Day 211 **S Tier 10-a-day**

1 $\mathbf{a} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$

Work out the exact length of the vector $\mathbf{a} - 2\mathbf{b}$.
Give your answer as a simplified surd.

2 The table shows the number of students in each of four groups.
(a) A stratified sample of 38 is taken. Work out how many come from Year 10.
(b) A different stratified sample has 30 from Year 8. Work out the size of this sample.

	Year 7	Year 8	Year 9	Year 10
Number	200	200	180	180

3 (a) Write $x^2 - 6x + 18$ in the form $(x + p)^2 + q$
(b) Write down the coordinates of the turning point of the curve $y = x^2 - 6x + 18$

4 In one country, income tax is worked out like this:
The first £12,500 of income is not taxed.
The next £37,500 is taxed at 20%.
All income above that is taxed at 40%.
Kofi earns £86,000 in a year.
Work out how much income tax Kofi pays.

5 The table gives information about the times taken by some people to travel to work.
An estimate for the mean is 52.
Work out the value of x.

Time, t (minutes)	Frequency
$0 < t \leq 20$	8
$20 < t \leq 40$	20
$40 < t \leq 60$	14
$60 < t \leq 80$	x
$80 < t \leq 100$	15

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6 A rectangle has length 9 cm and width 13 cm. Both measurements are correct to the nearest centimetre. Uma says that the perimeter of the rectangle could be exactly 48 cm. Is Uma correct? You must show your working.	
7 In a bag, the ratio of the number of red counters to the number of blue counters is 2 : 7. Then 3 red counters are removed and 2 more blue counters are added. The ratio is now 1 : 6. How many blue counters were there at the start?	
8 A circle has centre C(−5, 3) and passes through the point P(−1, 5). Find an equation of the circle.	
9 ABCD is a rectangle with AB = 15 cm and AD = 16 cm. A point P inside the rectangle is such that AP ≤ 12 cm and P is nearer to AB than to AD. Work out the area of the region in which P can lie. Give your answer in terms of π.	
10 Solve the simultaneous equations $x^2 + y^2 = 65$ $y = 3x + 5$	