**Day 34** **A Level Maths: A Tier 10-a-day**

**1** $f(x) = 3x^3 - 6x^2 - 33x - 18$.
(a) Show that $(x + 2)$ is a factor of $f(x)$.
(b) Solve $f(x) = 0$, giving surds in simplest form.

**2** The equation $e^x = 2x + 5$ has a root $\alpha$. Use the iteration $x_{n+1} = \ln(2x + 5)$ with $x_0 = 1$ to find $x_1$, $x_2$ and $x_3$ to 4 d.p., and hence the value of $\alpha$ to 2 d.p. (continue until the 2 d.p. value is settled).

**3** The table summarises the time, t seconds, to complete a task.
Estimate the mean and standard deviation (3 s.f.).

| Class | Frequency |
|---|---|
| $0 \le t < 20$ | 3 |
| $20 \le t < 40$ | 4 |
| $40 \le t < 60$ | 8 |
| $60 \le t < 80$ | 2 |
| $80 \le t < 100$ | 17 |
| $100 \le t < 120$ | 11 |

**4** A particle of mass 4 kg is acted on by forces $\mathbf{F}_1 = (-7\mathbf{i} - 28\mathbf{j})$ N and $\mathbf{F}_2$. Its acceleration is $(-4\mathbf{i} - 4\mathbf{j})$ m s$^{-2}$. Find (a) $\mathbf{F}_2$, (b) the angle between $\mathbf{F}_2$ and $\mathbf{i}$, to 1 d.p.

**5** $f(x) = x^3 - 4x - 11$.
Show that the equation $f(x) = 0$ has a root $\alpha$ in the interval $[2, 3]$.

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|---|---|
| **6** A circle touches both coordinate axes and passes through the point $(2, -1)$. Its centre lies in the fourth quadrant.<br>Find the equations of the two possible circles. | |
| **7** $X \sim N(66, 5^2)$. Find $P(X > 76 \mid X > 70)$ to 3 significant figures. | |
| **8** A 4 kg box is pulled from rest along rough horizontal ground by a horizontal force of 11.04 N and moves 10 m in 5 s. Find (a) the coefficient of friction. The force is then removed; (b) find the further distance moved. Take $g = 9.8$. Give answers to 3 s.f. if not exact. | |
| **9** Solve $x(\sqrt{7} - 3) = 1 - 3\sqrt{7}$, writing x in the form $p + q\sqrt{7}$. | |
| **10** $l_1: \mathbf{r} = \begin{pmatrix} 2 \\ 7 \\ 3 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ -3 \\ 3 \end{pmatrix}$<br>$l_2: \mathbf{r} = \begin{pmatrix} 3 \\ 4 \\ 8 \end{pmatrix} + \mu \begin{pmatrix} -2 \\ -2 \\ -2 \end{pmatrix}$<br>Determine whether $l_1$ and $l_2$ intersect. If they do, find the point of intersection. | |