Unit 3 Higher Tier: Number, Algebra, Geometry 2

5MB3H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
1. **FE**		380 ÷ 200 = 1.9 350 ÷ 175 = 2	Regular by 0.1p per gram	3	M1 for 380 ÷ 200 (= 1.9) or 200 ÷ 380 (= 0.526) M1 for 350 ÷ 175 (= 2) oe or 175 ÷ 350 (= 0.5) oe C1 for Regular with correct calculations
					Total for Question: 3 marks
2.	(a)(i) (ii)		4.08	3	B1 for 5.6644 or 81.8535(2772…) or 76.1(8912772…) or 18.67 B1 for 4.08(0831694) B1 cao
					Total for Question: 3 marks
3.		$2(3x + 2x + 7) = 22$ **OR** $3x + 2x + 7 + x + x + 2x + x + 7 = 22$ $10x + 14 = 22$ $10x = 8$ $x = 0.8$ Area = 2.4 × 8.6 – 1.6 × 0.8 **OR** 0.8 × 08 + 2.4 × 7.8	19.36 cm²	5	M1 for attempt to find an expression of the perimeter A1 for $10x + 14 = 22$ A1 for $x = 0.8$ M1 for attempt to find area A1 for 19.36
					Total for Question: 5 marks
4.	(a)		–3, –2, –1, 0, 1	2	B2 for –3, –2, –1, 0, 1 (B1 for –2, –1, 0, 1 or –2, –1, 0, 1, 2)
	(b)		$-1 < x \leq 3$	2	B2 for $-1 < x \leq 3$ (B1 for $-1 \leq x \leq 3$ or $-1 < x < 3$
					Total for Question: 4 marks

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5. **QWC (ii, iii)** **FE**		For 100 units: N Eastern = £30 Pacific = £20 East Anglian = £20 For 200 units: N Eastern = £30 Pacific = £40 East Anglian = £30 **OR** Graphs plotted correctly	Correct conclusion with justifying working	5	B1 for calculating 2 correct points for Pacific M1 for attempt find 2 correct points on East Anglian A1 for two correct points on East Anglian M1 for calculating a point that allows a comparison to be made between 100 and 200 units C1 for correct conclusion **QWC: Decision must be stated, and all comments should be clear and follow through from working out**
					Total for Question: 5 marks
6. **FE**	(a)	2 × (62 + 0.50+ 1) "127" × 1.15	£146.05	3	M2 for attempt to find cost including VAT e.g. "127" × 1.15 (M1 for VAT = "127" × 0.175 or $\frac{15}{100} \times 127$ or 12.70 + 6.35) A1 cao
	(b)	71.30 ÷ 1.15	£62	2	M1 for 71.30 ÷ 1.15 or 71.30 ÷ 115 × 100 A1 cao
	(c)		1.02(173913)	2	M1 for ÷ 1.15 or × 1.175 A1 for 1.02(173913)
					Total for Question: 7 marks
7.		1189 ÷ 200 or 891 ÷ 200 = 5 and 4 or 20 squares $200^2 \div 2$ $= \sqrt{(200^2 \div 2)}$ = 141.4 Realising that another row of squares of side 141.4 fits or 891 ÷ 141.4 = 5 squares	90	5	M1 for attempt to divide 1189 ÷ 200 or 891 ÷ 200 M1 for $200^2 \div 2$ M1 for $\sqrt{(200^2 \div 2)}$ M1 for realising that another row of squares of side 141.4 fits or 891 ÷ 141.4 A1 cao for 90 triangles
					Total for Question: 5 marks

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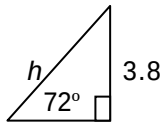
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
8. **FE**		 $\sin 72 = \frac{3.8}{h}$ $h = \frac{3.8}{\sin 72}$	4 m	4	M1 for drawing sketch of scenario showing all information M1 for $\sin 72 = \frac{3.8}{h}$ or for attempt at scale drawing M1 for $h = \frac{3.8}{\sin 72}$ C1 any ladder over 4.66 m long providing M3 earned NB scale drawing attempt scores a maximum of 2 marks
					Total for Question: 4 marks
9.	(a)	$2 = 2 \times 3.14 \times \sqrt{\frac{l}{9.81}}$ $\sqrt{\frac{l}{9.81}} = \frac{2}{2 \times 3.14}$ $\frac{l}{9.81} = \left(\frac{2}{2 \times 3.14}\right)^2$ $l = 9.81 \times \left(\frac{2}{2 \times 3.14}\right)^2$	0.995	2	M1 for dividing 2 by 2 × 3.14 and squaring A1 for 0.994(96937) cao
	(b)	$T^2 = 4\pi^2 \frac{l}{g}$ $\frac{T^2}{4\pi^2} = \frac{l}{g}$	$l = \frac{T^2 g}{4\pi^2}$	3	M1 for squaring both sides M1 for dividing by $4\pi^2$ or multiplying by g A1 for $l = \frac{T^2 g}{4\pi^2}$ oe
					Total for Question: 5 marks

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10.		$x(x + 3) = (x + 7)(x + 4)$	−3.5	4	M1 for multiplying through by LCD = $(x + 4)(x + 3)$ A1 for $x^2 + 3x = x^2 + 11x + 28$ B1 for − 28 = 8 A1 cao
					Total for Question: 4 marks
11.	(a)	78 – 65 = 13 $\frac{DB}{\sin 65} = \frac{50}{\sin"13"}$ $DB = \frac{50}{\sin"13"} \times \sin 65$ (=201..) "201" × sin 78	197 m	6	B1 for 13° M1 for $\frac{DB}{\sin 65} = \frac{50}{\sin"13"}$ M1 for $DB = \frac{50}{\sin"13"} \times \sin 65$ A1 for 201 – 201.5 M1 for "201" × sin 78 A1 for 196.6 – 197.1 **OR** B1 for 13° M1 for $\frac{AD}{\sin 102} = \frac{50}{\sin"13"}$ M1 for $AD = \frac{50}{\sin"13"} \times \sin 102$ A1 for 217 – 217.42 M1 for "217" × sin 65 A1 for 196.6 – 197.1
					Total for Question: 6 marks

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
12.		$15x + 10y = 55$ $4x - 10y = 40$ $19x = 95$ $x = 5$ $15 + 2y = 11$ $2y = -4$ $y = -2$	$x = 5$ $y = -2$	4	M1 for correct multiplication and use of correct operation to eliminate either x or y ,condone one arithmetical error A1 for either $x = 5$ or $y = -2$ M1 (dep) for substitution of found variable into either equation A1 for correct value of 2nd variable **OR** M1 Correct rearrangement of 1 equation and substitution into 2nd equation A1 for either $x = 5$ or $y = -2$ M1 (dep) for substitution of found variable into either equation A1 for correct value of 2nd variable **OR** M1 for one line drawn M1 for second line drawn A1 for $x = 5$ A1 for $y = -2$ (SC : If no method marks awarded, score B1 for one value correct)
					Total for Question: 4 marks
13.		$\frac{-2 \pm \sqrt{2^2 - 4 \times 3 \times -4}}{2 \times 3}$ $= \frac{-2 \pm \sqrt{52}}{6}$ **OR** $3(x + \frac{1}{3})^2 - \frac{13}{3} = 0$ $(x + \frac{1}{3})^2 = \frac{13}{9}$	0.869 –1.54	3	M1 for $\frac{-2 \pm \sqrt{2^2 - 4 \times 3 \times -4}}{2 \times 3}$ allow substitution of $c = \pm 4$ M1 for $\frac{-2 \pm \sqrt{52}}{6}$ A1 for 0.869 and –1.54 **OR** M1 for $3(x + \frac{1}{3})^2 - \frac{13}{3} = 0$ M1 for $(x + \frac{1}{3})^2 = \frac{13}{9}$ A1 for 0.869 and –1.54 **Trial and improvement:** M1 correct set of trials A1 for 0.869 and –1.54
					Total for Question: 3 marks

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14. **FE**		$\frac{(29.95 \times 14.95 \times 7.95)^3}{\frac{4}{3}\pi(0.255)^3}$ $= \frac{3559.632375}{0.0694559011\ 8}$	£462.25	6	B1 for using the least value of 1 dimension of the cuboid M1 for 29.95 × 14.95 × 7.95 oe B1 for using greatest radius of sphere as 0.25cm + 0.005 cm M1 for dividing least volume of lead "3559.632375" by greatest volume of sphere "0.0694559" A1 for 51250 or Selling price = £51.25 A1 for Profit = £1.25 cao
					Total for Question: 6 marks

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
15. **QWC (i,ii, iii)**		Join *AO* and produce to *P* Mark equal angles in isosceles triangle *AOC* or *AOB* Mark angle *COP* as twice angle *CAO* or mark angle *BOP* as twice angle *BAO* Identify angle *A* as half angle *BOC*		4	M1 for Joining *AO* and producing to "*P*" M1 for marking equal angles in isosceles triangle *AOC* or *AOB* giving reason that triangles are isosceles because radii are equal M1 for marking angle *COP* as twice angle *CAO* or marking Angle *BOP* as twice angle *BAO* giving reason that exterior angle of a triangle is equal to the interior and opposite angles o.e. **QWC: Working should be logical and sequential in structure; following on from labelling the extended line** A1 for Identifying angle *A* as half angle *BOC* if M3 awarded **QWC: All labelling and angle notation should be consistent**
					Total for Question: 4 marks
16.	(a)	$-6\mathbf{b} - 6\mathbf{a} + 12\mathbf{b}$	$6\mathbf{b} - 6\mathbf{a}$	1	B1 cao
QWC (ii, iii)	(b)	$\overrightarrow{BC} = -6\mathbf{b} - 6\mathbf{b} + 12\mathbf{b} = 6\mathbf{b} - 6\mathbf{a}$ $\overrightarrow{CY} = 4\mathbf{b} - 4\mathbf{a}$ $\overrightarrow{OX} = 12\mathbf{b} - 3\mathbf{a}$ $\overrightarrow{OY} = 12\mathbf{b} + 4\mathbf{b} - 4\mathbf{a} = 16\mathbf{b} - 4\mathbf{a}$ $\overrightarrow{OX} : \overrightarrow{OY} = 3 : 4$		4	M1 for attempt to find $\overrightarrow{CY}$ or sight of $\frac{2}{3}(6\mathbf{b} - 6\mathbf{a})$ M1 for attempt to find $\overrightarrow{OX}$ or sight of $12\mathbf{b} - 3\mathbf{a}$ M1 for attempt to find $\overrightarrow{OY}$ or sight of $12\mathbf{b} + 4\mathbf{b} - 4\mathbf{a}$ A1 for $OX : OY = 3 : 4$ shows that *OX* and *OY* are co-linear **QWC: labelling must be consistent and correct**
					Total for Question: 5 marks
17.	(a) (i) (ii)		(1, 5) (3, 2)	2	B1 cao B1 cao
	(b)		Reflection in x axis	1	B1 cao
					Total for Question: 3 marks

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
18.		$\frac{120}{360} \times 2\pi \times 10.3 = 21.572$ "21.572" $\div 2\pi = 3.4333$ $\sqrt{(10.3^2 - 3.433^2)}$	9.71	4	M1 for Length of arc = $\frac{120}{360} \times 2\pi \times 10.3$ M1 for Radius of circle = "21.572" $\div 2\pi$ M1 for $\sqrt{(10.3^2 - 3.433^2)}$ A1 cao
					Total for Question: 4 marks