 24 sides

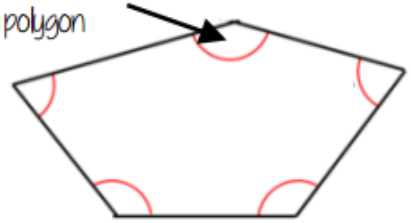
Keywords

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
Regular polygon: All the sides have equal length; all the interior angles have equal size

Sum of interior angles

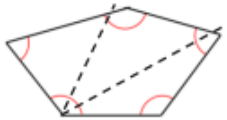
(number of sides – 2) x 180

Interior Angles
The angles enclosed by the polygon



This is an **irregular** polygon – the sides and angles are different sizes

Sum of the interior angles = (5 – 2) x 180

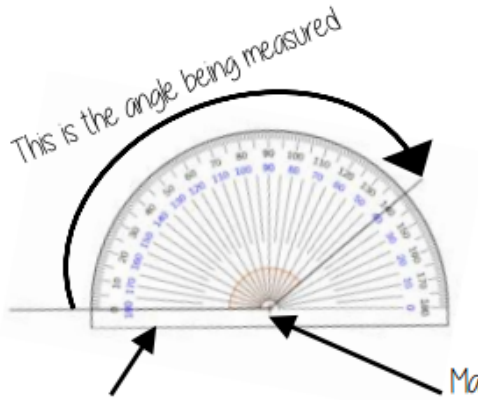


This shape can be made from three triangles
Each triangle has 180°

Sum of the interior angles = 3 x 180
= 540°

Remember this is **all** of the interior angles added together

Measure angles to 180°



Read from 0° on the base line.
Remember to use estimation
This is an obtuse angle so between 90 ° and 180 °

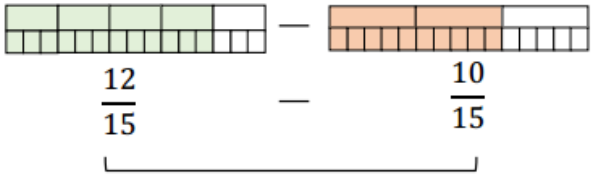
The base line follows the line segment

Make sure the cross is at the point the two lines meet

Y11 FOUNDATION HT1 Number 1a

Add/Subtraction any fractions

$\frac{4}{5} - \frac{2}{3}$



$= \frac{2}{15}$

$\frac{12}{15} - \frac{10}{15}$

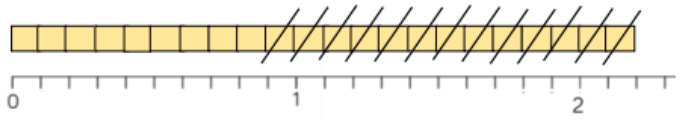
Use equivalent fractions to find a common multiple for both denominators

Add/Subtraction fractions (improper and mixed)

$2\frac{1}{5} - 1\frac{3}{10}$

$2\frac{2}{10}$

$\frac{22}{10} - \frac{13}{10} = \frac{9}{10}$



- Convert to an improper fraction
- Calculate with common denominator

Partitioning method

$2\frac{1}{5} - 1\frac{3}{10} = 2\frac{2}{10} - 1\frac{3}{10} = 2\frac{2}{10} - 1 - \frac{3}{10} = 1\frac{2}{10} - \frac{3}{10} = \frac{9}{10}$

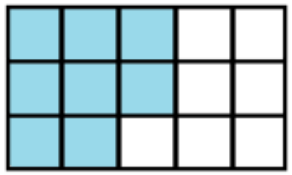
Dividing any fractions *Remember to use reciprocals*

$\frac{2}{5} \div \frac{3}{4}$

$\frac{2}{5} \times \frac{4}{3}$

Multiplying by a reciprocal gives the same outcome

Represented



$= \frac{8}{15}$

Multiplying non-unit fractions

Shade in 3 parts

Repeat it on this many rows

$\frac{3}{4} \times \frac{2}{3}$

This many columns

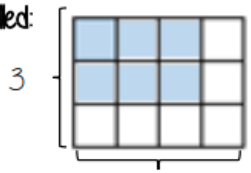
This many rows

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

Parts shaded

Total number of parts in the diagram

Modelled:



Keywords

Integer: a whole number that is positive or negative

Numerator : the number above the line on a fraction. The top number. Represents how many parts are taken

Denominator: the number below the line on a fraction. The number represent the total number of parts

Mixed numbers: a number with an integer and a proper fraction

Improper fractions: a fraction with a bigger numerator than denominator

Negative: a value less than zero.

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

Y11 FOUNDATION HT1 Number 1b

Estimation

Estimations are useful – especially when using fractions and decimals to check if your solution is possible.

Most estimations round to 1 significant figure

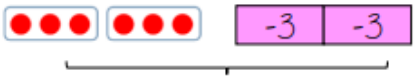
Estimations are useful – especially when using fractions and decimals to check if your solution is possible.

210 + 899 < 1200

This is true because even if both numbers were rounded up, they would reach 300 + 900.

The correct estimation would be 200 + 900 = 1100.

Multiply/ Divide directed numbers

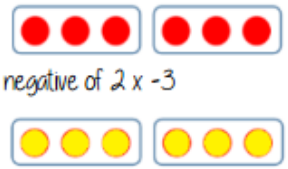


Two representations of the same calculation

2 x -3 = -6

Negative, Negative calculation

-2 x -3



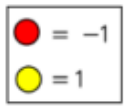
This is the negative of 2 x -3

The act of making counters into their negative is turning them over

-2 x -3 = 6

Divisions are the inverse operations

Subtract directed numbers



Representations

Representation for calculation

2 "Subtract" – means take away or remove

2 - - 1 = 3

Take away one

Start with the representation of 2

= 3

2 - - 3 = 5

= 5

Generalisation

- - = +

Add directed numbers

Representations

2 + - 4 = -2

Zero pair (-1 + 1 = 0)

Two " – 1 " left = -2

8 + -3 = 5

Partitioning

8 + -3 = 5

5 + 3 + - 3 = 5

Partition the value to create a zero pair calculation

Generalisation

+ - = -