<table>
<thead>
<tr>
<th>Grade</th>
<th>Skill</th>
<th>Understanding</th>
</tr>
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</table>
| C     | Make estimates when solving problems by first rounding numbers to one significant figure then multiplying or dividing mentally. Eg: \[
\frac{37.8 \times 195.24}{2.1} \approx \frac{40 \times 200}{2} = \frac{8000}{2} = 4000
\] | Understanding the effect of multiplying and dividing by numbers between 0 and 1. Eg: \[7 \div 0.5 = 14 \quad \text{and} \quad 7 \times 0.2 = 1.4\] Use a calculator effectively and appropriately to multiply or divide any number. Eg: \[32883.223 \div 0.0036 = 9134228.611.. = 9134229.6 \text{ to 1 d.p.}\] Understand proportional change and use multiplicative methods to calculate this change. Eg: \[5\text{kg of wax costs £14. How much wax can be bought for £20?}\] Solve problems involving powers, roots and numbers in standard form. Eg: \[\sqrt{25} - 2^3 = \quad \text{or} \quad 2.4 \times 10^8 + 1.6 \times 10^7 = \] Use fractions or percentages to solve problems involving repeated proportional change. Eg: \[A \text{ shirt in a 20% off sale is further reduced in price by half. How much will it cost if it was originally priced at £60?}\] Calculate the original amount after a proportional change. Eg: \[A \text{ car is in a sale, marked as 35% off, and now costs only £1200. How much did it cost originally?}\] Recognise and use rational and irrational numbers. Eg: \[\sqrt{\frac{9}{16}} = \frac{3}{4} \quad \text{and} \quad 3\sqrt{20} + 4\sqrt{5} = 3(2\sqrt{5}) + 4\sqrt{5} = 10\sqrt{5}\] Determine the bounds of intervals. Eg: \[\text{Find the maximum possible area of a 3.4cm} \times \text{2.8cm rectangle, where measurements are correct to 1 d.p.}\] Use direct and indirect proportion. Eg: \[\text{The velocity,} V, \text{ of a falling stone is directly proportional to the square of the time,} T. \text{ If it is travelling at 8mph after 3 seconds, find an expression for the velocity in terms of time, and the speed at} \ T = 10.\] |
## GCSE Grade Descriptors: Algebra (C to A*)

<table>
<thead>
<tr>
<th>Grade</th>
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<tbody>
<tr>
<td>C</td>
<td>Find the nth term of a quadratic sequence.</td>
<td>Find the nth term of the sequence: 3, 9, 19, 33, 51,...</td>
</tr>
<tr>
<td>C</td>
<td>Expand two sets of brackets, and simplify the answer.</td>
<td>((x + 2)(x + 3) = x^2 + 5x + 6)</td>
</tr>
<tr>
<td>C</td>
<td>Understand and use the rules of indices.</td>
<td>(x^a \times x^b = x^{a+b} ) and ((x^n)^m = x^{nm}) and (x^p + x^q = x^{p+q})</td>
</tr>
<tr>
<td>C</td>
<td>Solve simultaneous equations using algebraic and graphical methods.</td>
<td>Solve the simultaneous equations (y + x = 7) and (2y + 3x = 17). Draw the lines on a graph, and find the crossing point.</td>
</tr>
<tr>
<td>C</td>
<td>Solve simple inequalities algebraically.</td>
<td>(3x \leq 15 - 2x)</td>
</tr>
<tr>
<td>C</td>
<td>Draw line graphs to solve distance-time problems.</td>
<td>A car starts from Brighton and drives 40 miles north in 60 minutes. It is stationary for 3 hours, then returns to Brighton at 60mph. Display this information on a distance – time graph.</td>
</tr>
<tr>
<td>B</td>
<td>Evaluate algebraic formulae by substituting fractions, decimals and negative numbers.</td>
<td>Find the value of (y) when (x = -\frac{1}{3}) in the formula: (y = 2x^2 - x)</td>
</tr>
<tr>
<td>B</td>
<td>Calculate the value of one variable given the others in a formula.</td>
<td>If (A = 200) and (r = 4), find (h) when (A = 2\pi r(r + h))</td>
</tr>
<tr>
<td>B</td>
<td>Rearrange algebraic formulae, equations and expressions.</td>
<td>Make (r) the subject of this formula: (V = \frac{4}{3}\pi r^3)</td>
</tr>
<tr>
<td>B</td>
<td>Multiply two linear expressions.</td>
<td>((2x + 3)(3x - 4) = 6x^2 + x - 12)</td>
</tr>
<tr>
<td>B</td>
<td>Factorise linear and quadratic expressions and be able to identify the difference of two squares.</td>
<td>(x^2 + 4x - 5 = (x + 5)(x - 1)) and (4x^2 - 25 = (2x + 5)(2x - 5))</td>
</tr>
<tr>
<td>B</td>
<td>Solve quadratic equations by factorising.</td>
<td>(x^2 + 4x - 5 = 0 \Rightarrow (x + 5)(x - 1) = 0 \Rightarrow x = -5) or (x = 1)</td>
</tr>
<tr>
<td>B</td>
<td>Solve linear inequalities in two variables graphically.</td>
<td>Draw (y = 2x) and (y = -x + 4) on a graph, then show the region satisfying: (y \geq 2x) and (y &lt; -x + 4) for (x &gt; 0)</td>
</tr>
<tr>
<td>Level</td>
<td>Task</td>
<td>Notes</td>
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<tr>
<td>B</td>
<td>Solve a quadratic inequality algebraically.</td>
<td><strong>Find the range of values of</strong>( x ) <strong>which satisfy:</strong> ( 2x^2 + x &gt; 3 )</td>
</tr>
<tr>
<td>B</td>
<td>Understand straight line graphs.</td>
<td>( y = 3x - 4 ) <strong>has gradient</strong> 3 <strong>and</strong> ( y ) <strong>– intercept</strong> – 4</td>
</tr>
<tr>
<td>B</td>
<td>Sketch and interpret linear, quadratic, cubic and reciprocal graphs.</td>
<td><strong>Draw the graph of</strong> ( y = \frac{3}{x} ), including any asymptotes.</td>
</tr>
<tr>
<td>B</td>
<td>Sketch and interpret graphs that model real life situations.</td>
<td><strong>Sketch a graph showing the level of water in a conical funnel over time.</strong></td>
</tr>
<tr>
<td>A/A*</td>
<td>Simplify algebraic expressions using rules of indices for negative and fractional indices.</td>
<td>( \frac{\frac{5}{x^7}}{\sqrt[3]{x^4}} = x^6 )</td>
</tr>
<tr>
<td>A/A*</td>
<td>Find formulae that connect data, and express general laws algebraically.</td>
<td><strong>Prove that the sum of any two consecutive integers is even</strong> ( n + (n + 1) = 2n + 1 )</td>
</tr>
<tr>
<td>A/A*</td>
<td>Solve simultaneous equations in two variables where one is linear and the other quadratic.</td>
<td><strong>Find values of</strong> ( x ) <strong>and</strong> ( y ) <strong>which satisfy:</strong> ( y = x^2 + 3x - 4 ) <strong>and</strong> ( y = 2x - 3 )</td>
</tr>
<tr>
<td>A/A*</td>
<td>Solve problems using intersections and gradients of graphs.</td>
<td><strong>Find a line parallel to</strong> ( y = -2x + 5 ) <strong>passing through the point</strong> (3, –7)</td>
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</tbody>
</table>
### GCSE Grade Descriptors: Shape, Space and Measures (C to A*)

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| C     | Use Pythagoras' theorem.  
Eg:  
The two shortest sides of a right-angled triangle are 5m and 12m.  
*Find the length of the longest side.* | |
| C     | Calculate lengths, areas and volumes in plane shapes and prisms.  
Eg:  
*Find the volume of a cylinder with diameter 10cm and height 20cm.* | |
| C     | Enlarge shapes by a fractional scale factor. Understand the similarity of the resulting shapes.  
Eg:  
*A triangle has vertices at (0,2), (5,4) and (7,1). Enlarge this shape by scale factor $\frac{1}{3}$ with centre of enlargement (0,0).* | |
| C     | Determine the locus of an object moving according to a rule.  
Eg:  
*Draw the locus of points within 5cm of (7,5) and exactly 3cm from (6,6).* | |
| C     | Find the upper and lower bounds of a measurement and recognise that it may be inaccurate by up to one half of its stated accuracy in either direction.  
Eg:  
*A table is measured to be 73.5cm high, to the nearest 0.1cm. State the upper and lower bounds of this measurement.* | |
| C     | Understand and use compound measures such as speed.  
Eg:  
*Find the speed of a car, in mph, which travels 18 miles in 12 minutes.* | |
| B     | Understand and use congruence and mathematical similarity in 2D and 3D.  
Eg:  
*Two similar cones have volumes of 200cm³ and 350cm³ respectively.  
The smaller cone has a surface area of 150cm².  
Find the surface area of the larger cone.* | |
| B     | Use sine, cosine and tangent in right-angled triangles.  
Eg:  
*The height of a telegraph pole is 15m. A ladder is placed against it.  
The ladder has a length of 22m. If it exactly reaches the top of the pole, what angle will the ladder make with the pole?* | |
| B     | Distinguish between formulae for perimeter, area and volume by considering dimensions.  
Eg:  
*Which of these is an expression for area: $2\pi x^2y$, $\frac{3h^3}{x}$, $\frac{7l}{5}$, $2k^2 + 3m$* | |
| A/A*  | Sketch and interpret the graphs of sine, cosine and tangent functions for any angle.  
Eg: | ![Graphs](image)
| A/A* | Use sine, cosine and tangent of angles of any size when solving 2D and 3D problems.  
Eg:  
Find the angle made with the horizontal when a wire is stretched between opposite corners of a cuboidal room measuring $3 \times 4 \times 8$ metres. |
|---|---|
| A/A* | Use Pythagoras’ theorem when solving 2D and 3D problems.  
Eg:  
Calculate the length of this wire. |
| A/A* | Use the conditions for congruent triangles in formal geometric proofs.  
Eg:  
Prove that the angle between two tangents is equal to $180^\circ - x$ where $x$ is the angle made by the connected radii at the centre of the circle. |
| A/A* | Calculate the lengths of circular arcs and areas of sectors.  
Eg:  
Find the perimeter and area of a $30^\circ$ sector of a circle with radius $5$ m. |
| A/A* | Calculate the surface area of cylinders and volumes of cones and spheres.  
Eg:  
Find the surface area and volume of a cone with radius $5$ cm and vertical height $10$ cm. |
| A/A* | Appreciate the continuous nature of scales that are used to make measurements.  
Eg:  
Any two measurements can be bisected to find a measurement in between |
# GCSE Grade Descriptors: Handling Data (C to A*)

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| **C** | Write and test hypotheses using appropriate statistics.  
Eg:  
*A company carries out a survey to determine the number of men and women who smoke. Make a prediction, and explain the method you will use to test it.* |  |
| **C** | Calculate mode, median, mean and range from grouped data.  
Eg:  
| **Age (years)** | **Frequency** | Write down the modal age, the median age and the mean from this frequency table. |
| 10 | 12 |  |
| 11 | 16 |  |
| 12 | 8 |  |
| **C** | Compare distributions by using frequency polygons, averages and range.  
Eg:  
*Girls have a higher mean average than boys, but there is also a greater range with girls’scores, so boys were more consistent.* |  |
| **C** | Draw a line of best fit on a scatter diagram.  
Eg:  
*Constructing a straight line passing through the mean point with an equal number of points on either side.* |  |
| **C** | Understand and use relative frequency as an estimate of probability.  
Eg:  
*A spinner is spun 600 times and the number 4 has appeared a total of 50 times. Calculate an estimate for the probability of getting a 4.* |  |
| **B** | Draw and interpret cumulative frequency curves.  
Eg:  
*Calculate the median and the interquartile range for both distributions, and hence compare them.* |  |
| **B** | Find median and interquartile range. Use these to compare distributions including the use of box plots.  
Eg:  
*Compare these two distributions, making reference to both the medians and the interquartile range.* |  |
| **B** | Calculate the probability of two or more events happening including using a tree diagram. |  |
### A/A*

**Draw and interpret histograms.**

**Eg:**

![Histogram Example](image)

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### A/A*

**Understand different sampling methods, including stratified random sampling.**

**Eg:**

*Give details of two methods of choosing a fair sample.*

*If a population contains 300 girls and 250 boys, how many of each should be chosen for a stratified random sample of 50?*

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### A/A*

**Understand when and how to use conditional probability.**

**Eg:**

*What is the chance of being dealt an Ace given that 7 cards have been dealt out already and only one of them was an Ace?*