

Year 7 Maths Knowledge Organiser

Algebra

Solving linear equations

$$5x - 2 = 18$$

$$\begin{array}{r} +2 \\ 5x = 20 \end{array}$$

$$\begin{array}{r} \div 5 \\ x = 4 \end{array}$$

Add 2 to both sides

Divide both sides by 5

Expanding and Simplifying

$$\begin{aligned} & 5(3x - 2) + 3(2x + 1) \\ &= 15x - 10 + 6x + 3 \\ &= 21x - 7 \end{aligned}$$

Factorising

$$\begin{aligned} & \text{Factorise } 4a + 20 \\ &= 4 \times a + 4 \times 5 \\ &= 4(a + 5) \end{aligned}$$

The highest common factor of 4 and 20 is 4

Algebra – Keywords.

- Substitution – replacing a letter with a number. (Letters next to each other means to multiply.)

Eg. Work out $2g + 3h$ when $g=9$ and $h=4$

$$2 \times 9 + 3 \times 4$$

$$18 + 12$$

$$\underline{30}$$

- Expression – an algebraic sentence without an equal sign. (You may need to simplify but not solve.)

- Simplify – to make an expression have less terms.

Eg. $2a + b + 3a + 2b - a - 2b = 4a + b$

Eg. $5 \times r \times 2 \times p = 10rp$

- Solve – to work out an answer using algebra, to get $x = \dots$

- Term – one part of an expression separated by a + or -

Eg. $6p + 5q + 2r^2 \rightarrow$ 3 different terms.

- Expand – multiply to get rid of brackets.

Eg. $3(x + 2) = 3x + 6$

- Factorise – opposite of expand, divide and put in brackets.

Eg. $3x + 6 = 3(x + 2)$

$4x + 8 = 4(x + 2)$

- Indices an algebraic term that has a power Eg. $3t^5$

- Sequence – an algebraic pattern going up by the same amount each time. In year 8 work out the formula called the nth term

Calculation

Multiples and Factors

Find the highest common factor of 30 and 45

The factors of 30 are
1, 2, 3, 5, 6, 10, 15 and 30

The factors of 45 are
1, 3, 5, 9, 15 and 45

The 'highest' number in both lists is 15

15 is the highest common factor of 30 and 45

Find the lowest common multiple of 18 and 30

The first few multiples of 30 are
20, 60, 90, 120, 150

The first few multiples of 18 are
18, 36, 54, 72, 90

90 is the smallest number in both lists

90 is the lowest common multiple of 18 and 30

Fractions Decimals and Percentages

a) $0.83 = 83%$ a) $46% = 0.46$

b) $0.03 = 3%$ b) $9% = 0.09$

Examples

a) $\frac{7}{20} = \frac{35}{100} = 35%$

$20 \times 5 = 100$

You need multiply or divide to make the denominator 100

b) $\frac{13}{25} = \frac{52}{100} = 52%$

$25 \times 4 = 100$

a) $55% = \frac{55}{100} = \frac{11}{20}$

b) $8% = \frac{8}{100} = \frac{2}{25}$

Fractions

$\frac{1}{7} + \frac{2}{3} = \frac{3}{21} + \frac{14}{21} = \frac{17}{21}$

$\frac{1}{7} = \frac{3}{21}$ and $\frac{2}{3} = \frac{14}{21}$

SAME DENOMINATOR NEEDED

What is the smallest common multiple of the two denominators? (21)

Calculation – Key Words

- Integer - a whole Number
- Fraction - a part of a number has a numerator on the top and a denominator on the bottom
- Equivalent Fraction - two fractions which have the same value but are written differently- $\frac{1}{2} = \frac{4}{8}$
- Percent - means out of 100, symbol %
- Multiple - any number in your original times table
- Factor - a number that goes into another number with no remainder
- Highest Common Factor - the biggest number that goes into two numbers - HCF of 12 and 16 is 4
- Lowest Common Multiple - the first number that appears in the times table of 2 different numbers - LCM of 3 and 5 is 15
- Prime Number - a number with only 2 factors, itself and 1
- Square number - the answer to a number multiplied by itself
 $1 \times 1 = 1$ $2 \times 2 = 4$ $3 \times 3 = 9$
- Cube Number - the answer to a number multiplied by itself twice
 $1 \times 1 \times 1 = 1$ $2 \times 2 \times 2 = 8$ $3 \times 3 \times 3 = 27$
- Square Root - Opposite of square number. This is the answer to what number multiplied by itself is the square number - $\sqrt{16} = 4 \times 4$ so square root of 16 is 4
- Product means to multiply
- Sum means to add
- Share means to divide
- Difference means to subtract
- Evaluate - work out the answer

Percentages



20% is the same 10% + 10% or one fifth

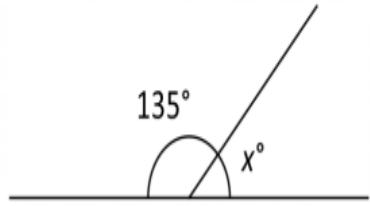
20% of £120 = £12 + £12
= £24

Geometry

$$x^\circ + 135^\circ = 180^\circ$$

$$x^\circ = 180^\circ - 135^\circ$$

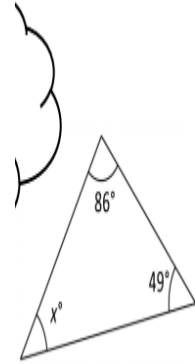
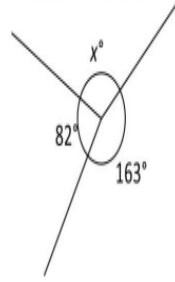
$$x^\circ = 45^\circ$$



$$x^\circ + 82^\circ + 163^\circ = 360^\circ$$

$$x^\circ = 360^\circ - 245^\circ$$

$$x^\circ = 115^\circ$$



$$x^\circ + 49^\circ + 86^\circ = 180^\circ$$

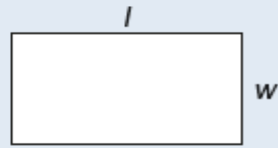
$$x^\circ + 135^\circ = 180^\circ$$

$$x^\circ = 180^\circ - 135^\circ$$

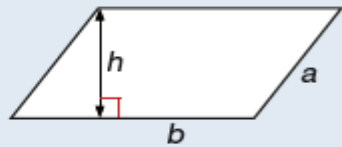
$$x^\circ = 45^\circ$$

Areas

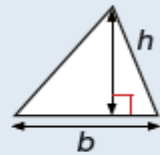
Rectangle = $l \times w$



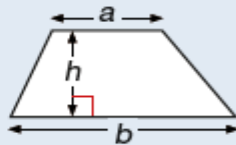
Parallelogram = $b \times h$



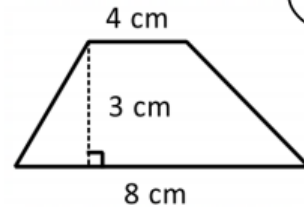
Triangle = $\frac{1}{2} b \times h$



Trapezium = $\frac{1}{2} (a + b)h$



Calculate the area



$$\begin{aligned} \text{Area} &= \frac{1}{2} \times (8 + 4) \times 3 \\ &= 18 \text{ cm}^2 \end{aligned}$$

Geometry Key Words and Formula's

- * Area – the space inside a 2D shape measured in units 2
- * Perimeter - the distance around the outside of a shape (called circumference for circles)
- * Volume – the space inside a 3D shape
- * Surface Area – the area of the flat faces of a 3D shape
- * Angle - The space made when two lines meet, measured in degrees
- * Acute angle – less than 90° , obtuse angle bigger than 90 smaller than 180° . Straight line angle equal to 180° . Reflex angle bigger than 180 but smaller than 360° .
- * Angles in a straight line add to 180°
- * Angles in a triangle add to 180°
- * Angles around a point add to 360°
- * Parallel lines – these lines have the same gradient and they never meet
- * Perpendicular lines – these lines cross at 90°
- * Alternate angles – these two angles are the same in parallel lines (Z angle)
- * Corresponding angles – these two angles are the same in parallel lines (F angles)
- * Co – interior angles – these two angles add up to 180° (C angles)
- * Scalene triangle – A triangle with three different sides and three different angles
- * Isosceles triangles – A triangle that has the two sides the same length and the base angles the same
- * Equilateral triangle – A triangle that has three sides the same and three angles the same
- * Polygon - A 2D shape that has only straight sides (edges)
- * Interior and Exterior angles – The exterior angles of any polygon always add to 360° . The interior angles + exterior angles always add to 180°

Statistics

AVERAGES

The MODE is the value that occurs most often

② 4, ② 6, 1, 4, ②

There are more 2's in the data list than any other number so the MODE = 2

To calculate the mean

3, 6, 3, 10, 8

Step 1: Add all of the 'numbers' together

$$3 + 6 + 3 + 10 + 8 = 30$$

Step 2: Divide your total by the number of values in your data list

$$\begin{aligned} \text{MEAN} &= 30 \div 5 \\ &= 6 \end{aligned}$$

A bag contains 3 yellow, 2 red and 4 blue counters.
A counter is selected at random.
What is the probability of picking a red counter?
TOTAL NUMBER OF COUNTERS $3 + 2 + 4 = 9$

$$P(\text{red}) = \frac{2}{9}$$

The MEDIAN is the value in the middle when the data list listed in order

Example 1

2, 5, 4, 2, 1

Write the data in order

1, 2, ②, 4, 5

MEDIAN = 2

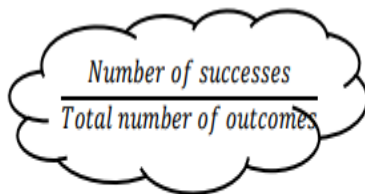
Example 2

4, 5, ⑤, 8, 8, 10

If there are 2 numbers in the middle

$$\text{MEDIAN} = \frac{5+8}{2} = \frac{13}{2} = 6.5$$

Probability


$$\frac{\text{Number of successes}}{\text{Total number of outcomes}}$$

Statistics Key Words

Range – the difference between the largest and the smallest number from a list of numbers

Mode – The number that appears the most often from a list of numbers

Median – the number in the middle of a list of ordered numbers

Mean – Add all the numbers up and then divide this total by the amount of numbers that were there

Averages – Mean, Median and Mode. Three averages to help determine common or a representative number from a list of numbers

Pie Charts – A way of representing data in a circle. All pie charts add up to 3600.

Probability - the chance of an event happening. Probability has to be written as a fraction, decimal or a percentage. Not as a ratio

Venn Diagrams – Uses two circles often overlapping to show data

Scatter Diagram – A graph that shows the relationship between two variables

Correlation – Used to describe the relationship in scatter diagrams – positive both go up or down, negative – one goes up as the other goes down, no correlation – there is no link between the two variables

Line of best Fit – A straight line drawn through the scatter diagram with roughly half the data points on either side of the line

Frequency Table – Data is put into groups in a table. Used to help find averages