

| 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. $8x + 14y = -40$ $4x - y = 4$ $(-)8x - 2y = 8$ $(-)4x + 7y = -20$ $16y = -48$ $-8y = 24$ 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 | 5 |
| (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 | | | |
| (b) | $(x + 2)(x^2 - 5x + 6)$ or $x^2(x - 3) - 4(x - 3)$ $x^2 - 5x + 6 = (x - 2)(x - 3)$ | | M1 | no working gains zero marks | 2 | |
| | | | M1 | Allow a sign error | | |
| | | $(x+2)(x-3)(x-2)$ | A1 | 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 | 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 | -1eeoo | 2 | |
| (b) | | $\begin{pmatrix} 11 & 0 \\ -3 & 10 \end{pmatrix}$ | B2 | -1eeoo | 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 | | | |