Day 190 **S Tier 10-a-day**

1 $\mathbf{a} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$

$\mathbf{a} + k\mathbf{b}$ is parallel to $\mathbf{c}$.

Work out the value of k.

2 Work out $27^{-\frac{2}{3}}$

3 60 beetles in a field are caught, marked and put back.

Later, a second sample of 40 beetles is caught. 5 of these are marked.

(a) Work out an estimate for the number of beetles in a field.

(b) State one assumption you have made.

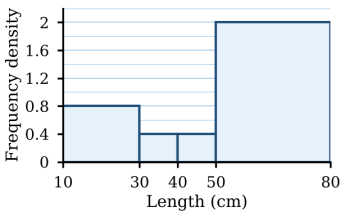
4 Rationalise the denominator of $\frac{4}{3\sqrt{5}}$

Give your answer in its simplest form.

5 The histogram shows the lengths of leaves collected from a tree.

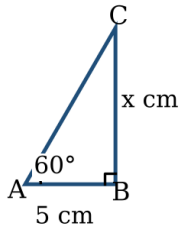
(a) Work out the total number of leaves.

(b) Estimate the number of leaves with a length between 20 cm and 45 cm.



Day 190	S Tier 10-a-day

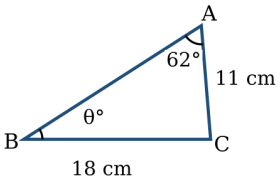
6 ABC is a right-angled triangle.
Work out the exact value of x. Give your answer in its simplest form.
The diagram is not drawn accurately.



7 The product of two positive numbers is 84.
The larger number is 5 more than the smaller number.
Let the smaller number be n.
(a) Show that $n^2 + 5n - 84 = 0$
(b) Work out the two numbers.

8 The lengths of the sides of a right-angled triangle are x cm, $(x - 1)$ cm and $(x + 1)$ cm.
The longest side is $(x + 1)$ cm.
(a) Show that $x^2 - 4x = 0$
(b) Hence work out the area of the triangle.

9 The diagram shows triangle ABC. (Calculator)
Angle BAC = 62° and angle ABC is acute.
Work out the size of angle ABC, marked θ.
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.



10 Uma invests £9,500 for 5 years at 4% per year compound interest.
Work out the value of the investment at the end of the 5 years.
Give your answer to the nearest penny.
(Calculator)