

## BIDMAS N3

...or BODMAS. Use the correct order of operations; take care when using a calculator.

- Brackets
- Indices (or powers)
- Division and Multiplication
- Addition and Subtraction

## Types of number N4

Integer: a "whole" number  
Factors; the divisors of an integer  
→ Factors of 12 are 1, 2, 3, 4, 6, 12  
Multiples; a "times table" for an integer (will continue indefinitely)  
→ Multiples of 12 are 12, 24, 36 ...  
Prime number: an integer which has exactly two factors (1 and the number itself). Note: 1 is not a prime number.

## HCF, LCM N4

Highest Common Factor (HCF)  
→ Factors of 6 are 1, 2, 3, 6  
Factors of 9 are 1, 3, 9  
HCF of 6 and 9 is 3  
Lowest Common Multiple (LCM)  
→ Multiples of 6 are 6, 12, 18, 24, ...  
Multiples of 9 are 9, 18, 27, 36, ...  
LCM of 6 and 9 is 18

## Prime factors N4

Write a number as a product of its prime factors; use indices for repeated factors:  
→  $720 = 5 \times 3^2 \times 2^4$

## Powers and roots N6, N7

Special indices: for any value  $a$ :  
 $a^0 = 1$   
 $a^{-n} = \frac{1}{a^n}$   
→  $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$

## Calculating with fractions N8

Adding or subtracting fractions; use a common denominator...

→  $\frac{4}{5} - \frac{1}{3} = \frac{12}{15} - \frac{5}{15} = \frac{7}{15}$

Multiplying fractions; multiply numerators and denominators...

→  $\frac{4}{7} \times \frac{2}{3} = \frac{8}{21}$

Dividing fractions; "flip" the second fraction, then multiply...

→  $\frac{2}{7} \div \frac{5}{6} = \frac{2}{7} \times \frac{6}{5} = \frac{12}{35}$

## Fractions, decimals N10

Fraction is numerator ÷ denominator

→  $\frac{5}{8} = 5 \div 8 = 0.625$

Use place values to change decimals to fractions. Simplify where possible.

→  $0.45 = \frac{45}{100} = \frac{9}{20}$

Learn the most frequently used ones:

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{4}$
0.5	0.25	0.1	0.2	0.75

## Surds N8

Look for the biggest square number factor of the number:  
→  $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$

## Standard form N9

Standard form numbers are of the form  $a \times 10^n$  where  $1 \leq a < 10$  and  $n$  is an integer.

## Standard units N13

1 tonne = 1000 kilograms  
1 kilogram = 1000 grams  
1 kilometre = 1000 metres  
1 metre = 100 centimetres = 1000 millimetres  
1 centimetre = 10 millimetres

## Rounding N15

Truncate the number, then use a "decider digit" to round up or down.  
Decimal places: use the decimal point  
→ 162.3681 to 2dp;  
162.36 | 81 = 162.37 to 2dp  
Significant figures: use the first non-zero digit.  
→ 162.3681 to 2sf;  
16 | 2.3681 = 160 to 2sf  
→ 0.007 039 to 3sf;  
0.007 03 | 9 = 0.007 04 to 3sf

## Error intervals N15

Find the range of numbers that will round to a given value:  
→  $x = 5.83$  (2 decimal places)  
 $5.825 \leq x < 5.835$   
→  $y = 46$  (2 significant figures)  
 $45.5 \leq y < 46.5$

## Algebraic notation A1

Note use of  $\leq$  and  $<$ , and that the last significant figure of each is 5

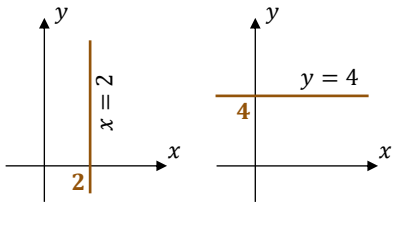
## Equations and identities A3

An equation is true for some particular value of  $x$   
→  $2x + 1 = 7$  is true if  $x = 3$   
...but an identity is true for every value of  $x$   
→  $(x + a)^2 \equiv x^2 + 2ax + a^2$  (note the use of the symbol  $\equiv$ )

## Laws of indices A4

For any value  $a$ :  
 $a^x \times a^y = a^{x+y}$   
 $\frac{a^x}{a^y} = a^{x-y}$   
 $(a^x)^y = a^{xy}$   
→  $\left(\frac{2pq^4}{p^3q}\right)^3 = \frac{8p^3q^{12}}{p^9q^3} = \frac{8q^9}{p^6}$  or  $8q^9p^{-6}$

## Standard graphs A12



## y = mx + c A9

Equation of straight line  $y = mx + c$   $m$  is the gradient;  $c$  is the  $y$  intercept:  
→ Find the equation of the line that joins (0, 3) to (2, 11)  
Find its gradient...  
 $\frac{11-3}{2-0} = \frac{8}{2} = 4$   
...and its  $y$  intercept...  
Passes through (0, 3), so  $c = 3$   
Equation is  $y = 4x + 3$

## Right angled triangles G20, G22

Pythagoras Theorem. Links all three sides. No angles.  $a^2 + b^2 = c^2$

## Trigonometry G16, G17, G18, G23

Links two sides and one angle. SOH | CAH | TOA

## Areas and volumes G16, G17, G18, G23

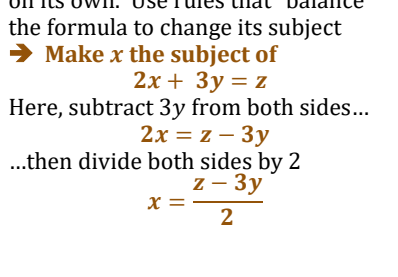
Area of triangle =  $\frac{1}{2} \times \text{base} \times \text{height}$   
Volume of cuboid = length  $\times$  width  $\times$  height  
Area of trapezium =  $\frac{1}{2}(a + b) \times h$   
Circumference of circle =  $\pi \times D$   
Area of circle =  $\pi \times r^2$   
Arc length =  $\frac{\theta}{360^\circ} \times \pi \times D$   
Area of sector =  $\frac{\theta}{360^\circ} \times \pi \times r^2$   
Volume of cylinder =  $\pi r^2 \times \text{height}$   
Volume of prism = area of cross section  $\times$  length

## Transformations G7, G8

Reflection  
• Line of reflection  
Translation  
• Vector  
Rotation  
• Centre of rotation  
• Angle of rotation  
• Clockwise or anticlockwise  
Enlargement  
• Centre of enlargement  
• Scale factor (if SF < 1 the shape will get smaller).

## Angle facts G3

Equal angles in parallel lines: always use correct terminology...  
Angles on a straight line total  $180^\circ$   
Angles in a full turn total  $360^\circ$   
Interior angles in a triangle total  $180^\circ$   
Use this for the interior angles of any polygon...  
Exterior angles always total  $360^\circ$   
...or  $180^\circ \times (n - 2)$



## Sequences A24, A25

Triangular numbers:  
1st 2nd 3rd 4th 5th  
1 3 6 10 15

Square numbers ( $n^2 = n \times n$ ):  
1<sup>2</sup> 2<sup>2</sup> 3<sup>2</sup> 4<sup>2</sup> 5<sup>2</sup>  
1 4 9 16 25

Cube numbers ( $n^3 = n \times n \times n$ ):  
1<sup>3</sup> 2<sup>3</sup> 3<sup>3</sup> 4<sup>3</sup> 5<sup>3</sup>  
1 8 27 64 125

## Probability P8, P9

$p = \frac{n(\text{equally likely favourable outcomes})}{n(\text{equally likely possible outcomes})}$   
 $p = 0$  impossible  
 $0 < p < 0.5$  unlikely  
 $p = 0.5$  evens  
 $0.5 < p < 1$  likely  
 $p = 1$  certain

## Probability rules P8, P9

Multiply for independent events  
→ P(6 on dice and H on coin)  
 $\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$   
Add for mutually exclusive events  
→ P(5 or 6 on dice)  
 $\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$

## Parts of a circle G9

Apply these rules to tree diagrams.

## Correlation G3

Positive correlation  
Negative correlation

## Division using ratio R5

Use a ratio for unequal sharing  
→ Divide £480 in the ratio 7 : 5  
 $7 + 5 = 12$ , then  $\text{£}480 \div 12 = \text{£}40$   
 $7 \times \text{£}40 = \text{£}280$ ,  $5 \times \text{£}40 = \text{£}200$   
(check:  $\text{£}280 + \text{£}200 = \text{£}480$  ✓)

## Ratio and fractions R8

Link between ratios and fractions  
→ Boys to girls in ratio 2 : 3  
 $\frac{2}{5}$  are boys,  $\frac{3}{5}$  are girls.

## Percentages R9

$y$  percent of  $x = \frac{y}{100} \times x$   
→ Increase £58 by 26%.  
 $\frac{26}{100} \times \text{£}58 = \text{£}15.08$   
 $\text{£}58 + \text{£}15.08 = \text{£}73.08$   
 $y$  as a percentage of  $x = \frac{y}{x} \times 100\%$   
→ The population of a town increases from 3500 to 4620  
Find the percentage increase.  
 $\frac{1120}{3500} \times 100\% = 32\%$   
Note: fraction =  $\frac{\text{increase}}{\text{original}}$   
Learn the most frequently used ones:  
50% 25% 10% 20% 1%

## Speed, distance, time R11

Speed =  $\frac{\text{distance}}{\text{time}}$   
→ A car travels 90 miles in 1 hour, 30 minutes. Find its average speed.  
 $90 \text{ miles} \div 1.5 \text{ hours} = 60 \text{ mph}$

## Averages S4

Mode: most frequently occurring  
Median: put the data in numerical order, then choose the middle one  
Mean =  $\frac{\text{total of items of data}}{\text{number of items of data}}$

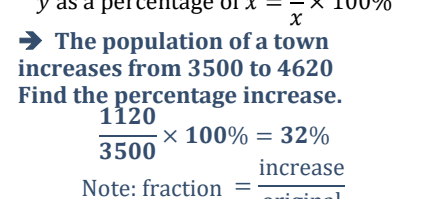
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Positive correlation  
Negative correlation



## Parts of a circle G9

segment  
diameter  
chord  
arc  
sector  
radius  
circumference  
tangent



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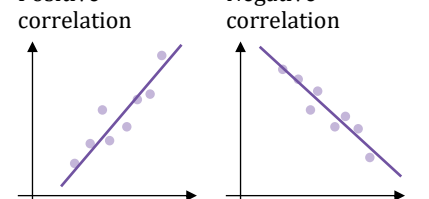
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