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Paper 2C

Mark scheme

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2 2 B Y 9 2 6 0 / 2 C / M S

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

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Key to mark types and abbreviations

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
[a, b)	Accept values $a \leq \text{value} < b$
3.14 ...	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Q	Answer	Mark	Comments
1	1.7 kg	B1	

Q	Answer	Mark	Comments
2	0.6	B1	

Q	Answer	Mark	Comments
3	8	B1	

Q	Answer	Mark	Comments
4	triangle	B1	

Q	Answer	Mark	Comments
5(a)	97 431	B1	

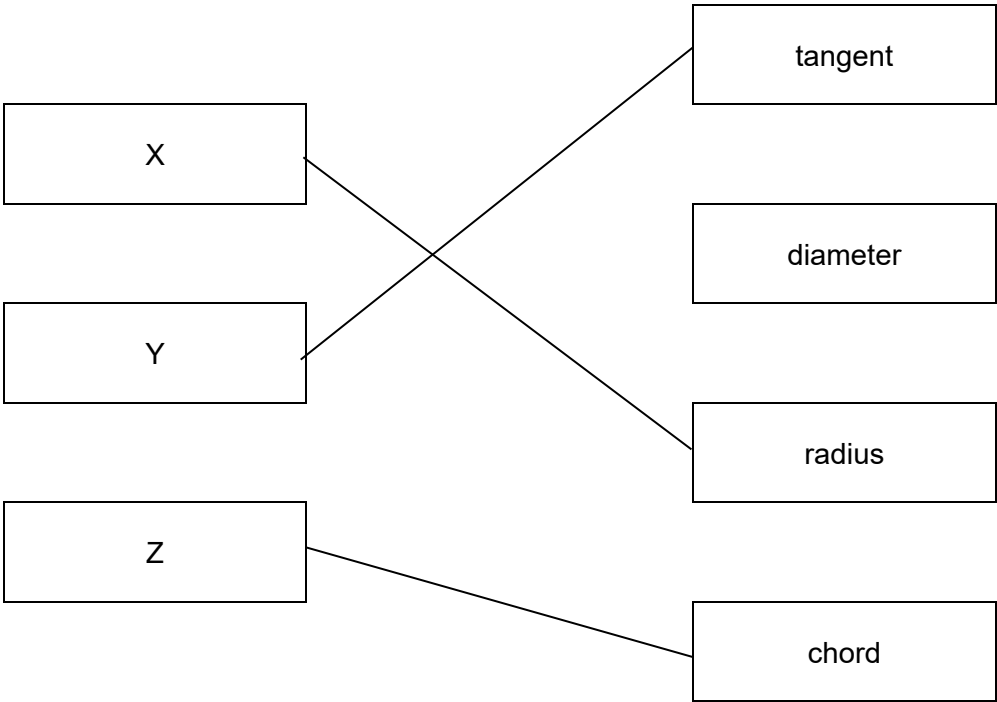
Q	Answer	Mark	Comments
5(b)	13 794	B2	B1 any even number using all five digits or 13 479

Q	Answer	Mark	Comments
6	Alternative method 1		
	36×19 or 684	M1	oe
	their 684 – 675	M1dep	
	9	A1	
	Alternative method 2		
	$675 \div 36$ or 18.75	M1	oe
	$(19 - \text{their } 18.75) \times 36$	M1dep	oe
	9	A1	

Q	Answer	Mark	Comments
7	Alternative method 1		
	$4 + 6 + 3 + 2$ or 15	M1	allow one error but must sum four values
	their 15×5	M1dep	oe
	75	A1	
	Alternative method 2		
	4×5 or 20 or 6×5 or 30 or 3×5 or 15 or 2×5 or 10	M1	oe
	$4 \times 5 + 6 \times 5 + 3 \times 5 + 2 \times 5$ or $20 + 30 + 15 + 10$	M1dep	oe allow one error but must sum four products
	75	A1	
	Additional Guidance		
	$5 + 6 + 3 + 2 = 16$ $16 \times 5 = 80$	M1 M1A0	
	$4 \times 5 + 6 \times 5 + 3 \times 5 + 5 \times 5$ $20 + 30 + 15 + 25 = 90$	M1M1 A0	

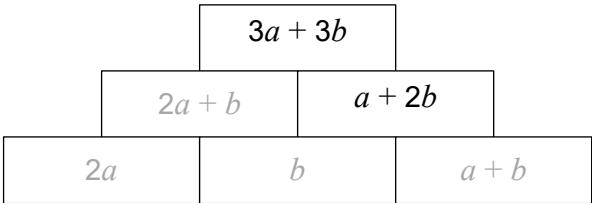
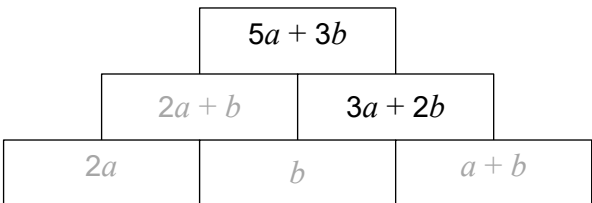
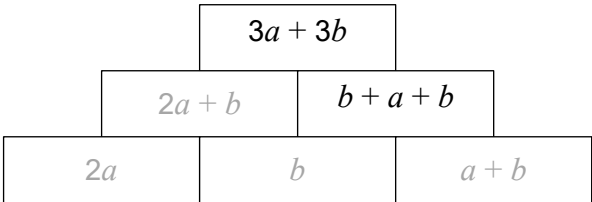
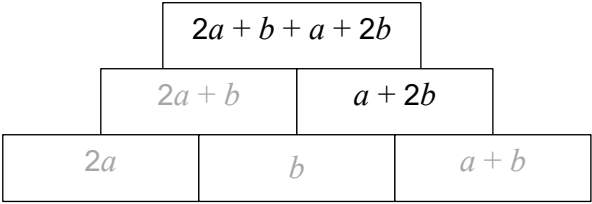
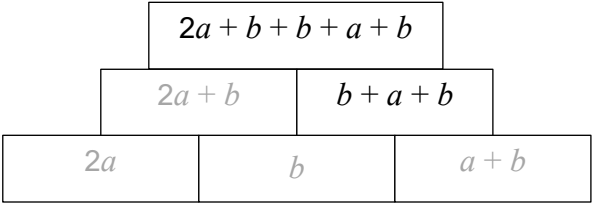
Q	Answer	Mark	Comments
8(a)	or	B1	
	Additional Guidance		
	Any indication		

Q	Answer	Mark	Comments	
8(b)	or or or	B2	B1 rotational symmetry of order 2 and 2 lines of symmetry or	
	Additional Guidance			
	Any indication			

Q	Answer	Mark	Comments
9	All three correctly matched	B3	B1 for each correct match
	Additional Guidance		
	Any indication		
	Two lines from X, Y or Z is choice		
			B3

Q	Answer	Mark	Comments
10(a)	$(48 + 25 + 30 + 24 + 43 + 39 + 40 + 13 + 35) \div 9$ or $297 \div 9$	M1	oe
	33	A1	
	Additional Guidance		
	$48 + 25 + 30 + 24 + 43 + 39 + 40 + 13 + 35 \div 9$ and answer 33		M1A1
	$48 + 25 + 30 + 24 + 43 + 39 + 40 + 13 + 35 \div 9$ with no or incorrect answer		M1A0

Q	Answer	Mark	Comments
10(b)	13 24 25 30 35 (...) or (...) 35 30 25 24 13 or 48 43 40 39 35 (...) or (...) 35 39 40 43 48 or $(35 + x) \div 2 = 36$ or $36 \times 2 - 35$	M1	oe any letter
	37	A1	
	Additional Guidance		
	Answer $(35 + 37) \div 2 = 36$		M1A0

Q	Answer	Mark	Comments
11(a)	$a + 2b$ or $2b + a$	B1	in the middle row
	$3a + 3b$ or $3b + 3a$ or $3(a + b)$ or $3(b + a)$	B1ft	in the top row ft $2a + b$ + their $(a + 2b)$ SC1 both correct but unsimplified
	Additional Guidance		
	Condone coefficients of 1 eg $1a$		
	Mark the diagram		
			B2
			B0B1ft
			B0B1
			B1B0
			SC1
	Further incorrect simplification does not score the relevant mark eg $a + 2b = 2ab$ in the middle row and $2a + b + 2ab$ in the top row		B0B1ft

Q	Answer	Mark	Comments
11(b)	$2c + 3d$ or $3d + 2c$	B1	in the middle row
	$2c + d$ or $d + 2c$	B1ft	in the bottom row ft their $(2c + 3d) - 2d$ SC1 both correct but unsimplified
	Additional Guidance		
	Condone coefficients of 1 eg $1d$		
	Mark the diagram		
			B2
			B0B1ft
			SC1
			SC1
	Further incorrect simplification does not score the relevant mark eg $2c + 3d = 5cd$ in the middle row and $5cd - 2d$ in the bottom row		B0B1ft

Q	Answer	Mark	Comments																				
12(a)	<table><tr><td>×</td><td>1</td><td>1</td><td>2</td><td>4</td></tr><tr><td>2</td><td>2</td><td>2</td><td>4</td><td>8</td></tr><tr><td>3</td><td>3</td><td>3</td><td>6</td><td>12</td></tr><tr><td>5</td><td>5</td><td>5</td><td>10</td><td>20</td></tr></table>	×	1	1	2	4	2	2	2	4	8	3	3	3	6	12	5	5	5	10	20	B2	B1 5, 6 or 7 scores correct
×	1	1	2	4																			
2	2	2	4	8																			
3	3	3	6	12																			
5	5	5	10	20																			

Q	Answer	Mark	Comments
12(b)	Yes and gives a valid reason	B1ft	ft their fully complete table eg Yes, there are the same amount of primes and non-primes Yes, there are 6 primes and 6 non-primes Yes, the probability of getting a prime is $\frac{6}{12}$ oe
	Additional Guidance		
	Incorrect table in (a) containing only 4 prime numbers and No there are more non-primes than primes in (b)		B1ft
	Yes, half the numbers are prime		B1
	Yes because there are 6 prime numbers		B1
	Yes because 2, 3 and 5 are the prime numbers		B1

Q	Answer	Mark	Comments
13(a)	$\times 3$ in the first box and -5 in the second box or $-\frac{5}{3}$ in the first box and $\times 3$ in the second box	B1	

Q	Answer	Mark	Comments
13(b)	$(7 - 1) \times 2$	M1	oe
	12	A1	SC1 3 or 13 or 16
	Additional Guidance		
	If answer line is blank, check the input oval		

Q	Answer	Mark	Comments
14(a)	28	B1	

Q	Answer	Mark	Comments
14(b)	180 – their 28 or 152	M1	ft their 28 from part (a) provided it is less than 180
	76	A1ft	ft their 28 from part (a) provided it is less than 180

Q	Answer	Mark	Comments
15	11×4.5 or 49.5 or 2.5×4.5 or 11.25 or $(11 - 2.5 - 2.5) \times 3$ or 18 or $(11 - 2.5 - 2.5) \times (4.5 - 3)$ or 9 or $(11 - 2.5) \times (4.5 - 3)$ or 12.75 or 2.5×3 or 7.5 or $11 \times (4.5 - 3)$ or 16.5 or $2.5 \times (4.5 - 3)$ or 3.75	M1	oe eg 6×3 6×1.5 8.5×1.5 11×1.5 2.5×1.5
	Any sum of areas that would lead to the area of the shape	M1dep	eg their $49.5 -$ their 18 their $11.25 \times 2 +$ their 9 their $11.25 +$ their $12.75 +$ their 7.5 their $7.5 \times 2 +$ their 16.5 their values must come from correct methods
	31.5	A1	oe
	Additional Guidance		
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	31 or 32 with no correct working		M0M0A0

Q	Answer	Mark	Comments
16	$1.6 \div 4$ or 0.4 or $1.6 \div 2$ or 0.8 or any correct value labelled on the number line	M1	oe
	-0.8	A1	oe

Q	Answer	Mark	Comments
17	Alternative method 1		
	$2 \times 60 + 5$ or 125	M1	oe
	$x + x + 11 =$ their 125 or $(\text{their } 125 - 11) \div 2$ or 57	M1dep	oe any letter
	68	A1	
	Alternative method 2		
	$2 \times 60 + 5$ or 125	M1	oe
	$x + x - 11 =$ their 125 or $(\text{their } 125 + 11) \div 2$	M1dep	oe any letter
	68	A1	
	Alternative method 3		
	2 min 5 s – 11 s or 1 min 54 s	M1	oe eg $2.08(3\dots) - 0.18(3\dots)$ or 1.9
	$(\text{their } 1 \text{ min } 54 \text{ s}) \div 2$ or 57 s	M1dep	oe eg their $1.9 \div 2$ or 0.95
	68	A1	
	Alternative method 4		
	2 min 5 s + 11 s or 2 min 16 s	M1	oe eg $2.08(3\dots) + 0.18(3\dots)$ or $2.26(6\dots)$ or 2.27
	$(\text{their } 2 \text{ min } 16 \text{ s}) \div 2$ or 1 min 8 s	M1dep	oe eg their $2.26(6\dots) \div 2$
	68	A1	

Q	Answer	Mark	Comments
18	$6n - 3 = 75$ or $6n = 75 + 3$ or $6n = 78$ or $(75 + 3) \div 6$ or $78 \div 6$ or $10n - 3$	M1	
	$(n =) 13$	A1	implied by 52
	$4 \times \text{their } 13$ or 52 or $10 \times \text{their } 13 - 3$	M1	oe ft any value for n except 75
	127	A1ft	ft any value for n except 75 that gives a positive integer answer
	Additional Guidance		
	Up to M3 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	$6n - 3 = 75$ $n = 12$ Answer 123 (using $75 + 4 \times 12$)	M1 A0 M1A1ft	
	$6n - 3 = 75$ $n = 12$ Answer 117 (using $10n - 3$)	M1 A0 M1A1ft	
	$n = 12$ with no working Answer 123	M0A0 M1A1ft	

Q	Answer	Mark	Comments
19	obtuse	B1	

Q	Answer	Mark	Comments
20	$\frac{5d}{2b}$	B2	B1 $\frac{5cd}{2bc}$ or $\frac{5ad}{2ab}$ or $\frac{10d}{4b}$
	Additional Guidance		
	Mark final answer		
	Accept $\frac{2.5d}{b}$ or $2.5\frac{d}{b}$ or $2\frac{1}{2}\frac{d}{b}$		B2
	Do not ignore further working following a B2 expression		
	Ignore further working following a B1 expression		

Q	Answer	Mark	Comments
21	625 – 243 or $5^4 - 3^5$	B2	oe eg $625 - 3^5$ or $382 + 243 = 625$ or $625 - 382 = 243$ B1 a power of 5 correctly evaluated that is greater than or equal to 625 or a power of 3 correctly evaluated that is greater than or equal to 81
	Additional Guidance		
	Powers of 5 and 3 evaluated must be integer powers		
	Ignore any incorrect evaluations of powers		
	243 – 625		B1

Q	Answer	Mark	Comments
22	A	B1	

Q	Answer	Mark	Comments
23	$\frac{10}{3}$	B1	

Q	Answer	Mark	Comments
24(a)	$9n - 5$ or $-5 + 9n$	B2	oe eg $4 + 9(n - 1)$ B1 $9n (\dots)$
	Additional Guidance		
	Condone $T_n = 9n - 5$ or $n = 9n - 5$		B2
	Allow other letters eg $9x - 5$		B2
	Condone $n9 - 5$		B2
	Do not ignore further working for B2 eg $9n - 5 = 4n$		B1
	Ignore further working following a B1 answer eg $9n + 5 = 14n$		B1
	$4 + 9n$		B1
	$5 + 9(n - 1)$		B1
	$n9 (\dots)$		B1
	$9 + 5n$		B0
	$9n - 5n$		B0
	$n - 5$		B0

Q	Answer	Mark	Comments
24(b)	Yes and valid reason	B1	eg Yes, it is the 49th term Yes, it goes $\sqrt{48}$, $\sqrt{49}$, $\sqrt{50}$ oe Yes, $\sqrt{49} = 7$
	Additional Guidance		
	Ignore references to the sequence in part (a)		
	Ignore incorrect or irrelevant statements alongside a correct statement, unless contradictory eg Yes, $\sqrt{49} = 7$ It is the 7th term		B1
	Yes, $7^2 = 49$		B1
	Ticks No		B0
	Reference to $\sqrt{7}$		B0
	Yes, 7 is a square number		B0
	Yes, the 6th term is 49		B0

Q	Answer	Mark	Comments
25	Alternative method 1 – mixed number converted to an improper fraction		
	$\left(3\frac{3}{4}\right)\frac{15}{4}$	M1	oe improper fraction
	$\frac{2}{5} \times \frac{15}{4} = \frac{30}{20}$ or $\frac{2}{5} \times \frac{15}{4} = \frac{3}{2}$ with cancelling shown	A1	oe using equivalent fractions must show answer to multiplication of numerator and denominator or must show cancelling
	Alternative method 2 – both numbers converted to decimals		
	0.4 and 3.75	M1	
	$0.4 \times 3.75 = 1.5$	A1	
	Alternative method 3 – multiplication split		
	$\frac{2}{5} \times 3$ or $\frac{6}{5}$ or $1\frac{1}{5}$ or 1.2 and $\frac{2}{5} \times \frac{3}{4}$ or $\frac{6}{20}$ or $\frac{3}{10}$ or 0.3	M1	oe using equivalent fractions
	$1\frac{1}{5} + \frac{3}{10} = \frac{15}{10}$ and $\frac{15}{10} = \frac{3}{2}$ or $1\frac{1}{5} + \frac{3}{10} = 1\frac{5}{10}$ and $1\frac{5}{10} = 1\frac{1}{2}$ or $1.2 + 0.3 = 1.5$	A1	oe using equivalent fractions must show answer to addition with denominator 10 or equivalent common denominator
	Additional Guidance		
	Allow use of other denominators, eg both fractions changed to denominator 20		
	If decimals are used, 1.5 needs to be seen for the A mark		
	$\frac{2}{5} \times \frac{15}{4} = \frac{3}{2}$ without $\frac{30}{20}$ and no cancelling shown on multiplication		M1A0
	$\frac{2 \times 15}{5 \times 4}$		M1

Q	Answer	Mark	Comments	
26	$\frac{66}{120}$ or $\frac{33}{60}$ or $\frac{22}{40}$ or $\frac{11}{20}$ or 0.55 or 55%	B2	B1 $\frac{24 + 42}{50 + 70}$ oe or $\frac{24}{50}$ or $\frac{12}{25}$ or 0.48 or 48% or $\frac{42}{70}$ or $\frac{21}{35}$ or $\frac{3}{5}$ or 0.6 or 60% or (1 –) $\frac{26 + 28}{50 + 70}$ oe	
	Additional Guidance			
	Ignore incorrect cancelling or conversion to another form for B2 and B1 responses			
	B1 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts			
	B1 may be awarded for a correct fraction or decimal contained in an incorrect calculation, eg 0.48×0.52		B1	
	Any unprocessed fraction equivalent to $\frac{66}{120}$ eg $\frac{24 + 42}{120}$ or $\frac{66}{50 + 70}$		B1	
	0.45 or 45%	B1		

Q	Answer	Mark	Comments
27	$x = y^2 - 5$	B1	

Q	Answer	Mark	Comments
28	$\tan 32 = \frac{x}{9}$ or $9 \times \tan 32$ or $\tan (90 - 32) = \frac{9}{x}$ or $9 \div \tan (90 - 32)$	M1	oe eg $9 \div \cos 32$ or $10.6(1\dots)$ and $\sqrt{(9 \div \cos 32)^2 - 9^2}$
	5.6(2...)	A1	
	Additional Guidance		
	If trigonometry and Pythagoras' Theorem are used it must be a fully correct method that would lead to the correct value of x to score M1		
	5.6(2...) seen followed by answer 5 or 6		M1A1
	$\tan 32 \times 9$		M1
	Accept opp or o for x eg $\tan 32 = \frac{\text{opp}}{9}$		M1
	$\tan = \frac{x}{9}$ or $\tan \theta = \frac{x}{9}$ (unless recovered)		M0
	Answer coming from scale drawing		M0A0

Q	Answer	Mark	Comments												
29	At least three correct pairs of coordinates	M1	seen or plotted $\pm \frac{1}{2}$ square may be seen in a table of values												
	At least four points plotted correctly	M1dep	$\pm \frac{1}{2}$ square												
	Fully correct smooth cubic curve	A1	$\pm \frac{1}{2}$ square												
	Additional Guidance														
	For integer values of x														
	<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>y</td><td>-7</td><td>0</td><td>1</td><td>2</td><td>9</td></tr></table>		x	-2	-1	0	1	2	y	-7	0	1	2	9	
	x	-2	-1	0	1	2									
	y	-7	0	1	2	9									
	Decimal values for x are not needed, but if plotted must be correct and the curve must then pass through them ($\pm \frac{1}{2}$ square)														
	<table><tr><td>x</td><td>-1.5</td><td>-0.5</td><td>0.5</td><td>1.5</td></tr><tr><td>y</td><td>-2.375</td><td>0.875</td><td>1.125</td><td>4.375</td></tr></table>		x	-1.5	-0.5	0.5	1.5	y	-2.375	0.875	1.125	4.375			
x	-1.5	-0.5	0.5	1.5											
y	-2.375	0.875	1.125	4.375											
Ignore any graph drawn beyond given domain															
Curve must have a decreasing positive gradient to the left of (0, 1) and an increasing positive gradient to the right of (0, 1)															
Condone a positive gradient at (0, 1)															
Condone an infinite gradient at (-2, -7) and/or (2, 9)															
If two points are plotted for a given x -value, then this is choice for that x -value unless their graph passes through one of the points															

Q	Answer	Mark	Comments
30	0.1 or $\frac{1}{10}$ or 0.1^2 or 0.01 or $\frac{1}{100}$ or 80 000	M1	
	800 and 0.1 or $\frac{1}{10}$ or 0.1^2 or 0.01 or $\frac{1}{100}$ and 80 000	A1	
	Additional Guidance		
	0.01 oe from rounding 0.010609 does not score the M mark (but it may still be awarded for 80 000)		
	800 with no working		M0A0
	800 from rounding 839.(...) or 840		M0A0

Q	Answer	Mark	Comments
31	1.08 seen or implied	M1	oe implied by or $30\,000 + 30\,000 \times 0.08$ or $30\,000 + 2400$ or 32 400 or 1.08^4 or 1.36(...)
	$30\,000 \times 1.08^4$	M1dep	oe complete method for 4 years eg $30\,000 \times 1.08$ or 32 400 and their $32\,400 \times 1.08$ or 34 992 and their $34\,992 \times 1.08$ or 37 791(.36) and their $37\,791(.36) \times 1.08$
	40 814.(...) or 40 815	A1	
	Additional Guidance		
	$30\,000 \times 0.08$		M0

Q	Answer	Mark	Comments
32	Rotation	B1	
	90° clockwise or 270° anticlockwise	B1	accept quarter turn clockwise or three-quarter turn anticlockwise
	(0, 1)	B1	
	Additional Guidance		
	Accept rotate or rotating for rotation		1st B1
	Do not accept turn or spin		1st B0
	Accept 90 clockwise		2nd B1
	Accept 270 anticlockwise		2nd B1
	Accept 0, 1 for (0, 1)		3rd B1
	Combined transformation eg rotate 90 and move 6 down		B0B0B0

Q	Answer	Mark	Comments
33	1.9×3.5 or 6.65 or $\frac{1}{2} \times -0.4 \times 3.5^2$ or -2.45	M1	oe
	4.2 or $\frac{21}{5}$ or $4\frac{1}{5}$	A1	oe
	Additional Guidance		
	(1.9)(3.5)		M1
	$\frac{1}{2}(-0.4)(3.5)^2$		M1
	$\frac{1}{2} - 0.4 \times 3.5^2$ unless recovered with no other creditworthy working		M0
	$\frac{1}{2} \times -1.4^2$ with no other creditworthy working		M0

Q	Answer	Mark	Comments
34	Alternative method 1		
	even $\times$ odd = even or odd $\times$ even = even or even + even = even	M1	accept $8 \times \text{odd} = \text{even}$ accept $5 \times \text{even} = \text{even}$
	even $\times$ odd = even and odd $\times$ even = even and even + even = even	A1	accept $8 \times \text{odd} = \text{even}$ accept $5 \times \text{even} = \text{even}$
	Alternative method 2		
	$8(2n - 1) + 5(2m)$	M1	oe eg $2n + 1$ for $2n - 1$ m and n are interchangeable any letters
	$2(8n - 4 + 5m)$ or $16n - 8 + 10m$ and explanation as to why this is even eg each term can be divided by 2	A1	oe
	Additional Guidance		
	In alt 2 condone use of the same letter for M1 only eg $8(2n - 1) + 5(2n) (= 2(13n - 4))$		M1A0
	Numerical examples		M0
	even + even = even on its own		MOA0