

Maximum 40 marks

M	For using a method which should lead to a correct answer.
A	For a correct answer. A marks can only be gained if the previous M mark has been gained.
Aft	Follow through their working and allow A mark if correct.
B	For an answer which is exactly as in the mark scheme.

**INSTRUCTIONS:**

- Write **only** in the answer booklet.
- You **must** show your method.
- Where rounding is necessary give your answers correct to **3 significant figures** unless stated otherwise.
- Where appropriate give the **units** for your answers.

1	<p>(You must show your method.)</p> <p>(a) Simplify <math>\sqrt{12} = \sqrt{3 \times 4} = 2\sqrt{3}</math></p> <p>(b) Rationalise and simplify <math>\frac{1}{3-\sqrt{7}} \times \frac{3+\sqrt{7}}{3+\sqrt{7}}</math></p> $= \frac{3 + \sqrt{7}}{2}$	<p>B1 must show method</p> <p>M1</p> <p>A1</p>
2	<p>Simplify (a) <math>x^3 \times x^7 = x^{10}</math></p> <p>(b) <math>(3t^3)^4 = 81t^{12}</math></p>	<p>B1</p> <p>B1</p>
3	<p>Fully factorise</p> <p>(a) <math>3x^2 - 2x - 8 = (3x + 4)(x - 2)</math></p> <p>Allow B1 for <math>(3x - 4)(x + 2)</math></p> <p>(b) <math>3x^2 - 75 = 3(x + 5)(x - 5)</math></p> <p>Allow B1 for only factorising once</p>	<p>B2</p> <p>B2</p>

4	<p>Make <math>n</math> the subject of</p> $B = \frac{4\sqrt{d}}{RT}$ $\sqrt{d} = \frac{BRT}{4}$ $\therefore d = \frac{B^2 R^2 T^2}{16} = \frac{(BRT)^2}{16}$	<p>A1</p> <p>A1 accept either answer</p>
5	<p>Solve the equation</p> $\frac{4}{3} = \frac{16}{x+5}$ $\therefore 4(x+5) = 3 \times 16$ $\therefore x = 7$	<p>M1 for eliminating the denominators</p> <p>A1</p>
6	<p>Use the quadratic formula to find the roots of</p> $6x^2 + 3x - 7 = 0$ <p>giving your correct to <b>3 significant figures</b>.</p> $x = \frac{-3 \pm \sqrt{(3)^2 - 4(6)(-7)}}{2(6)}$ $\therefore x = 0.859 \text{ or } x = -1.36$	<p>A1 for substituting values correctly</p> <p>M1 for finding <u>two</u> values</p> <p>A1 for both values correctly rounded</p>
7	<p>Use Pascal's triangle to find the expansion of <math>(4 - 3x)^4</math> Simplify your answer.</p> $= 16 - 96x + 216x^2 - 216x^3 + 81x^4$	<p>B1 for 5 terms AND correct powers of <math>x</math></p> <p>B1 for correct coefficients</p>
8	<p>Solve the simultaneous equations</p> $\begin{array}{ll} 2x + 7y = 11 & (1) \\ 5x + 3y = 13 & (2) \end{array}$ $\begin{array}{ll} (1) \times 5: & 10x + 35y = 55 \quad (3) \\ (2) \times 2: & 10x + 6y = 26 \quad (4) \end{array}$ $(3) - (4): \quad 29y = 29$ $\therefore y = 1$ <p>using (1): <math>2x + 7(1) = 11</math></p> $\therefore x = 2$	<p>M1 for <math>\times</math> (1) &amp; (2) by suitable values AND subtracting</p> <p>A1 (or <math>x</math>)</p> <p>A1 ft their <math>y</math></p>

9	<p>(a) Convert <math>90^\circ</math> to radians giving your answer as a multiple of <math>\pi</math>.</p> $= \frac{\pi}{2} \text{ (rad)}$ <p>(b) Convert 1.8 radians into degrees.</p> $= 103^\circ \text{ or } 103.1^\circ$	<p>B1 condone missing units but must be a multiple of <math>\pi</math></p> <p>B1 condone missing units</p>
10	<p>Find the two angles in the range <math>0^\circ</math> to <math>360^\circ</math> whose tangent is <math>-1</math></p> $= 135^\circ \text{ and } 315^\circ$	B1 must have both
11	<p>(a)</p> $BC^2 = 16^2 + 18^2 - 2(16)(18) \cos 35^\circ$ $= 108.2$ $\therefore BC = 10.4\text{cm}$	<p>M1 A1</p> <p>A1*</p>
	<p>(b)</p> $\text{Area} = \frac{1}{2} \times 16 \times 18 \times \sin 35^\circ$ $= 82.6\text{cm}^2$	<p>M1</p> <p>A1*</p>
	<p>(c)</p> <p>Let perpendicular height of <math>B</math> be <math>h</math></p> <p>Either (using trig)</p> $\frac{h}{16} = \sin 35^\circ$ $\therefore h = 9.18\text{cm}$ <p>Or (using area)</p> $82.6 = \frac{1}{2} \times 18 \times h$ $\therefore h = 9.18\text{cm}$	<p><b>Either</b></p> <p>M1</p> <p>A1*</p> <p><b>Or</b></p> <p>M1</p> <p>A1*</p>
	<p>* Should be rounded to 3 sf and have the correct units but only penalise once in this question</p>	

12	<p>Differentiate the following with respect to <math>x</math> [4 marks]</p> <p>(a) <math>y = \frac{3}{x^4} = 3x^{-4}</math>  <math>\therefore \frac{dy}{dx} = -12x^{-5} = -\frac{12}{x^5}</math></p> <p>(b) <math>y = 6\sqrt[3]{x} = 6x^{\frac{1}{3}}</math>  <math>\therefore \frac{dy}{dx} = 2x^{-\frac{2}{3}} = \frac{2}{\sqrt[3]{x^2}}</math></p>	<p>M1</p> <p>A1 Accept either answer</p> <p>M1</p> <p>A1 Accept either answer</p>
13	<p>Determine the co-ordinates of the point on the graph</p> $y = 3x^2 + 8x - 1$ <p>where the gradient is -4</p>	
	$\frac{dy}{dx} = 6x + 8$ $\text{let } 6x + 8 = -4$ $\therefore x = -2$ $\text{when } x = -2, y = 3(-2)^2 + 8(-2) - 1$ $= -5$ <p>So the required co-ordinates are <math>(-2, -5)</math></p>	<p>M1 for using differentiation A1</p> <p>A1</p> <p>M1 for substituting</p> <p>A1 ft their value of <math>x</math> must be given as co-ordinates</p>

**End of Examination**