Crucial Knowledge – Stage 1 - Number

BIDMAS

The **order** you do calculations in:

B rackets

I ndices

D ivision

M ultiplication

A ddition

S ubtraction

Place Value

- The 'column values' of numbers

....	Thousands	Hundreds	Tens	Units	Decimal Point	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$	....

4 Operators

- Addition (or **Sum**) **+**
- Subtraction (or **Difference**) **–**
- Multiplication (or **Product**) **x**
- Division **÷**

Negative Numbers

- Adding or subtracting – USE A **NUMBER LINE**
- Multiplying or dividing use the rules

+ x + = +	+ ÷ + = +
+ x - = -	+ ÷ - = -
- x + = -	- ÷ + = -
- x - = +	- ÷ - = +

Fractions Decimals and Percentages

- Different ways of saying part of a whole number
- You can change from one to the other

Prime Numbers

- Have **exactly two factors**
- No other whole numbers, except **1** and **itself** divide into them

Rounding

- Decimal places (column after decimal point)
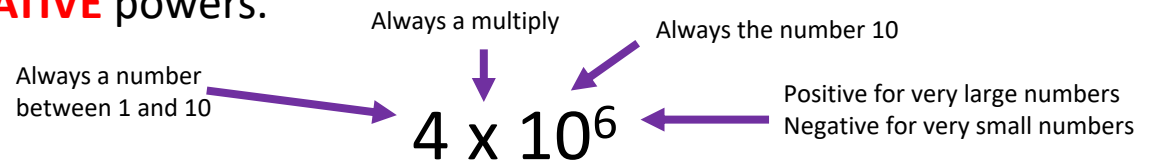- Significant Figures (highest value column)

Crucial Knowledge – Stage 1 - Number

Highest Common Factor (HCF)
Lowest Common Multiple (LCM)

- Write down all the factors from the numbers and find the biggest value on both lists – This is the **Highest Common Factor**

- Write down all the multiples of the two numbers and find the smallest on both lists – This is the **Lowest Common Multiple**

Standard Form

- A way of writing very **BIG** or very **SMALL** numbers
- Think **BIG** numbers – distance between planets and **SMALL** numbers – sizes of atoms.
- **BIG** numbers have **POSITIVE** powers and **SMALL** number have **NEGATIVE** powers.

Always a number between 1 and 10

Always a multiply

Always the number 10

Positive for very large numbers
Negative for very small numbers

$$4 \times 10^6$$

Percentages

- **An amount out of 100**
- **To Calculate a percentage of an amount (What is 40% of £50)**
    Percentage ÷ 100 x amount (40 ÷ 100 x 50 = £20)
- **To change to a percentage (you score 4 out of 5 in a test, what percentage is this?)**
    Amount you got ÷ what it is out of x 100 (4 ÷ 5 x 100 = 80%)

Fractions

- **Multiplying** – Multiply top by top and bottom by bottom.
- **Dividing** - **'Keep Change Flip'.**
- **Addition or Subtraction** – You need same bottom number **(denominator).**

Crucial Knowledge – Stage 1 – Ratio and Proportion

Ratio as a measure
- A ratio is a comparison of parts
- Use a colon (:) to separate parts of a ratio
- A colon is read as 'to'
- 2 or 3 parts
- Understand the parts add up and stay in proportion

Cancelling ratios
- Like simplifying fractions
- Look for common factors
- Do the same to both parts of the ratio

3:6
÷3↓ ↓÷3
1:2

Equivalent ratios
- Same values but different numbers
- Values used can get larger, as well as smaller
- Do same to all parts

3:6
x4↓ ↓x4
12:24

Basic unit conversions
- Convert units of length (mm, cm, m, km)
- Be able to convert to common unit before calculating
- Convert units of time
- Convert units of measure (ml, l)
- Convert units of mass (g, kg, t)

Dividing a given ratio
- The question matches the order of items to the order of parts in the ratio. The first thing mentioned gets the first part of the ratio
- Find the total number of parts in the ratio (+)
- Divide the amount to be shared by the total parts (÷)
- Multiply by each part of the ratio (x

Example
Q: Adam and Ben share £45 in the ratio 1:2. Who gets how much?
A: 1 + 2 = **3** parts in total
            £45 ÷ **3** = £**15** per part
                          1:2
                   x15↓ ↓x15
                        15:30

Adam gets £15 and Ben gets £30

Crucial Knowledge – Stage 1 – Geometry and Measures

Coordinates
- Remember "along the corridor then up the stairs"
- X and y values written on the axes
- 4 quadrants

Area and perimeter
- Perimeter is distance around shape
- Area is space inside a shape (2D), measure in square units
- Rectangle $Area = length \times width$
- Triangle $Area = \frac{1}{2}(base \times height)$
  Only use diagonals for perimeter
- Trapezium $Area = \frac{1}{2}(a + b) \times height$
  Only use diagonals for perimeter
- Circle $Area = \pi \times radius^2$
  $Circumference = 2\pi \times radius$
Circumference is the perimeter of a circle

Use of Protractor
- Measure angles accurately
- Draw bearings

Angle Reasoning
- Angles on straight line = 180º
- Angles in a triangle = 180º
- Vertically opposite angles are always equal
- Angles in quadrilateral = 360º
- Angles at a point = 360º

Types of Triangles
- Scalene – all sides and angles are different
- Isosceles – 2 sides and angles are the same
- Equilateral – 3 sides and angles are the same
- Right – contains a right angle

Terminology Shape
- Edge – Where 2 faces meet
- Vertices – Where 3 faces meet
- Face – side of a 3d shape
- Quadrilateral – a 4 sided polygon
- Polygon – a 2d shape with straight sides
- Acute – an angle less than 90º
- Obtuse – an angle between 90º and 180º
- Reflex – an angle more than 180º

Crucial Knowledge – Stage 1 – Algebra

Algebra terminology
- 2y means 2 multiplied by the value of 'y'.
  So if y = 5 then 2y = 2 x 5 = **10**

- y^2 the value of 'y' multiplied by itself.
  So if y = 5 then y^2 = 5 x 5 = 25

Substitution
- We get rid of our letters by putting number in to create an answer.
- We are normally given formula and values to put in, but sometimes we have to create the expression and then put values in.
- We need to know about terminology to do this.
  You are told E = ½ mv^2
  Calculate E when m = 10 and v = 2.5

  E = ½ x 10 x 2.5 x 2.5
  E = 31.25

Simplifying – Collecting like terms
- We can only bring **'like terms'** together to simplify the expression
- Rewrite to get your **'like terms together'**

Adding and Subtracting
4a + 3b + 6a – b = 4a + 6a + 3b – b = 10a + 2b
$3f^2$ + $5g^2$ + $3f^2$ – $7g^2$ = $3f^2$ + $3f^2$ + $5g^2$ – $7g^2$ = $6f^2$ – $2g^2$

Multiplying and Dividing
4a x 6a = $24a^2$ (Multiply numbers and add powers)
$30b^5$ ÷ $5b^2$ = $6b^3$ (Divide numbers and subtract powers)

Multiplying out single brackets
- Bracket create an order (BIDMAS)
- Brackets are also an invisible multiply
  6 (a + 3) = 6 x a + 6 x 3 = 6a + 18
  5 (2b – a) = 5 x 2b + 5 x -a = 10b – 5a
  2m (3m – 5) = 2m x 3m + 2m x -5 = $6m^2$ – 10m

Crucial Knowledge – Stage 1 – Algebra

Solving equations

- To get a numerical answer for a letter
- We have to do the same to both sides of the equals sign
- If we move things across the equals sign the operator changes to be opposite

Solve 4y + 1 = 17

Move +1 over to become -1

4y = 17 -1 so 4y = 16

Move x4 over to become ÷4 so y = 16÷4

y = 4

Solve 2(3y + 1) = 20

Expand bracket

2 x 3y = 6y and 2 x 1 = 2 so

6y + 2 = 20 Move +2 over to become -2

6y = 20 – 2 so 6y = 18

Move x6 over to become ÷6 so y = 18÷6

y = 3

Factorising

- The process of putting things into brackets
- We can have numerical or algebraic factors
- The 'best' factor goes on the outside of the brackets
- You can check your answer by expanding bracket

Factorise 10a + 5b

'best' factor is 5 so this goes on outside of brackets 5(?????)

2a + b in brackets because when these are multiplied by 5 you get your 10a and 5b

So 5(2a + b) is answer

Factorise $20a^2$ + 4a

'best' factor is 4 number wise and a algebra wise it is a so this goes on outside of brackets 4a(?????)

5a + 1 in brackets because when these are multiplied by 4a you get your $20a^2$ and 4a

So 4a(5a + 1) is answer

Crucial Knowledge – Stage 1 – Data and Probability

Mean, median, mode and range

- You must be able to get measures from a list of values or values in a frequency table

- MEAN = Total of values ÷ Number of values
- MEDIAN – The middle value when written in size order
- MODE – The value that occurs the most often
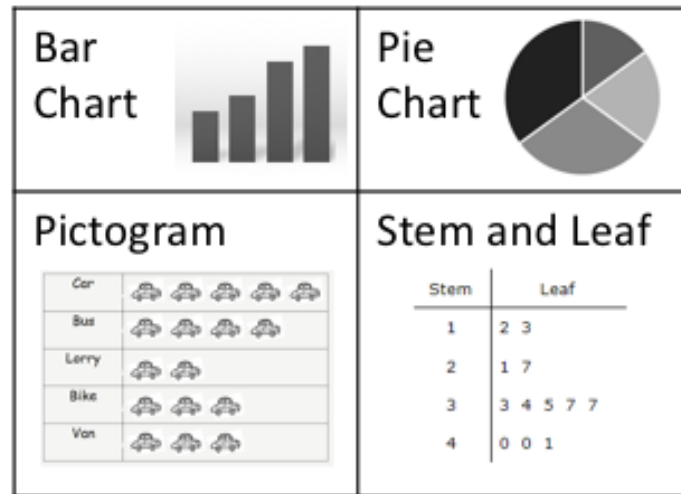- RANGE – Maximum value – Minimum value

Sample space diagrams

- A list of all possible outcomes from an event. We use this to help calculate probabilities

Probability and relative frequency

- A list of all probabilities adds up to 1
- Relative frequency $=\dfrac{Times\ occured}{Number\ of\ trials}$

Displaying data

Interpreting data

- Get values from bar charts
- Get values from pie Charts
- Use key to get values from Stem and Leaf diagram
- Use key to get values from Pictogram

Probability definition and scale

- Outcome – A possible result of an experiment
- Event – A set of outcomes
- Impossible – An outcome that cannot happen
- Certain – An event that must happen