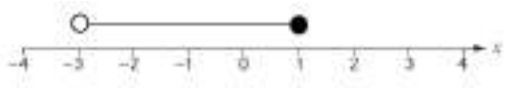
EDUQAS GCSE MATHEMATICS

AUTUMN 2024 MARK SCHEME

Component 2: Higher Tier	Mark	Comment
1*.		No marks are awarded for an answer of 15.3 obtained from use of a scale drawing.
$(h^2 =)\ 7.2^2 + 13.5^2$	M1	May be implied in later working. Provided not spoiled by answers of 20.7, 20.7^2 or 428.49.
$h^2 = 234.09$ or $(h =) \sqrt{234.09}$	A1	
$(h =)\ 15.3$	A1	FT from M1 for the correctly evaluated square root of 'their 234.09' provided 'their answer' > 13.5 (cm) Must be from correct working
(Area of square =) $((7.2 + 13.5 + 15.3) \div 4)^2$	M2	FT 'their 15.3' provided M1 previously awarded. M1 for $(7.2 + 13.5 + 15.3) \div 4$ (= 9)
81 (cm^2)	A1	FT If no marks award SC1 for the correct evaluation of $(13.5 + 7.2 + \text{'their 15.3'}) \div 4)^2$
	(6)	
2*.		
$\pi \times 7^2 \times 21 \div 102$	M2	M1 for $\pi \times 7^2 \times 21$ (= 3231 to 3233.118 or 1029π) Allow the M1for sight of $\pi \times 7^2 \times 21$ if embedded in incorrect work e.g. $2 \times \pi \times 7^2 \times 21$
= 31 (complete cylinders)	A1	Unsupported 31.69 or 32 is awarded M2 A0
	(3)	

3*. 8.96 × 1540 ÷ 1000 = 14 (kg)	 M2 A2	Answer space takes precedence M1 for 8.96 × 1540 (= 13798.4) Allow M1 for digits 896 × 1540 if incorrect mass unit conversion seen first A1 for 13.7(98…) or 13.8 (kg) FT from M1 to award: A2 for an answer of 14000 Allow A2 for a correct FT answer with 14 as the only non-zero digits from a seen incorrect unit conversion A1 for an answer of 13798(.4) or 13800 Allow A1 for either of the following: • 13798(.4) seen and then spoiled e.g 13000 • a correct FT answer with 1379(84) or 138 as the only non-zero digits e.g. 138, 0.01379 from a seen incorrect unit conversion If no marks award SC1 for a calculation of: a number with only non-zero digits of 896 × a number with only non-zero digits of 154 e.g. 0.0896 × 1.54
	(4)	

4*.(a) $28x^5y^6$	B2	B1 for one of the following: • kx^5y^6 $k \neq 28$ or 0 • $28x^ny^6$ $n \neq 5$ or 0 or • $28x^5y^m$ $m \neq 6$ or 0 • $28 \times x^5 \times y^6$ • $28\ x^5 \times y^6$ • $28 \times x^5y^6$ Mark final answer. B1 if $28x^5y^6$ seen then spoiled.
4*.(b)(i) $11 + 5 < 4n - n$ or $n - 4n < -5 - 11$ $16 < 3n$ or $-3n < -16$ $\frac{16}{3} < n$ oe or $n > \frac{16}{3}$ oe	B1 B1 B1	 Implies the first B1 ISW. Allow 5.33…< n or n > 5.33… If n > 5.3 without n > $\frac{16}{3}$ award B1 B1 B0 FT from $16 < an$ or $b < 3n$ OR $-3n < c$ or $-dn < -16$ where a, b, c and d >0 Use of equal signs is not awarded the marks unless finally replaced.
4*.(b)(ii) 6	B1	FT 'their n > $\frac{a}{b}$' where a > b
4*.(c) $x = \frac{a}{b}$	B1	Do not allow x = a ÷ b
4.(d) 	B1	
	(8)	
5*. The correct answer circled or clearly indicated $2{\cdot}4 \times 10^{-6}$	B1	
	(1)	

<table>
<tr><td>6*.(a)

$8000 \times (1 - 0.3)^4$ oe

= 1920.8 or 1921

8000 – 1920.8 = 6079.2 therefore 6079 (£10 vouchers)

or 8000 – 1921 = 6079 (£10 vouchers)</td><td>

M2

A1

B1</td><td>

M1 for $8000 \times (1 - 0.3)^n$ oe when $1 \leq n < 4$
$8000 \times (1 - 0.3)$ (= 5600)

CAO</td></tr>
<tr><td><u>Alternative method</u>

A full method for the number of vouchers sent for the 4 weeks.
<table><tr><td></td><td>Vouchers sent</td><td>Houses left</td></tr><tr><td>Week1</td><td>8000 × 0.3 = 2400</td><td>8000 – 2400 = 5600</td></tr><tr><td>Week2</td><td>5600 × 0.3 = 1680</td><td>5600 – 1680 = 3920</td></tr><tr><td>Week3</td><td>3920 × 0.3 = 1176</td><td>3920 – 1176 = 2744</td></tr><tr><td>Week4</td><td>2744 × 0.3 = 823(.2)</td><td></td></tr></table>
2400 + 1680 + 1176 + 823.2 or 2400 + 1680 + 1176 + 823

= 6079.2 therefore 6079 (£10 vouchers)</td><td>M2

m1

A1</td><td>M1 for 8000 – 8000 × 0.3 (= 5600) oe

FT provided M2 awarded

CAO</td></tr>
<tr><td>6*.(b)(i)

A valid assumption that John made e.g.

‘Every house that was sent a voucher used the voucher.’
‘Every house that was sent the voucher received the voucher.’
‘Every house that received the voucher used the voucher by the end of the four weeks.’
‘Every house that received the voucher uses that supermarket.’
‘They had time to use the voucher.’</td><td>

E1</td><td>

Allow e.g.

‘None got lost in the post.’
‘They use that supermarket.’
‘That <u>every</u> house will use their voucher’

Do not allow e.g.
‘6039 vouchers would be used’
‘The vouchers would encourage people to go to the supermarket’</td></tr>
<tr><td>6*.(b)(ii)

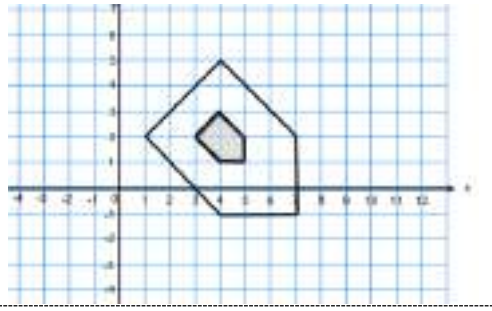
A valid effect of their assumption e.g.

‘Less than 6079 vouchers would have been used.’</td><td>

E1</td><td>If no valid assumption is made, then this mark cannot be awarded. Cannot award E0 E1.

Allow e.g.
‘Less vouchers used.’</td></tr>
<tr><td></td><td>(6)</td><td></td></tr>
</table>

7. (a) 1 AND 5	B2	B1 for one correct value
7.(b) Correct curve drawn through all 6 correct plots.	B2	FT their values from the table for B2 or B1 On FT award B2 only if a smooth curve obtained B1 for at least 5 points plotted correctly with or without curve.
7.(c) y = 3	B1	
	(5)	
8*(a) 6T + 7K = (£)185.75 AND 5T + 4K = (£)130.50	B1	Both equations given, T & K may be other letters, words are accepted. FT provided at least one equation is correct, the equations have consistent place value and are of an equivalent level of difficulty.
Method to eliminate an unknown e.g. equal coefficients and subtraction or rearranges one equation and substitutes into the other	M1	No marks for use of T&I or for an unsupported answer. Candidates may use 11T + 11K = (£)316.25 Allow one error in one term, but not in the equated coefficients
Finds one unknown	A1	CAO; T = 15.5(0) or K = 13.25
Method to find second unknown	m1	FT 'their T' or 'their K' used in one of their equations
Finds second unknown	A1	FT
8*.(b) 65 % ≡ (£)24570	B1	Allow for clear indication that 65 % ≡ (£)24570, not for sight of 65% or 0.65.
24570 ÷ 65 × 100 = (£)37800	M1 A1	Or equivalent e.g.24570 ÷ 0.65 This implies B1 M1
	(8)	

9. (x =) $\frac{7\times1800}{150}$	M2	Award M2 for 1800 × 0.466(66..) OR 1800 ÷ 21.4(28…) from premature approximation M1 for $\frac{x}{1800}=\frac{7}{150}$ OR $\frac{1800}{x}=\frac{150}{7}$ OR $\frac{x}{7}=\frac{1800}{150}$
(x =) 84	A1	A0 for $\frac{84}{1800}$ OR $\frac{84}{150}$
	(3)	
10. A correct enlargement in the correct position. 	B2	B1 for one of the following: • 5 correct vertices not joined together. • 5 vertices joined together with 4 correct. • a correct enlargement of scale factor $\frac{1}{3}$ in an incorrect position in the correct orientation. • a correct enlargement of scale factor 3 with centre (4, 2).
	(2)	
11. (Finding the angle at Port A) (x =) $\tan^{-1}(\frac{17}{11})$	M2	M1 for $\tan(x)=\frac{17}{11}$
(x =) 57.09…(°) or 57.1(°) or 57(°)	A1	
(Bearing) ((180−57.09) or (90+32.9)) 122.905…(°) or 122.9(°) or 123(°)	B1	FT 'their 57.09…' provided M1 awarded
Alternative method *(Finding the angle at Port B)* *(x =) $\tan^{-1}(\frac{11}{17})$*	*M2*	*M1 for $\tan(x)=\frac{11}{17}$*
(x =) 32.90…(°) or 32.9 (°) or 33 (°)	*A1*	
(Bearing) ((180 − 57.09) or (90 + 32.9)) *122.905…(°) or 122.9(°) or 123(°)*	*B1*	*FT 'their 32.90…' provided M1 awarded*
	(4)	

12. $A\hat{D}C = 64(°)$ (opposite angles in a cyclic quadrilateral sum to 180°) $C\hat{A}D = 65(°)$ (angles in a triangle sum to 180) $C\hat{D}E = 65(°)$ with <u>alternate segment theorem</u>	 B1 B1 B1	Angles may be seen on the diagram. No marks for sight of 64(°) or 65(°) unless appropriately labelled or correctly placed on the diagram. $C\hat{A}D$ =65(°) must be from correct working.
<u>Alternative method 1</u> *$A\hat{D}C = 64(°)$* *(opposite angles in a cyclic quadrilateral sum to 180°)* *$A\hat{D}F = 51(°)$ with <u>alternate segment theorem</u>* *$C\hat{D}E = 65(°)$* *(angles in a straight line sum to 180°)*	 *B1* *B1* *B1*	
<u>Alternative method 2</u> *$A\hat{B}D = 51(°)$ (angles in the same segment)* *$D\hat{B}C = 116 – 51 = 65(°)$* *$C\hat{A}D = 65(°)$. (angles in the same segment)* *$C\hat{D}E = 65(°)$ with <u>alternate segment theorem</u>*	 *B1* *B1* *B1*	 *The two steps are required for this mark*
<u>Alternative method 3</u> *$C\hat{O}D = 116 \times 2 – 51 \times 2 = 130(°)$* *(Angle at the centre is twice that at the circumference)* *$C\hat{A}D = 65(°)$* *(Angle at the centre is twice that at the circumference)* *$C\hat{D}E = 65(°)$ with <u>alternate segment theorem</u>*	 *B1* *B1* *B1*	 *$C\hat{A}D$ =65(°) must be from correct working.*
	(3)	

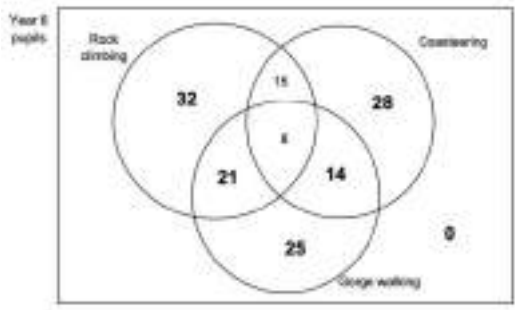
13. Use of 8.5 AND 13	B1	
$\frac{13}{175}$ (× 100) − $\frac{8.5}{170}$ (× 100) (= 7.4285..% − 5%)	M2	Award M2 for $\frac{170 - 8.5}{170}$ (× 100) − $\frac{175 - 13}{175}$ (× 100) (= 95 − 92.57..)(%) M1 for either $\frac{8.5}{170}$ (× 100) OR $\frac{13}{175}$ (× 100) provided unambiguous or used to obtain the final answer May be seen as 170 × 0.05 = 8.5 If B0, FT for M2 or M1 provided unambiguous or used to obtain the final answer provided: for M2: 8 ≤ their 8.5'< 9 AND 12 < 'their 13' ≤ 14. for M1: 8 ≤ their 8.5'< 9 OR 12 < 'their 13' ≤ 14. Award M1 for $\frac{170 - a}{170}$ (× 100) − $\frac{175 - b}{175}$ (× 100) provided 8 ≤ a < 9 OR 12 < b ≤ 14
= 2.4(2…) or $2\frac{3}{7}$ (%) oe	A1	CAO Allow 2(%) from correct working. If no marks, award SC1 for an answer of 0.697(5..)% or 0.7% from: $\frac{11}{175}$ (× 100) − $\frac{9.5}{170}$ (× 100) (=6.286...%. − 5.588…%)
	(4)	
14. $\frac{2}{11} \times \frac{1}{10} \times 275$	M2	M1 for $\frac{2}{11} \times \frac{1}{10}$ (= $\frac{2}{110}$ or $\frac{1}{55}$ or 0.01818…)
= 5 (times)	A1	If no marks, award SC1 for an answer of 9 or 9.09… from $\frac{2}{11} \times \frac{2}{11} \times 275$
	(3)	

15. (Creates an equation in x using speed, distance, and time)		
$1.25 = \frac{5x+0.5}{1.8x+7}$ or 1.25(1.8x + 7) = 5x + 0.5 or $1.8x + 7 = \frac{5x+0.5}{1.25}$	B1	Or equivalent. Do not allow 1 hr 15 unless later replaced by 1.25
(Remove fractions and expands brackets) 2.25x + 8.75 = 5x + 0.5 or 1.8x + 7 = 4x + 0.4	B1	Or equivalent. Allow for use of 1.15 (hours) or 75 (mins) Use of 1.15 2.07x + 8.05 = 5x + 0.5 oe or 1.8x + 7 = 4.347…x + 0.4347.. Use of 75 mins 135x + 525 = 5x + 0.5 oe or 1.8x + 7 = 0.0666..x + 0.00666..
(Isolates and collects x terms) 8.25 = 2.75x or 2.2x = 6.6 x = 3	B1 B1	FT from their equation provided no errors Allow for use of 1.15 (hours) or 75 (mins) Use of 1.15 2.93x = 7.55 Use of 75 mins 130x = −524.5 FT from one arithmetic error provided time = 1.25 2.75x = a or 2.2x = b OR ax = 8.25 or bx = 6.6 Use of 1.15 (hours) x = 2.5(767.) or 2.6 B0 for use of 75 mins as x is negative
(Distance =) 15.5 (km)	B1	CAO If no marks award SC1 for sight of one of the following: • 1 hour 15 mins = $\frac{5x+0.5}{1.8x+7}$ oe • (Distance =) 2.25x + 8.75 • (Speed =) $\frac{5x+0.5}{1.25}$
	(5)	
16. $\frac{1}{2}$ (-8**r** + 6**q**) oe = 3**q** − 4**r**	M1 A1	If no marks award SC1 for an answer of −3**q** + 4**r**
	(2)	

17.(a) 1.2× 20 + 4.2× 10 + 5× 5 + 3.4× 5 + 0.8× 30 (24 + 42 + 25 + 17 + 24) = 132 (cars) (Estimated median =) 30 (mph)	 M1 A1 B1	 Allow one slip (e.g. the sum of 5 values with 4 correct) CAO. FT 'their 132' provided M1 awarded A median of 30 from incorrect work or unsupported is awarded no marks. Median = 30 and 24 + 42 = 25 + 17 + 24 oe is awarded all 3 marks If no marks award SC1 for sight of the 5 correct values: 24, 42, 25, 17 AND 24
17.(b)(i) $\frac{1 \times 10 + 6 \times 5 + 7.2 \times 10 + 2.8 \times 5}{150} \times 100$ (= 84%) or $\frac{150 - (0.5 \times 20 + 2.8 \times 5)}{150} \times 100$	 B2	 B1 for 1 × 10 + 6 × 5 + 7.2 × 10 + 2.8 × 5 (= 126) (10 + 30 + 72 + 14) or 150 – (0.5 × 20 + 2.8 × 5) 150 – (10 + 14)
Alternative method 1 *0.84 × 150 = 126 AND* *1 × 10 + 6 × 5 + 7.2 × 10 + 2.8 × 5 = 126* *OR* *150 - (0.5 × 20 + 2.8 × 5) = 126*	*B2*	*B1 for one of the following:* • *1 × 10 + 6 × 5 + 7.2 × 10 + 2.8 × 5 (= 126)* • *150 - (0.5 × 20 + 2.8 × 5) (= 126)* • *0.84 × 150 = 126 AND sight of 5, 30, 72 and 14*
Alternative method 2 *(1 – 0.84) × 150 OR 0.16 × 150 = 24 AND* *150 - (1× 10 + 6× 5 + 7.2× 10 + 2.8× 5) = 24* *OR* *0.5 × 20 + 2.8 × 5 = 24*	*B2*	*B1 for one of the following:* • *150 - 1× 10 + 6× 5 + 7.2× 10 + 2.8× 5 (= 24)* • *0.5 × 20 + 2.8 × 5 (= 24)*
Alternative method 3 $\frac{1 \times 10 + 6 \times 5 + 7.2 \times 10}{150}$ *x 100 = 74.66… or 75 (%)* *AND* $\frac{1 \times 10 + 6 \times 5 + 7.2 \times 10 + 2.8 \times 10}{150} \times 100 = 93(.33..)(\%)$ *AND* *e.g. '84% lies between these values'*	*B2*	*B1 for both percentages attempted with at least one correct*

17.(b)(ii) A correct explanation e.g. 'Irene cannot be sure that 14 cars in the 4th bar were travelling less than 30mph'. 'More than half of the cars in the 4th bar could have been travelling more than 30 mph'. 'More than half of the cars in the 4th bar could have been travelling less than 30 mph'.	E1	Do not allow e.g. 'The graph does not show the exact number of cars' without further explanation.
17.(c) Speed bumps selected with a <u>valid reason quoting values</u> from the histograms e.g. 'With 30 mph signs 50% of cars travelled at a speed less than 30 mph, but, with speed bumps 84%* of cars travelled at a speed less than 30 mph'. 'With 30 mph hour signs 50% of cars travelled at a speed more than 30 mph, but, with speed bumps 16% of cars travelled at a speed more than 30 mph'. * Allow 75% to 93% ** Allow 16% to 25%	E1	Allow e.g Speed bumps selected and: 'Less people travel at over 40 mph' 'Less people travel at over 35 mph' 'No one travelled at over 55 mph' 'More people travel at less than 30 mph with the speed bumps' provided supporting evidence seen in (a) AND (b)(i). 'Median speed with speed bumps is lower than with 20 mph signs' provided answer to (a) > 25 Do not allow e.g. 'More people travel at less than 30 mph with the speed bumps' without supporting evidence seen in (a) AND (b)(i). 'There are less people going faster' without reference to values from the graph
	(7)	

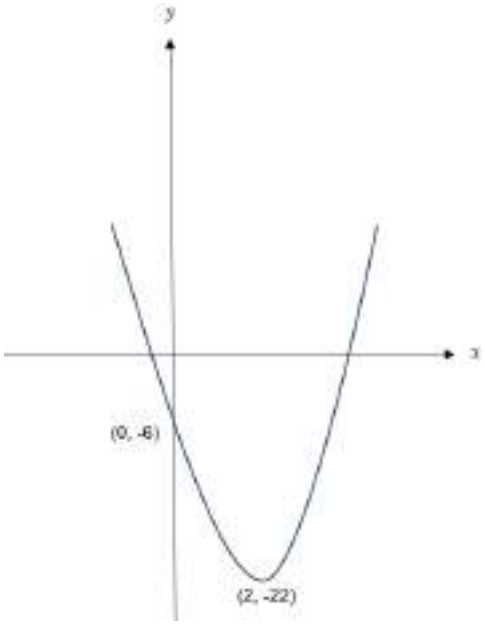
18.(a) (Expression for total volume) $\frac{1}{2} \times \frac{4}{3} \times \pi \times (x+1)^3 + \frac{1}{3} \times \pi \times (x+1)^2 \times 5$	B1	Need not be equated to 24π for this mark
(Equate to 24π and expands brackets correctly) $2x^3 + 11x^2 + 16x + 7 = 72$ or $\frac{2\pi}{3}x^3 + \frac{11}{3}\pi x^2 + \frac{16}{3}\pi x + \frac{7}{3}\pi = \frac{72}{3}\pi$ $(=24\pi)$ or $(2x^3+4x^2+2x+2x^2+4x+2)+(5x^2+10x+5) = 72$	B3	FT provided of the form: $k\pi(x+1)^3 + 5m\pi(x+1)^2$ $(= 24\pi)$ B2 for volume equated to 24π and both $(x+1)^3$ and $(x+1)^2$ expanded correctly e.g. $\frac{2}{3}\pi\,(x^3 + 2x^2 + x + x^2 + 2x + 1) + \frac{5}{3}\pi\,(x^2 + 2x + 1) = 24\pi$ or $2(x^3 + 2x^2 + x + x^2 + 2x + 1) + 5(x^2 + 2x + 1) = 72$ OR for $(x^2 + 2x + 1)(2x + 7) = 72$ B1 for one of the following: • $2(x+1)^3 + 5(x+1)^2 = 72$ • $(x+1)^2\,(2(x+1) + 5) = 72$ • $(x+1)^2(2x + 7) = 72$
Convincingly leading to $2x^3 + 11x^2 + 16x = 65$	B1	CAO If no marks award SC1 for sight of: $\frac{1}{2} \times \frac{4}{3} \times \pi \times (x+1)^3$ AND $\frac{1}{3} \times \pi \times (x+1)^2 \times 5$ If no marks or B1 B0 B0 awarded, award SC1 for the correct expansion of $(x+1)^3$ $x^3 + x^2 + x^2 + x^2 + x + x + x + 1$ or better

18.(b) One correct evaluation $1.6 \leq x \leq 1.7$ 2 correct evaluations $1.635 \leq x \leq 1.655$, one < 0, one > 0. 2 correct evaluations $1.645 \leq x \leq 1.655$, one < 0, one > 0. $x = 1.65$	 B1 B1 M1 A1	Correct evaluation regarded as enough to identify if < 0 or > 0. If evaluations not seen accept 'too high' or 'too low'. Some candidates may test $2x^3 + 11x^2 + 16x - 65 = 0$ x / $2x^3 + 11x^2 + 16x$ 1.6 61.952 1.61 62.619… 1.62 63.291… 1.63 63.967… **1.64 64.647…** 1.635 64.306… **1.65 65.331…** **1.645 64.989…** 1.66 66.020… 1.646 65.0575.. 1.67 66.712… 1.655 65.675… 1.68 67.409… 1.69 68.110… 1.7 68.816… Note: Evidence for M1 must be seen before A1 can be awarded. No marks awarded for an unsupported answer of 1.65.
	(9)	
19.(a) A fully correct Venn diagram  	B3	Allow no entry outside the circles to imply zero If 15 is changed to 23 then no marks are awarded. • 21 in correct position • 14 in correct position • Rock climbing total = 76 23 + 'their 21' + 'their 32' = 76 • Coasteering total = 65 23 + 'their 14' + 'their 28' = 65 • Overall total = 143 Award B2 for four of the above conditions met. Award B1 for two or three of the above conditions met.
19.(b) $\frac{14}{143}$ oe ISW	B1	CAO
19.(c) $\frac{29}{68}$ oe ISW	B2	FT 'their 21' + 8 and 'their 21' + 'their 14' + 'their 25' + 8 for either B2 or B1 provided it gives a fraction < 1. B1 for one of the following: • $\frac{29}{a}$ provided a > 29 and a ≠ 143 • $\frac{\text{'their 21'} + 8}{b}$ provided b > 'their 21' + 8 • $\frac{c}{68}$ provided c < 68
	(6)	

20. $2(y-7)^8$	B1	Mark final answer
	(1)	
21. (r =) $\sqrt{\frac{12\times360}{55\pi}}$ or $\sqrt{\frac{12}{\frac{55}{360}\times\pi}}$ oe	M2	M1 for 12 = $\frac{55}{360}\times\pi\times r^2$ or better
r = 5(cm) oe	A1	r = $\sqrt{\frac{864}{11\pi}}$
(Perimeter =) $\sqrt{5^2+5^2-2\times5\times5\cos(180-55)}$ $+\ \frac{180-55}{360}\times\pi\times2\times5$ OR $2\times5\sin\left(\frac{180-55}{2}\right)+\frac{180-55}{360}\times\pi\times2\times5$ OR $\frac{5\sin125}{\sin((180-125)\div2)}+\frac{180-55}{360}\times\pi\times2\times5$	M3	FT 'their derived r' M2 for one of the following: • (AD=) $\sqrt{5^2+5^2-2\times5\times5\cos(180-55)}$ • (AD=) $2\times5\sin\left(\frac{180-55}{2}\right)$ • (Arc AD =) $\frac{180-55}{360}\times\pi\times2\times5$ oe AND $AD^2=5^2+5^2-2\times5\times5\cos(180-55)$ oe OR (AD=) $\frac{5\sin125}{\sin((180-125)\div2)}$ OR $\frac{5\sin125}{\sin27.5}$ oe M1 for one of the following: • $AD^2=5^2+5^2-2\times5\times5\cos(180-55)$ oe • (Arc AD =) $\frac{180-55}{360}\times\pi\times2\times5$ • $\frac{AD}{\sin125}=\frac{5}{\sin((180-125)\div2)}$ oe
19.7(7…) (cm) or 19.8(cm)	A3	Allow answers in the range 19.7 to 20 inclusive from correct working. A1 for each of the following: • (AD =) 8.8(7….)(cm) or 8.9(cm). Allow 9 from correct working. • (Arc AD =) 10.9(08…)(cm). Allow 11 from correct working. • The correct evaluation of 'their AD' + 'their arc AD' providing at least M1 M2 previously awarded and one is correct.
	(9)	

22.(a) 136.9(7…) or 137(°) AND 223(°) with no other values	B2	B1 for either angle. Allow embedded answers. Penalise -1 for each additional incorrect value. Ignore additional correct values outside the range for B2 or B1. If no marks award SC1 for answers of 136(°) AND 224(°) with no other values
22.(b) A correct translation through $\binom{0}{-1}$ with at least -2 indicated on the y axis and 180 and 360 indicated on the x axis.	B2	B1 for a correct translation through $\binom{0}{-1}$ without labels on the axes.
	(4)	
23. 2×3×2×3×2×1 AND 6×5×4×3×2×1 (6×5×4×3×2×1 − 2×3×2×3×2×1) = 648 (more combinations)	M3 A1	M2 for 2×3×2×3×2×1 (= 72) or M1 for 6×5×4×3×2×1 or 6! (= 720)
	(4)	

24. $y \propto \frac{1}{w^3}$ or $y = \frac{k}{w^3}$ OR $w \propto \sqrt{x}$ or $w = c\sqrt{x}$	B1	
$\frac{1}{9} = \frac{k}{6^3}$	M1	FT $y \propto \frac{1}{w}$ or $y \propto w^3$ *Note: k = 24 implies M1*
$y = \frac{24}{w^3}$ oe	A1	CAO. May be seen in later work
$6 = c\sqrt{4}$	M1	FT $w \propto x^2$ *c = 3 implies M1*
$w = 3\sqrt{x}$	A1	CAO May be seen in later work
$y = \frac{24}{(3\sqrt{x})^3}$ or $y = \frac{8}{9(\sqrt{x})^3}$ oe	M1	FT provided M1 M1 previously awarded.
$y = \frac{8}{9}x^{\frac{-3}{2}}$	A1	Mark final answer. A0 on FT if $y = mx^n$ and m and n are not both fractions
Alternative method $y \propto \frac{1}{w^3}$ *or* $y = \frac{k}{w^3}$ *OR* $w \propto \sqrt{x}$ *or* $w = c\sqrt{x}$	*B1*	
(Substitutes in for w) $y = \frac{k}{(c\sqrt{x})^3}$	*M1*	*FT* $y \propto \frac{1}{w}$ *or* $y \propto w^3$ *or* $w \propto x^2$
(Changes constants) $y = \frac{k}{c^3(\sqrt{x})^3}$ *or* $y = \frac{P}{(\sqrt{x})^3}$ *oe*	*A1*	*CAO*
$\frac{1}{9} = \frac{P}{(\sqrt{4})^3}$	*M1*	
$P = \frac{8}{9}$ *oe*	*A1*	*CAO*
$y = \frac{24}{(3\sqrt{x})^3}$ or $y = \frac{8}{9(\sqrt{x})^3}$ oe	M1	FT provided M1 M1 previously awarded.
$y = \frac{8}{9}x^{\frac{-3}{2}}$	A1	Mark final answer. A0 on FT if $y = mx^n$ and m and n are not both fractions
	(7)	

25. (y =) $4(x^2 – 4x) – 6$ or $4[x^2 – 4x – 1.5]$ or $4x^2 – 16x + 16 – 16 − 6$	B1	
(y =) $4(x – 2)^2 – 4 × 2^2 – 6$ or $4[(x – 2)^2 – 1.5 – 2^2]$ oe or $(2x – 4)^2 – 16 − 6$	B2	FT from $4(x^2 – 4x) + c$ Award B1 for $4(x – 2)^2$ or $(2x – 4)^2$ Either B2 or B1 implies the first B1.
(y =) $4(x – 2)^2 – 22$ or $(2x – 4)^2 – 22$	B1	CAO
Sketch of a quadratic curve with (0,-6) indicated at the intercept with the y axis and (2, -22) indicated at stationary point  	B2	No marks are awarded for the graph unless an expression of the form $a(x ± b)^2 ± c$ obtained with $a > 1$, $b ≠ 0$ and $c ≠ 0$ FT 'their expression' in the form $a(x ± b)^2 ± c$ B1 for the correct shape curve with either the y-intercept coordinate correct, or the stationary point coordinates correct. Intercepts on the x-axis are not required but, if given they must be correct for their equation (4.345.. and -0.345 if correct)
	(6)	