

16. Averages (M & M & M)

TIP: These really depend on simple arithmetic. Therefore make sure you do each calculation twice as a check.

Mean

Add them all up and divide by the number of numbers in the data.

Median

Arrange all the data in increasing order. The median is the one in the middle. If there are two in the middle, go half way between the two.

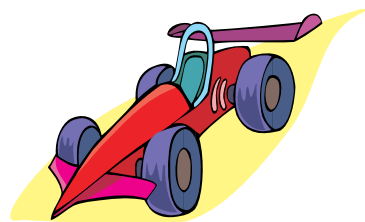
Mode

The most common value.

Range

Maximum Minus Minimum

MATHLETICS



A Common Entrance Revision Booklet for Fast Track Maths Revision

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14. Circles and Area Formulae

TIP: Always draw a diagram to help you see what is going on. Write in all the lengths you know. Take it step by step.

Circles

$C = \pi \times d$	$A = \pi r^2$	$C = 2 \times \pi \times r$
$C = \pi d$	$A = \pi \times r \times r$	$C = 2\pi r$
$d = 2 \times r$	$d = 2r$	$r = d \div 2$

$$\pi = 3.1415926535897932384626433\dots$$

Area

Rectangle: Length \times Width
Triangle: Base \times Height $\div 2$
Trapezium: Average of Parallel Sides \times Width
Parallelogram: Base \times Height
Kite & Rhombus: Length \times Width $\div 2$

3. Ordering Fractions, Decimals & %

TIP: Change everything into decimals to the same number of decimal places. Add extra zeroes or round decimals if necessary. Then just sort the decimals (easy!) but finally write the numbers in their original form.

Fractions to Decimals

"You take your top and you divide it by your bottom" This gives a decimal. OR use the decimal conversion button on your calculator if you have one.

Percentages to Decimals

Just divide by 100.

e.g. 35% = 0.35,

7% = 0.07

17.5% = 0.175 and so on.

12. Polygons - Names of Shapes

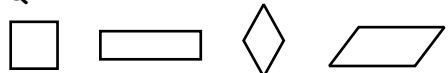
TIP: Learn the quadrilaterals & triangles first. They are much more common.

Triangles:

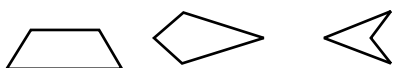


Equilateral Isosceles Right-Angled Obtuse-Angled

Quadrilaterals:



Square Rectangle Rhombus Parallelogram



Trapezium Kite Arrowhead

Others:

Pentagon (5), Hexagon (6), Heptagon (7), Octagon (8), Nonagon (9), Decagon (10)

5. Tricky Arithmetic

TIP: Make sure you can add, subtract, multiply and divide any two numbers. Practise - you know they'll come up!

Multiplication and Division

Practise long multiplication until it becomes easy. With decimals, ignore the decimal points for multiplying then put them back at the end. Division can be thought of as simplifying a fraction.

Fractions

To add or subtract, first make sure the denominators are the same using equivalent fractions. You don't need to bother to do this for \times and \div fractions.

Decimals

For + and -, Line Up The Decimal Points!

10. Graphs

TIP: Check that your graph is accurately drawn and clearly labelled. Presentation is everything in a graph.

Scattergraphs and Conversion Graphs

Carefully plot the points given. For a scattergraph draw the Line Of Best Fit. Check that you understand Positive, Negative and Zero Correlation. For a conversion graph, draw lines to show how you are reading the graph.

Graphs From Equations

You often get given one value in the table of points. Check to see if you agree. All points on a straight line graph must line up - use this to check for errors. With curved graphs you will get either of two shapes: \cup or \cap , so again check carefully those points which don't seem to fit the curve.

Common Errors - Squaring a negative number gives you not a negative but a POSITIVE answer. Also be careful when adding / subtracting negative values!

7. Algebra (2)

TIP: Multiplying and dividing can be done with anything, but you can only add or subtract LIKE terms.

Simplifying is done with adding and subtracting like terms, or with division:

e.g. $7bc + bc - 3bc = 5bc$ and $\frac{4a^2b^3c}{20ab^5c} = \frac{a}{5b^2}$.

Multiplying Out Brackets means multiplying what is outside the bracket by everything inside it, one thing at a time. Remember Banana Man?

e.g. $3(a-b) = 3a - 3b$

A more complicated version (watch those - signs!):

$$2p(q-4r) - 3q(p-r) = 2pq - 8pr - 3pq + 3qr = 3qr - 8pr - pq$$

Factorising is just the reverse of multiplying out brackets. Put them back!

e.g. $12ab - 4bc = 4b(3a - c)$, taking $4b$ outside. Make sure you take outside as much as you can.

4. Percentage Increase & Decrease

TIP: Every percentage change is based on the Original Value (100%). You can go up or down from this.

$$\% \text{ Increase (Profit)} = \frac{\text{Actual Increase}}{\text{Original Value}} \times \frac{100}{1}$$

$$\% \text{ Decrease (Loss)} = \frac{\text{Actual Decrease}}{\text{Original Value}} \times \frac{100}{1}$$

Fast tracking:

10% is the same as $\frac{1}{10}$ so just divide by 10.

For the quickest way to find % increases and decreases, use decimals! Examples:

To increase by 25%, multiply by 1.25

To increase by 40%, multiply by 1.4 (1.40)

To decrease by 5%, multiply by 0.95 (1-0.05)

To decrease by 25%, multiply by 0.75 (1-0.25)

13. Angles and Lines

TIP: Draw a diagram. Mark in all the angles you know. Work out as many of the others as you can. Then begin!

Regular Polygons: The Angles

Exterior Angle = $360^\circ \div \text{number of sides}$

Interior Angle + Exterior Angle = 180°

Angle at Centre = Exterior Angle

Parallel and Intersecting Lines

Equal angles are found: Opposites (X),

Alternates (Z or N), Corresponding (F).

Angle Totals

Triangle (180°), Quadrilateral (360°),

Straight Line (180°), Point/Circle (360°),

Right Angle (90°).

2. Important Numbers

TIP: Just sit down and learn the lot!

Tables

Learn them up to 10×10 or even 12×12

Primes

There are 15 prime numbers under 50:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47.

Squares

A number multiplied by itself:

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, ...

Triangular Numbers

Add one more each time you increase:

1, 3, 6, 10, 15, 21, 28, 36, 45, 55, ...

15. Pie Charts

TIP: The total frequency of the data is the same as 360° on the pie chart. Everything is then just a fraction of the total (a fraction of 360°)

Construction Kit

Find the total frequency. (Say this is 90)

Divide into 360° ($360^\circ \div 90 = 4^\circ$)

Multiply all frequencies by this factor (4°) to find the angle of each sector.

Reading and Interpreting

If you know, say, that 90° represents 30 people, you can work out all the others:

Angle = Frequency \times Factor

Factor = Angle \div Frequency

Frequency = Angle \div Factor

8. Equations (1)

TIP: Always do the same thing to both sides. You will never go wrong if you do.

Inverse Operations

Undo every operation with its inverse:

+ and - are inverses. So are \times and \div too.

Solving Equations

Multiply out any brackets. Apply inverse operations until all the letter terms are on one side and all the number terms are on the other. Then it's easy.

EXAMPLE: $5x + 2(x - 1) = 3(2x + 6) - 3$

Multiply out brackets: $5x + 2x - 2 = 6x + 18 - 3$

Simplify each side: $7x - 2 = 6x + 15$

+2 to each side: $7x = 6x + 17$

-6x from each side: $x = 17$

9. Equations (2)

TIP: Once you have a solution, don't forget to check it using substitution.

Equations With Fractions

Always multiply everything on both sides by the denominator.

EXAMPLE: $7 - \frac{3x-5}{2} = 31 - 2(5x-2)$

Multiply out brackets: $7 - \frac{3x-5}{2} = 31 - 10x + 4$

Multiply both sides by denominator: $14 - (3x-5) = 62 - 20x + 8$

Brackets: $14 - 3x + 5 = 62 - 20x + 8$

Simplify each side: $19 - 3x = 70 - 20x$

+20x to each side: $19 + 17x = 70$

-19 from each side: $17x = 51$

$\div 17$ on both sides: $x = 3$

Inequalities

Treat as equations. If you multiply or divide by a negative number you must reverse the $<$ or $>$ symbol.

6. Algebra (1)

TIP: Learn and use the correct notation. This is the language of Mathematics!

No Divide or Multiply Symbols

To show division, write it as a fraction. To show multiplication, write the two things side by side or use powers. We don't usually write the number 1 unless we are adding.

$$a \div b = \frac{a}{b} \quad a \times b = ab \quad a \times a = a^2$$
$$4 \times a = 4a \quad 1 \times a = a$$

Like and Unlike Terms

To make it easier to see what's going on, we always write numbers first, then the letters (and their powers) in alphabetical order. Like terms are then those with identical letter parts. Unlike terms are those with different letter parts.

These are like terms: $7ab$, ab and $2ab$

These are unlike terms: $5p$, $6pq$, $5p^2$, and $\frac{6p}{q}$

11. Transformations

TIP: Turn the paper, fold the paper, use tracing paper - anything to help you!

Reflections

Draw in the mirror line. Remember that every point ends up an equal distance away from this line on both sides.

Rotations

Check that you know the Centre of Rotation, the Angle Rotated, and the Direction (Clockwise or Anticlockwise).

Enlargements

Check that you know the Centre of Enlargement and the Scale Factor. Every length is multiplied by this factor.

$$\text{Area Factor} = (\text{Scale Factor})^2$$