

Question number	Scheme	Marks
<p><b>1.</b> (a)</p> <p>(b)</p>	$1 \times 7 + 2 \times 7 + \dots \quad a = 7, d = 7, n = 142 \quad n = 142$ $S_n = \frac{1}{2}n(a + b) \quad \text{or} \quad \frac{1}{2}n(2a + (n - 1)d) \quad \text{or} \quad 7 \times \frac{n(n + 1)}{2}$ $= \frac{142}{2}(7 + 994) \quad \text{or} \quad \frac{142}{2}(14 + 141 \times 7) \quad \text{or} \quad 7 \times \frac{142 \times 143}{2} = 71\,071$ $\sum_{r=1}^{142} (7r + 2) = \sum_{r=1}^{142} 7r + \sum_{r=1}^{142} 2 \quad \text{split}$ $\sum_{r=1}^{142} 2 = 2 \times 142$ $\therefore \sum_{r=1}^{142} (7r + 2) = 71\,071 + 2 \times 142 = \mathbf{71\,355}$	<p>B1</p> <p>M1 (use of correct formula)</p> <p>A1 (3)</p> <p>M1</p> <p>A1 (3)</p> <p><b>(6 marks)</b></p>
<p><b>2.</b></p>	$x = 3y - 1$ $(3y - 1)^2 - 3y(3y - 1) + y^2 = 11 \quad y^2 - 3y - 10 = 0$ $(y - 5)(y + 2) = 0 \quad y = 5 \quad y = -2$ $x = 14 \quad x = -7$	<p>M1</p> <p>M1 A1</p> <p>M1 A1</p> <p>M1 A1 ft</p> <p><b>(7 marks)</b></p>
<p><b>3.</b> (a)</p> <p>(b)</p>	$(5p - 8) - p = (3p + 8) - (5p - 8)$ <p>Solve, showing steps, to get <math>p = 4</math>, or verify that <math>p = 4</math>. (*)</p> $a = 4 \quad \text{and} \quad d = 8 \quad (\text{stated or implied here or elsewhere}).$ $T_{40} = a + (n - 1)d = 4 + (39 \times 8) = 316$	<p>M1</p> <p>A1 c.s.o. (2)</p> <p>B1</p> <p>M1 A1 (3)</p> <p><b>(5 marks)</b></p>

Question number	Scheme	Marks
<p><b>4.</b> (a)</p> <p>(b)</p>	$b^2 - 4ac = (-k)^2 - 36 = k^2 - 36$ <p>Or, (completing the square), <math>\left(x - \frac{1}{2}k\right)^2 = \frac{1}{4}k^2 - 9</math></p> <p>Or, if <math>b^2</math> and <math>4ac</math> are compared directly, [M1] for finding both [A1] for <math>k^2</math> and 36.</p> <p>No real solutions: <math>k^2 - 36 &lt; 0</math>, <math>-6 &lt; k &lt; 6</math> (ft their "36")</p> $x^2 - 4x + 9 = (x - 2)^2 + 5 \quad (p = 2)$ <p>Ignore statement <math>p = -2</math> if otherwise correct.</p> $x^2 - 4x + 9 = (x - 2)^2 - 4 + 9 = (x - 2)^2 + 5 \quad (q = 5)$ <p>M: Attempting <math>(x \pm a)^2 \pm b \pm 9</math>, <math>a \neq 0</math>, <math>b \neq 0</math>.</p>	<p>M1 A1</p> <p>M1, A1ft (4)</p> <p>B1</p> <p>M1 A1 (3)</p> <p><b>(7 marks)</b></p>
<p><b>5.</b> (a)</p> <p>(b)</p>	$y = 5x - x^{-1} + C$ $7 = 5 - 1 + C, \quad C = 3$ $x = 2: \quad y = 10 - \frac{1}{2} + 3 = 12\frac{1}{2}$	<p>M1 A2 (1,0) (3)</p> <p>M1 A1 ft</p> <p>M1 A1 (4)</p> <p><b>(7 marks)</b></p>

Question number	Scheme	Marks
6.	$V = \pi r^2 h = 500, \quad A = 2\pi r h + \pi r^2$ $A = 2\pi r \left( \frac{500}{\pi r^2} \right) + \pi r^2 = \pi r^2 + \frac{1000}{r}$	B1, M1 M1 A1 <b>(4 marks)</b>
7.	<p>(a) Mid-point of <math>AB = [\frac{1}{2}(-3 + 8), \frac{1}{2}(-2 + 4)] = (\frac{5}{2}, 1)</math></p> <p>(b) <math>M_{AB} = \frac{4 - (-2)}{8 - (-3)}, = \frac{6}{11}</math></p> <p>Equation of <math>AB: y - 4 = \frac{6}{11}(x - 8)</math></p> <p><math>\Rightarrow 11y - 44 = 6x - 48, \quad \Rightarrow 6x - 11y - 4 = 0</math> (or equivalent)</p> <p>(c) Gradient of tangent = <math>-\frac{11}{6}</math></p> <p>Equation: <math>y - 4 = -\frac{11}{6}(x - 8)</math> (or <math>6y + 11x - 112 = 0</math>)</p> <p>(d) Equation of <math>l: y = \frac{2}{3}x</math></p> <p>Substitute into part (c): <math>\frac{2}{3}x - 4 = -\frac{11}{6}x + \frac{88}{6}</math></p> <p><math>\Rightarrow x = 7\frac{7}{15}, y = 4\frac{44}{45}</math></p>	M1, A1 (2) M1, A1 M1 A1 (4) B1 ft M1 A1 (3) B1 M1 A1, A1 (4) <b>(13 marks)</b>