



Preparation for A-Level Mathematics: Summer Task

These topics are all key GCSE topics which will be relied upon heavily at A-Level Mathematics. Show your full working and use the video links to help you if you get stuck.

1. Index Laws

1.1 Simplify the following as far as possible:

a) $(a^3)^2 \times 2a^2$ b) $\frac{8x^{10}}{6x^5}$ c) $\frac{20x^7+15x^3}{5x^2}$ d) $24x^0$

1.2 Simplify the following as far as possible:

a) $(x^3)^{\frac{2}{3}}$ b) $2x^{\frac{3}{2}} \div 4x^{-\frac{1}{4}}$ c) $\sqrt[3]{125x^6}$ d) $\frac{2x^2-x}{x^5}$

2. Brackets

2.1 Expand the following brackets:

a) $(x+2)(x-7)$ b) $(y+3)(y^2-1)$ c) $(x-2y)(x^2+2)$ d) $(x+1)(x-2)(x+5)$

2.2 Fully factorise the following expressions:

a) $3xy^2 - 15x^2y$ b) $x^2 - 5x - 6$ c) $x^2 - 36$ d) $16x^2 - 9y^2$

3. Surds

3.1 Without a calculator, simplify the following as far as possible:

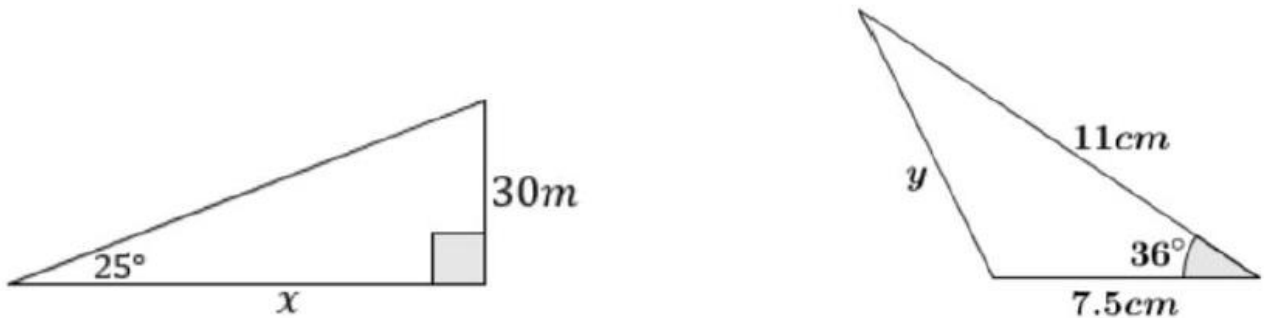
a) $\sqrt{50}$ b) $\frac{\sqrt{20}}{2}$ c) $5\sqrt{6} - 2\sqrt{24} + \sqrt{294}$ d) $(2 - \sqrt{3})(5 + \sqrt{3})$

3.2 Without a calculator, rationalise the denominators of the following:

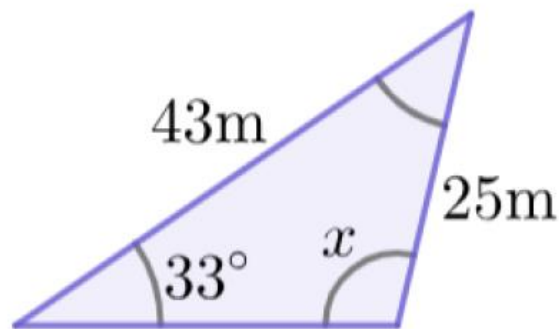
a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{3+\sqrt{5}}$ c) $\frac{5+\sqrt{2}}{5-\sqrt{2}}$ d) $\frac{1}{(1-\sqrt{7})^2}$

4. Triangles

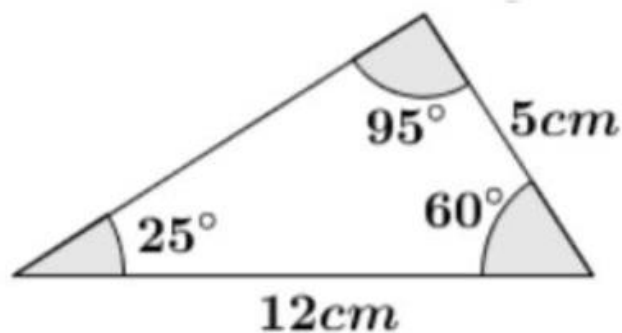
4.1 (Calculator allowed) Find the missing lengths in the triangles below:



4.2 (Calculator allowed) Find the angle x in the triangle below:



4.3 (Calculator allowed) Find the area of the triangle below

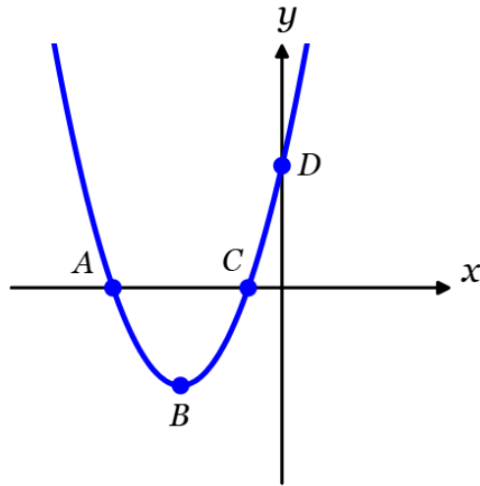


5. Quadratics

5.1 Write the following expressions in the form $(x + a)^2 + b$.

- a) $x^2 + 6x + 8$ b) $x^2 - 4x + 3$ c) $x^2 + 3x + 1$ d) $3x^2 + 12x + 3$

5.2 The graph of $y = x^2 + 6x + 5$ is shown. Work out the coordinates of the points marked A, B, C and D.



6. Straight Line Graphs

6.1 Write down the equation for the following lines in the form $y = mx + c$.

- a) A line with the gradient of 2 and a y-intercept of (0,3).
- b) A line with a gradient of 3 that passes through (4, 11).
- c) A line that passes through (3, -1) and (6, 5)

6.2 Write down the equation for the following lines in the form $y = mx + c$.

- a) A line parallel to $y = 3x + 5$ that passes through (5, 16)
- b) A line perpendicular to $y = -2x + 7$ that passes through (6, 10)

Video Links

1. Index Laws

<https://www.youtube.com/watch?v=7IYQR3jtl-A>

<https://www.youtube.com/watch?v=UCcW2ImvTVM>

2. Brackets

Expanding: <https://www.youtube.com/watch?v=QWaatt3t76k>

Factorising: <https://www.youtube.com/watch?v=9HbjNir7Ahs>

3. Surds

Simplifying surds: https://www.youtube.com/watch?v=2_LkSaP2Vv8

Expand and simplify surds: <https://www.youtube.com/watch?v=Bqx5gYfsEGl>

Rationalise the denominator: <https://www.youtube.com/watch?v=t9iFBDHc-nA>

4. Triangles:

Trigonometry: <https://www.youtube.com/watch?v=ZMh2WkoZVz8>

Cosine Rule: <https://www.youtube.com/watch?v=iBfBKMVrloI>

Sine Rule: <https://www.youtube.com/watch?v=DGjRU3cminQ>

Area of triangle: <https://www.youtube.com/watch?v=ORkNWz9ADNU>

5. Quadratic Graphs:

Completing the Square: https://www.youtube.com/watch?v=9_2DYOfHxyk

Quadratic Graphs: https://www.youtube.com/watch?v=rM_A8t0CV7A

6. Straight Line Graphs:

Equation of a Line: <https://www.youtube.com/watch?v=5-tH8hT-8BQ>

Parallel and Perpendicular Lines: <https://www.youtube.com/watch?v=eFjXfm6vQY8>