Crucial Knowledge – Stage 2 - Number

Percentage Change
- If a value goes up, it's a percentage increase.
- If a value goes down, it's a percentage decrease.
- We work out percentage of amount and either add it on or subtract it from our starting value
- Or we work out the percentage change by working out the difference in values and dividing by our original value and then multiplying by 100.

Powers
- If we multiply powers we add. $y^3 \times y^4 = y^{(3+4)} = y^7$
- If we divide powers we subtract. $y^{10} \div y^6 = y^{(10-6)} = y^4$
- Anything to the power zero is always 1

Product of Primes
- Any value split into prime numbers MULTIPLIED together.
- First 5 prime numbers are 2, 3, 5, 7 and 11.
- Sometimes we put into a VENN diagram to calculate LCM and HCF.

Inequalities
- Understand inequality symbols $<$ $>$ $\leq$ $\geq$
- List values that satisfy a inequality.
- Show by drawing on a number line values that satisfy inequality.

Estimation
- An answer close to the exact answer.
- All values are rounded to 1 significant figure.
- Follow BIDMAS to get your estimation.

Use of Calculator
- Must be able to use brackets ( ) on calculator to get an answer to multi stage calculations.
- Must be able to use powers on calculator.
- Must be able to use for Standard Form calculations .
- Must be able to use fraction button for all multi tier calculations.
- Must be able to use calculator for percentage calculations.

Crucial Knowledge – Stage 2 – Ratio and Proportion

Unit conversions

- Area conversions
  Use the same conversions as for length, but squared
- Volume conversions
  Use the same conversions as for length, but cubed
- $Speed = \frac{distance}{time}$
- Units for speed include metres per second (m/s) and kilometres per hour (kmph)

Ratio calculations

- Use a ratio to scale measurements up and down
- Examples include using maps and scale drawings
- Size calculations relative to scale and real life

Recipe Scaling

- Work out we have enough to complete
- How much of something do we need

Example:
Q: A recipe uses 300g of flour and 150g of butter to make a cake for 4 people. How much of each ingredient is needed to bake a cake for 6 people.
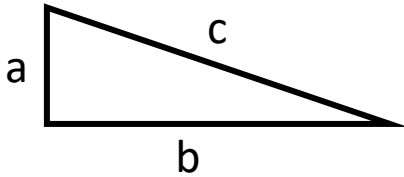
A: 6 ÷ 4 = 1.5 (scale factor).
300g x 1.5 = 450g flour
150 x 1.5 = 225g butter

Crucial Knowledge – Stage 2 – Geometry and Measures

Pythagoras

- $a^2 + b^2 = c^2$
  Square root c^2 to find Hypotenuse
- $c^2 + a^2 = b^2$
  Square root b^2 to find shorter side

Plans and Elevations

- Images from 3 different directions
- Front, side and plan
- Work out size or volume
- Draw 3 images from a 3D drawing
- Draw a 3D image from 3 plans and elevations

Polygons

- A shape with 3 or more straight sides
- Total Interior Angles = (n-2) x 180
- Interior + Exterior = 180°
- Sum of Exterior = 360°

Basic transformations

- Reflections
  Over straight lines (y=, x=) including diagonals (y=x)
- Rotations
  Direction, Distance and Centre
- Translation
$$\begin{pmatrix} right + \quad left\ - \\ up +\ down\quad - \end{pmatrix}$$
- Enlargement
  Scale factor and Centre

Bearings

- 3 digit format
- Measure clockwise from North, 000°
- Be able to draw and add onto a diagram
- Measure reflex angles using a compass
- Calculations using North for parallel lines

Angles with parallel lines

- F – Corresponding
  Always equal
- Z – Alternate
  Always equal
- C – Co-Interior
  Always add to 180°

Crucial Knowledge – Stage 2 – Algebra

Expanding Double Brackets – FOIL

- Two brackets with nothing between them
- (x+2)(x+5) – This is a double bracket
- 4(x+2) + 5(x+5) – This is 2 single brackets
- When expanding them think First Outer Inner Last
- To start with, you get 4 terms out of double brackets
- You must simplify to 3 or sometimes 2 values

Straight line graphs

- Remember y = ? (this is horizontal line)
- Remember x = ? (this is vertical line)
- You have to substitute values into equations to plot the graph
- y = mx + c where y = y coordinate, m = gradient (how steep graph is), x = x coordinate and c = intercept (where we cut y axis)
- Parallel lines have same gradients
- Gradient is RISE ÷ RUN a positive number we climb and a negative value we ski down

Linear sequences

- A list of numbers that goes up or down by the same amount each time
- Work out Term to Term rule
- Work out your Zero Term
- Form your equation for the nth term
- A value appears if a sequence, the nth term equation is solved with an integer answer.

Solving linear equations – more advanced

- Fractional or non integer – Follow your normal rules, be prepared to give your answer as a fraction, improper fraction or mixed number. It might be positive or negative.
- x on both side – Before you start identify the smallest algebra term and do the opposite of this to both sides of the equation. Then, follow your rules to solve as normal.

Crucial Knowledge – Stage 2 – Data and Probability

Drawing pie charts

- Angles in a pie chart

$$= \frac{Frequency}{Total\ frequency} x\ 360$$

- Use a protractor and ruler to draw accurately

Probability trees

- Used to show outcomes of multiple events
- All branches add up to 1
- Multiply along branches to find probabilities
- Add multiple routes through tree

Stem and leaf diagrams

- Pick correct stems
- Leaves are always single digits
- Ascending order
- Use of key
- Obtain mean, median, mode and range from diagram

Grouped data

- Find Mean from a frequency table
- Find Estimated Mean from grouped frequency table
- Calculated Modal class interval
- Calculate Median class interval
- A class interval means a group of data

Mean, median, mode and range with missing values

- Be able to calculate missing values from a data set when given some of the values.

Example: The mean of the following 5 numbers is 9:

$$[\ 6\ ]\ [\ 7\ ]\ [\ ?\ ]\ [\ 11\ ]\ [\ 13\ ]$$

What is the missing number?

Total value = 5 x 9 = 45

Known total = 6 + 7 + 11 + 13 = 37

Missing value = 45 – 37 = 8

Two way tables

- Values add up vertically and horizontally
- Totals can be given but may need to be calculated
- Used to simplify information