

Question	Working	Answer	Mark	Notes	Sub-Total	Total
1	$\frac{23}{8} \times \frac{8}{5}$		M1	Need to see $\frac{23}{8} \times \frac{8}{5}$ and $\frac{23}{5}$ or $\frac{184}{40}$		2
		$4\frac{3}{5}$	A1	NB no marks for an answer without any working. Must be the mixed fraction in its simplest form		
2	$360 \div 12$ or $180(n - 2) = 168n$ oe		M1	$360 \div (180 - 168)$ NB $180(n - 2) = 168$ is M0		2
		30	A1			
3	$(1.7 \times 10^7) \div (1.5 \times 10^3)$		M1	for 1.1(3) $\dot{3} \times 10^n$ or correct value to 2 or more significant figures. Eg 11333.33... 11000, 11300		2
		1.1×10^4	A1	cao 1.1×10^4		
4	$-3 \times 7x^{-4} - 5x^4$		M1	for one correct term (allow $-3 \times 7x^{-4}$)		2
		$-21x^{-4} - 5x^4$	A1	oe e.g. $-\frac{21}{x^4} - 5x^4$		
5	$\frac{12}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}}$ or $12 = 3a + 3b\sqrt{5} - a\sqrt{5} - 5b$ and $3a - 5b = 12$, $3b - a = 0$ oe		M1			2
	$\frac{36+12\sqrt{5}}{9-5}$ or $4b = 12$ or $4a = 36$	$9 + 3\sqrt{5}$	A1	Correct expansion/correct method for solving simultaneous equations with a correct answer and no errors. NB no marks for answer without any working.		

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6	$\angle EFG = 63^\circ$		M1	May be marked on diagram		3
	$\angle GEF = 54^\circ$ or $\angle BEF$ or $\angle DEG = 126^\circ$		M1	Allow $180 - \text{"their } \angle FEG\text{"}$ from correct work May be marked on diagram		
		126	A1			
7	e.g. $8x + 14y = -40$ $(-)8x - 2y = 8$ $16y = -48$ or $y = 4x - 4$ and $2x + 3.5(4x - 4) = -10$		M1	First stage of method to eliminate one variable – allow one error only in multiplication or one sign error eg $4x = 4 - y$ – with intention to add or subtract as appropriate or correct substitution.		3
	e.g. $4x - -3 = 4$		M1	Dep on first M1 method to find second variable or starting again.		
		$x = 0.25$ $y = -3$	A1	for both 0.25 oe and -3 dep on first M1		
8	$0.6^3 \times 0.4 (= \frac{54}{625} (0.0864))$		M1			3
	$0.6^3 \times 0.4 \times 4$		M1	Dep on 1 st M1		
		0.3456	A1	$\frac{216}{625}$ or 0.346 or 0.345 NB if working shown can allow 0.35		
9	$3 - 2x = 5(2x - 3)$ or $3 - 2x = 10x - 15$		M1	or $\frac{3}{5} - \frac{2}{5}x = 2x - 3$ oe		3
	$3 + 15 = 10x + 2x$ or $-2x - 10x = -15 - 3$ oe e.g. $18 = 12x$ or $2.4x = 3.6$, etc		M1	dep on first M1 for isolating x terms and numerical terms		
		1.5	A1	oe dep on at least one M1		

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10	19.45 or 19.35 or 2.35 or 2.45		B1		3	
	$(b =) 19.45 - 2 \times 2.35$		M1	Or for $UB_1 - 2 \times LB_2$ or $UB_1 = 2 \times LB_2 + b$ where $19.4 < UB_1 \leq 19.5$ & $2.3 \leq LB_2 < 2.4$		
		14.75	A1			
11	$3(x^3 + a) = 4(c - x^3)$ oe $3x^3 + 4x^3 = 4c - 3a$ or $3a - 4c = -4x^3 - 3x^3$		M1		3	
			M1	Collecting x terms on one side and other terms on the opposite side oe. Do not ISW		
		$\sqrt[3]{\frac{4c - 3a}{7}}$	A1	NB A0 for $\pm \sqrt[3]{\frac{4c - 3a}{7}}$ $3\sqrt{\frac{4c - 3a}{7}}$		
12	$5^{3k+4} = 125$		M1	Allow $\frac{750}{6}$	3	
	$3k + 4 = 3$		M1	Dep first M1 Writing "125" as a power of 5 and equating powers, 0.33(0.33...)		
		$-\frac{1}{3}$	A1	cao		
13	$\left[\frac{BE^2}{9.6^2} = \right] \left(\frac{9}{16} \right) \text{or} \left(\frac{27}{21+27} \right) \text{oe}$		M1	For $\frac{9}{16}$ or $\frac{27}{21+27}$ Alternate $h = 10$, $0.5BE \times x = 27$	3	
	$[BE =] \sqrt{\frac{9}{16}} \times 9.6$		M1	Alternate $(9.6 + BE)(10 - x) = 42$		
		7.2	A1			

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14 (a)(i) (ii) (iii)	$y = 2$ $x + y = 5$ $y = 2x + 1$		B1 B1 B1	correct line correct line (condone incorrect labelling) correct line	1 1 1	
(b)		R correctly placed	B1	Do not award if lines incorrect Ignore labelling of lines	1	4
15	$\frac{1}{5} \times \left(\frac{120}{5} \times 3 \right) (= 14.4(0))$ $0.35 \times \left(\frac{120}{5} \times 2 \right) (= 16.8(0))$ $\frac{'14.4' + '16.8'}{120} = \frac{"31.2"}{120}$		M1 M1 M1	or (Barry): $\frac{3}{5} \times \frac{1}{5} (= \frac{3}{25})$ or (Carlos): $\frac{35}{100} \times \frac{2}{5} (= \frac{14}{100} = \frac{7}{50})$ Dep on M2 or for $\frac{3}{25} + \frac{7}{50}$		4
		$\frac{13}{50}$ or 0.26	A1			

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16 (a)		$6w^5y^8$	B2	B1 for 2 terms correct as part of a product. Do not ISW	2	
(b)		$3a^2c$	B2	B1 for 2 terms correct as part of a product, allow $3a^2c^1$. Do not ISW	2	4
17	$OBA = 52^\circ$ $AOB = 76^\circ$ or $BAC = 128^\circ$ e.g. angle between tangent and radius = 90° base angles/radii equal / isosceles triangle <u>Angle sum of triangle</u> Angle sum of <u>triangle</u> = 180 <u>Angle sum of straight line</u> Angle sum of <u>straight line</u> = 180	14	M1 M1 A1 B1	may be marked on diagram may be marked on diagram must be identified as correct angles for 2 correct reasons for method used		
18 (a)	$\begin{pmatrix} -4 \\ 2 \end{pmatrix} + \begin{pmatrix} -2 \\ 6 \end{pmatrix}$ or $\begin{pmatrix} -2 \\ 6 \end{pmatrix} - \begin{pmatrix} 4 \\ -2 \end{pmatrix}$	$\begin{pmatrix} -6 \\ 8 \end{pmatrix}$	M1 A1	oe	2	
(b)	$\sqrt{(-6)^2 + 8^2}$	10	M1ft A1ft	ft part(a). Condone missing minus. ft part (a)	2	4

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19	$(3x+2) \times \frac{5}{3x^2 - 7x - 6} \left[-\frac{5}{x+3} \right]$		M1	For \times by reciprocal condone missing bracket round $3x + 2$	4	
	$(3x+2) \times \frac{5}{(3x+2)(x-3)} \left[-\frac{5}{x+3} \right]$		M1	Factorising correctly		
	$\frac{5(x+3) - 5(x-3)}{(x-3)(x+3)}$		M1	Correct method for combining into a single fraction		
	$\frac{5x+15 - 5x+15}{(x+3)(x-3)}$					
		$\frac{30}{x^2 - 9}$	A1	or $\frac{30}{(x+3)(x-3)}$		
20	$\overrightarrow{AP} = -\mathbf{a} + \frac{5}{6}(\mathbf{a} + 3\mathbf{b}) [= -\frac{1}{6}\mathbf{a} + \frac{5}{2}\mathbf{b}]$		M1	For correct vector for \overrightarrow{AP}	4	
	$\overrightarrow{AD} = -\mathbf{a} + n\mathbf{b}$ or $-\mathbf{a} + (5+n)\mathbf{b}$		M1	indep allow $\overrightarrow{OD} = \mathbf{a} + n\overrightarrow{AP}$		
	$\overrightarrow{AD} = 6(-\frac{1}{6}\mathbf{a} + \frac{5}{2}\mathbf{b}) [= -\mathbf{a} + 15\mathbf{b}]$		M1	or $AD = 6AP$ or $1 - \frac{1}{6}n = 0$ and $\overrightarrow{OD} = 15\mathbf{b}$		
	$OB : OD = 5 : 15$	1 : 3	A1	Seeing 5 : 15 or $5\mathbf{b} : 15\mathbf{b}$ equals 1 : 3 from correct working		

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21	$\sqrt{8^2 + 15^2}$ (=17)		M1	Using Pythagoras correctly		5
	$10 \times 9 + 18 \times 9 + 15 \times 9$		M1	correct areas of the 3 rectangles		
	$\frac{18+10}{2} \times 15$ or $10 \times 15 + \frac{8 \times 15}{2}$ [=210]		M1	Attempt at area of trapezium		
	$2 \times "210" + 10 \times 9 + 18 \times 9 + 15 \times 9 + "17" \times 9$		M1	dep on previous method marks – for adding the six areas together		
	960	A1				
22 (a)	$[T =] \frac{k}{y^2}$		M1	For $\frac{k}{y^2}$	3	5
	$0.32 = \frac{k}{5^2}$		M1	Subst 0.32 for T and 5 for y		
		$T = \frac{8}{y^2}$	A1	NB SCB1 for $0.32 = \frac{k}{\sqrt{5}}$		
(b)	$200 = \frac{"8"}{y^2}$		M1			2
		0.2	A1	oe		5

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23 (a)		$(x+5)^2 - 32$	B2	or for $p = 5$ and $q = -32$ B1 for $(x + 5)^2$, B1 for -32	2	
(b)	$(x + '5')^2 = '32'$		M1	ft from (a)		
	$x + '5' = \pm\sqrt{'32'}$		M1	ft		
		$-5 \pm \sqrt{32}$	A1	$-5 \pm 4\sqrt{2}$ gets A0 SCB1 for use of formula with correct answers although $-5 \pm 4\sqrt{2}$ is B0	3	5
24 (a)	$(-2)^3 - 3 \times (-2)^2 - 2a + 12 (=0)$ Or $(-2)^3 - 3 \times (-2)^2 - 2 \times -4 + 12$ $2a = -8$ or $-2a = 8$ or $2a = -20 + 12$, $a = -4$ Or $-8 - 12 + 8 + 12 = 0$ so $a = -4$		M1			
			A1	no working gains zero marks	2	
(b)	$(x + 2)(x^2 - 5x + 6)$ or $x^2(x - 3) - 4(x - 3)$		M1	Allow a sign error		
	$x^2 - 5x + 6 = (x - 2)(x - 3)$		M1	For factorising any 3 term quadratic which when expanded, the result gives at least 2 of the 3 terms from their trinomial, e.g. $(x - 6)(x - 1)(=0)$ will give x^2 and +6 terms or $(x^2 - 4)(x - 3)$ Indep of previous M mark		
		$(x+2)(x-3)(x-2)$	A1		3	5

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25 (a)	$1 - (0.15+0.13+0.2+0.32)$		M1		2	
		0.2	A1			
(b)	$\frac{0.32}{0.13} \times 39$ or $0.32 \times (39 \div 0.13)$ or 0.32×300		M1	oe	2	
		96	A1			
(c)	0.15×360		M1	oe	2	6
		54	A1			
26(a)		$\begin{pmatrix} 16 & 3 \\ -4 & 11 \end{pmatrix}$	B2	-1eoo	2	
(b)		$\begin{pmatrix} 11 & 0 \\ -3 & 10 \end{pmatrix}$	B2	-1eoo	2	
(c)		$(12 \quad -7)$	B1	for matrix of correct order or for 12 and -7 seen. Allow $10 + 2$, $-15 + 8$ or $5 \times 2 + 2 \times 1$ and $5 \times -3 + 2 \times 4$	2	6
			B1	fully correct including brackets		

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27	$\angle EOD = \frac{360 \times 3.5\pi}{12\pi} \text{ oe} (= 105)$		M1	method to find angle EOD		6
	$ED = \sqrt{6^2 + 6^2 - 2 \times 6 \times 6 \times \cos 105}$ or $ED = 2 \times 6 \sin 52.5 \text{ oe } (= 9.52) \text{ oe}$		M1	method to find length ED		
	$DC \times (DC + "9.52") = 9 \times 16$		M1	correct equation for DC Allow 9.5 or better for ED		
	$DC^2 + 9.52DC - 144 (= 0) \text{ oe}$		M1	Dep on previous M mark. correct equation in form to solve		
	$DC = \frac{-9.52 + \sqrt{9.52^2 - 4 \times 1 \times -144}}{2 \times 1}$		M1	Dep on previous two M marks fully correct method to find DC		
		8.15	A1			