## Indices and surds – 2020 O Level Additional Math

1.

Find the value of $x$ such that $\dfrac{4^{x+1}}{2^{x-1}} = 32^{\frac{x}{3}} \times 8^{\frac{1}{3}}$. [4]

$\dfrac{4^{x+1}}{2^{x-1}} = 32^{\frac{x}{3}} \times 8^{\frac{1}{3}}$

**2.**
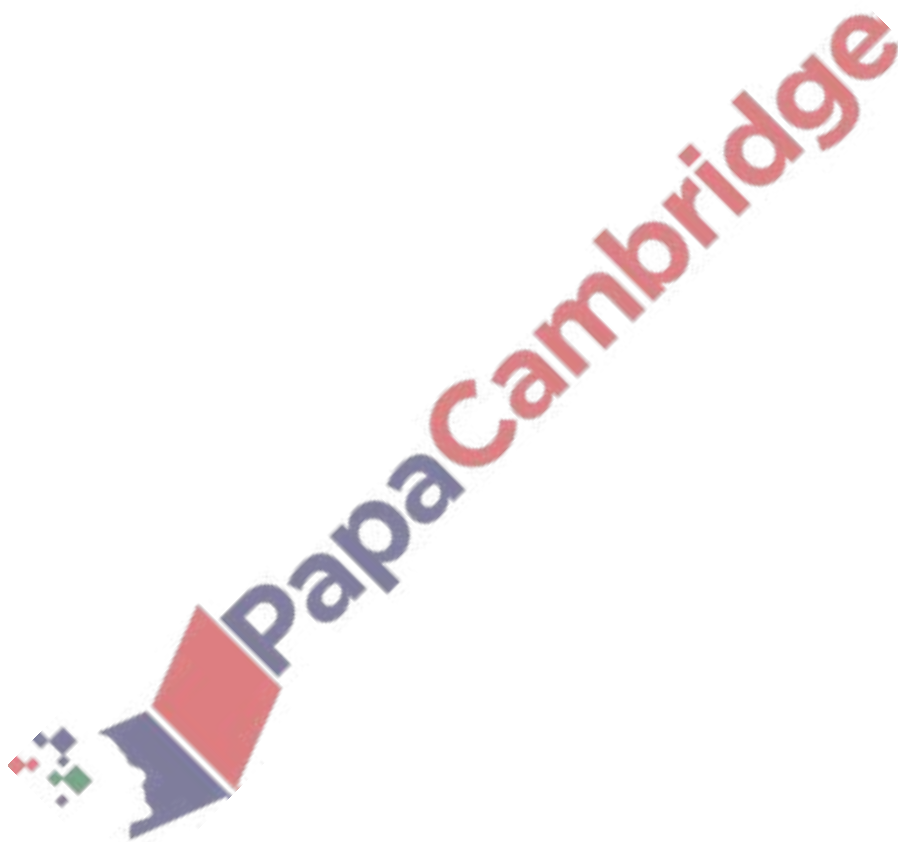
**DO NOT USE A CALCULATOR IN THIS QUESTION.**

In this question lengths are in centimetres.
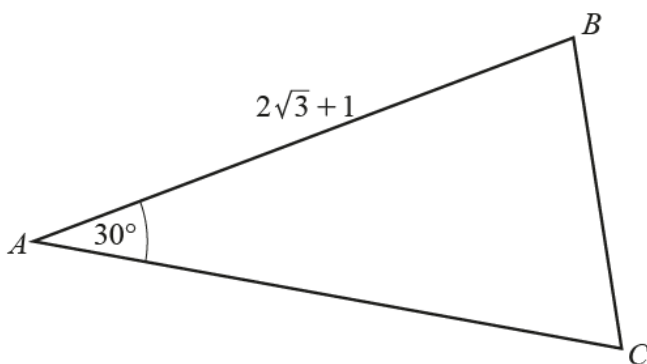


You may use the following trigonometric ratios.

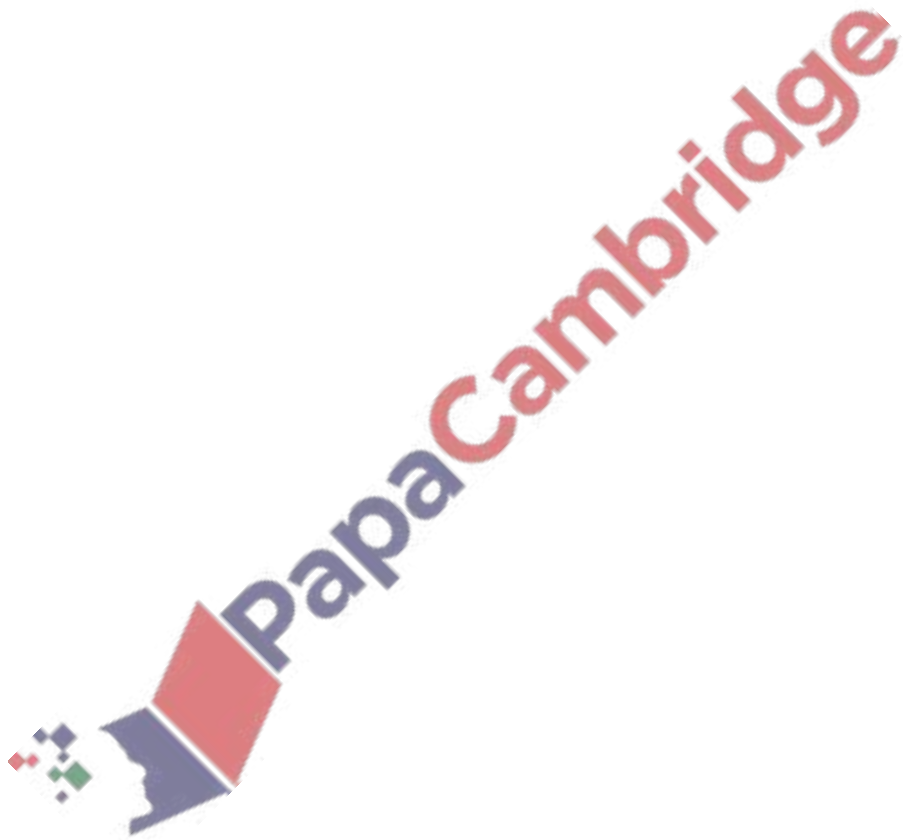$$\sin 30° = \frac{1}{2}$$

$$\cos 30° = \frac{\sqrt{3}}{2}$$

$$\tan 30° = \frac{1}{\sqrt{3}}$$

**(a)** Given that the area of the triangle $ABC$ is $5.5\,\text{cm}^2$, find the exact length of $AC$. Write your answer in the form $a + b\sqrt{3}$, where $a$ and $b$ are integers. [4]

**(b)** Show that $BC^2 = c + d\sqrt{3}$, where $c$ and $d$ are integers to be found. [4]

2

**DO NOT USE A CALCULATOR IN THIS QUESTION.**

Solve the quadratic equation $(\sqrt{7}-2)x^2 - 4x + (\sqrt{7}+2) = 0,$ giving each of your answers in the form $a + b\sqrt{7}$, where $a$ and $b$ are constants. [7]
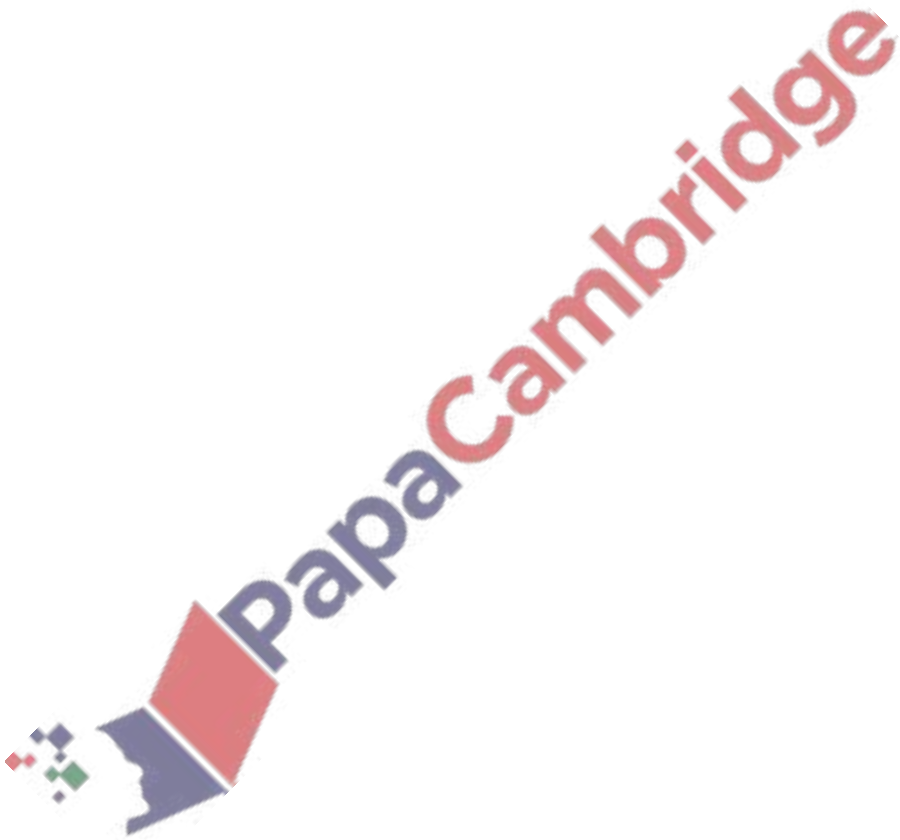
**DO NOT USE A CALCULATOR IN THIS QUESTION.**

Find the positive solution of the equation $(5 + 4\sqrt{7})x^2 + (4 - 2\sqrt{7})x - 1 = 0$, giving your answer in the form $a + b\sqrt{7}$, where $a$ and $b$ are fractions in their simplest form. [5]

**5.**
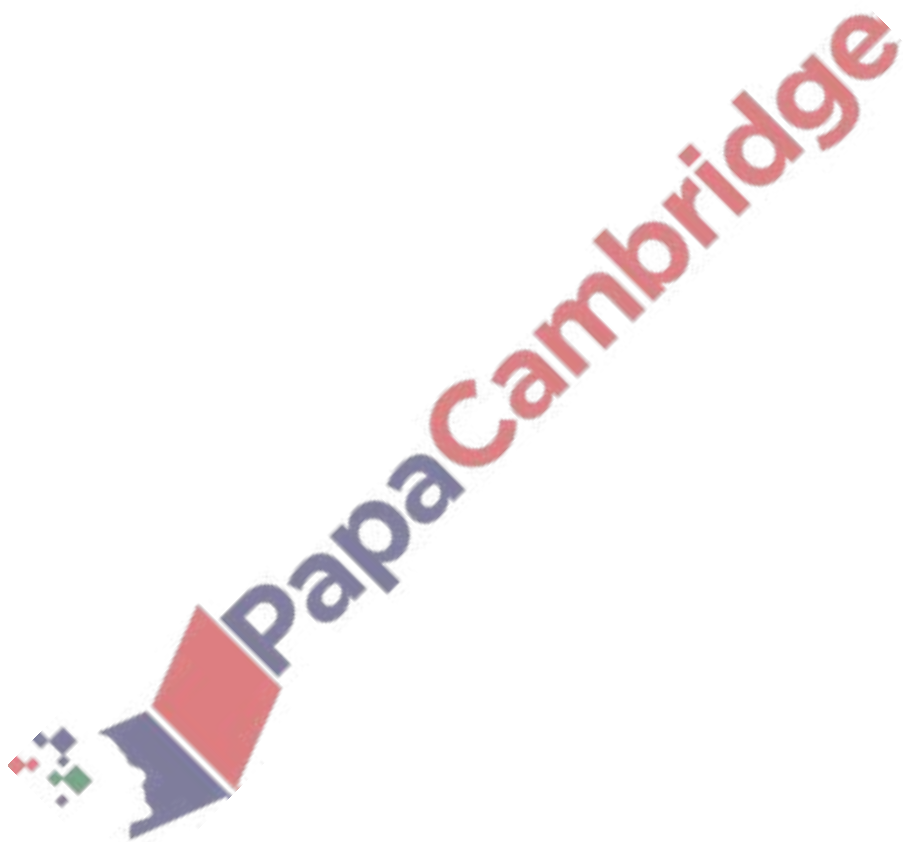
**DO NOT USE A CALCULATOR IN THIS QUESTION.**

The point $\left(1 - \sqrt{5}, p\right)$ lies on the curve $y = \dfrac{10 + 2\sqrt{5}}{x^2}$. Find the exact value of $p$, simplifying your answer. [5]

**6.**

   **(a)** Solve the equation $\dfrac{9^{5x}}{27^{x-2}} = 243$. [3]