Collins

AQA

GCSE

Mathematics

SET B – Higher Tier

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Answers

Key to abbreviations used within the answers

M method mark (e.g. M1 means 1 mark for method)

A accuracy mark (e.g. A1 means 1 mark for accuracy)

B independent marks that do not require method to be shown (e.g. B2 means 2 independent marks)

C communication mark

oe or equivalent

ft follow through

dep dependent on previous mark

cao correct answer only

sc special case indep independent

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Paper 1

Ра	per 1			
Qı	uestion	Answer	Mark	Comments
	1	<i>x</i> + 3	B1	
	2	(x - 2)(x + 3) = 0	B1	
	3 (a)	$\sqrt{52}$ cm	B1	
	3 (b)	$\frac{3}{4}$	B1	
	4	6x - 12 + 8 = x	M1	
		5x = 4	M1dep	
		<i>x</i> = 0.8	A1	ое
	5	Area of any face, i.e. 20 × 5 or 100 etc.	M1	
		2 × 100 + 2 × 50 + 2 × 200	M1dep	
		700	A1	
	6	4x + 4 - 6x + 8	M1	M1 for 3 terms correct
		4x + 4 - 6x + 8	A1	A1 for 4 terms correct
		-2 <i>x</i> + 12	A1ft	ft on M1, e.g. 4x + 1 - 6x - 8 = -2x - 7 is M1, A0, A1ft
	7	2x + 100 = 180	M1	
		360 ÷ 40	M1dep	
		9	A1	
	8 (a)	230 000	B1	
	8 (b)	5 × 10 ⁻⁴	B1	
	8 (c)	1.6 × 10 ⁸	B2	B1 for 16 × 10 ⁷
	9 (a)	-1.5 and 3	B2	B1 each answer
	9 (b)	(0.75, -6.1)	B1	
	10	x + 2 = 2x - 1	M1	
		x = 3	A1	
		3 + 2 or 2 × 3 – 1	M1dep	
		5	A1	
		25	A1	
	11	$x^2 + 2x + 1$ or $x^2 - 2x - 3$	M1	
		$x^3 - 3x^2 + 2x^2 - 6x + x - 3$	M1dep	
		$x^3 - x^2 - 5x - 3$	A1	
	12	$\pi \times (r)^2 \times 6r$	M1	oe
		their $6\pi r^3 = 48\pi$	M1dep	
	4.5	2	A1	
	13	<i>x</i> ≤ 6	B1	
		$x + y \ge 7$	B1	
		$y \le x + 1$	B1	

Question	Answer	Mark	Comments
14	$27 + 9\sqrt{2} - 3\sqrt{8}$	M1	oe
	_ √16		
	$27 + 9\sqrt{2} - 6$	A1	
	$\sqrt{2}-4$		
	$23 + 3\sqrt{2}$	A1	
15	Vertical scale	B3	B2 Scale
	marked to at least 3.5 Bar between 5–10 to a height of 3 Bar between 10–20 to a height of 3.5 Bar between 20–35 to a height of 2 Bar between 35–45 to a height of 1.5 Bar between		marked and any two bars B1 Scale marked and any 1 bar
	45-50 to a height of 1		
16 (a)	56	B1	
16 (b)	60	B1	
16 (c)	ACB stated or shown as 32	B1	
	CAB stated or shown as 90 (may be implied by working)	B1	
	58°	B1	
17	16	B2	B1 for $(\sqrt[3]{64})^2$ oe B1 for $\sqrt[3]{64} = 4$
18 (a)	24	B1	
18 (b)	31 and 17 seen	M1	
	14	A1	
18 (c)	Valid box plot with Median marked (ft their median) IQR marked (ft their IQR) Minimum value as 5 and maximum as 50	B2 	B1 any 2 components
19 (a)	$\mathbf{a} + \frac{3}{2}\mathbf{b}$	B1	

Question	Answer	Mark	Comments
19 (b)	$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AO}$	M1	
	+ OC = −a		
	$+\frac{1}{2}$ b		
	or $-\frac{3}{2}\mathbf{b} - \mathbf{a} + OC$		
	$=-\mathbf{a}+\frac{1}{2}\mathbf{b}$		
	2 b	A1	
20	x = 0.733333 and $10x$ = 7.33333	M1	
	$9x = 6.6 \text{ or } \frac{66}{90}$	A1	
	3 11 15	A1	
21	$\frac{x^2}{2} = 9$	M1	
	$x = 3\sqrt{2}$	M1	
	Hypotenuse = 6	M1	
	$6+2\times3\sqrt{2}$	M1	
	$6 + 6 \sqrt{2}$	M1	
22	Tree diagram with at least 3 correct probabilities marked or P(R and B) + P (B and R)	M2	M1 for less than 3 correct probabilities marked
	All correct probabilities identified as $\frac{7}{10}$, $\frac{3}{10}$, $\frac{6}{9}$ oe, $\frac{3}{9}$ oe, $\frac{7}{9}$ and $\frac{2}{9}$ or one of $\frac{7}{10}$ $\times \frac{3}{9}$ or $\frac{3}{10} \times \frac{7}{9}$	A1	
	$\frac{7}{10} \times \frac{3}{9} + \frac{3}{10} \times \frac{7}{9}$	M1dep	
	$\frac{42}{90}$ or $\frac{7}{15}$	A1	

Question	Answer	Mark	Comments
23	(2x + 3)(2x - 5) $(2x - 3)(x + 4)$ $2(x + 4)$ $(2x - 3)(2x + 3)$	B3	B2 three factorisations B1 two factorisations
	$\frac{2x-5}{2}$	B1	
24	Gradient AB $= -\frac{1}{2}$	M1	
	Gradient perpendicular 2	A1	
	Midpoint <i>AB</i> = (5, 9)	B1	
	$9 = 2 \times 5 + c$	M1	
	y = 2x - 1	A1	

Paper 2

Question	Answer	Mark	Comments
1	<u>2</u> 5	B1	
2	(7, 6)	B1	
3 (a)	alternate angles	B1	
3 (b)	a + b = 180	B1	
4	Correct translation, i.e. $(1, 1) \rightarrow (-2, -3)$, etc.	B2	B1 for correct translation of one vector component
5	6 ² + 11 ²	M1	
	√157	M1dep	
	12.5	A1	
6	5 × 145 + 9 × 155 + 12 × 165 + 8 × 175 + 6 × 185 or 6610	M1	
	6610 ÷ 40	M1dep	
	165.25	A1	
7 (a)	Any product including a prime that makes 28	M1	
	$2 \times 2 \times 7$ or $2^2 \times 7$	A1	
7 (b)	$2 \times 2 \times 5 \times 7$	M1	
	140	A1	
8	4(x+4)=26	M1	
	4x = 10	M1dep	
	2.5	A1	

Question	Answer	Mark	Comments
9	0.85	B1	
	238 ÷ 0.85	M1	
	280	A1	
10	36 ÷ 3 or 12	M1	
	2 × 12 or 5 × 12	M1dep	
	24 and 60	A1	
11	$\sqrt{\frac{402}{\pi}}$ or 11.3	M1	
	$11.3 \times \pi + 2 \times 11.3$	M1dep	
	[58, 58.2]	A1	
12	Arc from <i>A</i> cutting given line	M1	
	Arc centred on intersection and crossing original arc plus line drawn and angle 60° drawn	A1	
	60° angle bisected	A1	Angle must be between [26, 32]
13 (a)	$4x^2 - 8x + 3x - 6$	M1	
	$20x^2 - 25x - 30$	A1	
13 (b)	2(x+a)(x+b)	M1	$ab = \pm 3$
	2(x + 1)(x + 3)	A1	oe eg $(2x + 2)(x + 3)$
14	Triangle between (3, 9), (4, 9) and (4, 7)	В3	B2 two vertices correct B1 rays marked through (5, 8)
15	30 × 1.6 or 48	M1	
	(their 48 – 40) ÷ 40 (× 100)	M1dep	
	20	A1	
16 (a)	$(x + 3)^2$	M1	
	$(x + 3)^2 - 9$	M1dep	
	$(x + 3)^2 - 18$	A1	
16 (b)	$x + 3 = \sqrt{18}$	M1	
	$x = -3 \pm \sqrt{18}$	A1	
17	2(4x - 1) - 3(x + 1)	M1	
	5x - 5 =	A1	
	$(4x - 1)(x + 1)$ or $4x^2 + 4x - x - 1$	M1	
	$4x^2 - 2x + 4$	A1	

18 (a) $y = kx^2$ and $20 = M1$ $k \times 2^2$ k = 5 A1 500 A1 18 (b) $5 = 5 \times x^2$ M1
k = 5 A1 500 A1
500 A1
18 (b) $5 = 5 \times x^2$ M1
±1 A1 Condone
omission of ±
19 $x(x-6) + 2x + M1$ x-4+x+30 =
146
$x^2 - 2x - 120 = 0$ A1
(x - 12)(x + 10) A1
= 0
x = 12 A1
$\frac{8}{146}$ or $\frac{4}{73}$ A1
146 73
20 (a) $\cos x$ M1
$= \frac{10^2 + 7^2 - 13^2}{2 \times 10 \times 7}$
2×10×/
1 A1
$\left -\frac{1}{7} \right $
98.2 A1
20 (b) 1 M1
$\frac{1}{2} \times 7 \times 10 \times \sin \left(\frac{1}{1} \right)$
(their 98.2)
34.6 A1
21 $6(3+\sqrt{3})$ M1
$(3-\sqrt{3})(3+\sqrt{3})$
18 + $6\sqrt{3}$ A1
9-3
a(a · /a) A1
$\frac{6(3+\sqrt{3})}{2}$
6
22 11.5 or 12.5 or M1 8.25 or 8.35
11.5 and 12.5 and M1dep
8.25 and 8.35
8.25 ÷ 12.5 or M1
8.35 ÷ 11.5
Upper 46.6 A1
Lower 41.3 A1

Question	Answer	Mark	Comments
23 (a)	Tangent drawn at 3	M1	
	y-step and x-step measured	M1dep	
	[0.7, 1.1]	A1ft	ft their tangent
23 (b)	Attempt to calculate area under curve	M1	
	[75, 85]	A1ft	ft their area
	Their area ÷ 10	M1dep	
	[7.5, 8.5]	A1	

Paper 3

Question	Answer	Mark	Comments
1	Force ÷ Area	B1	
2	$\frac{\sqrt{3}}{2}$	B1	
3	729	B1	
4	125	B1	
5 (a)	<i>x</i> ⁹	B1	
5 (b)	<i>x</i> ¹⁰	B1	
6	$\left(\begin{array}{c} 10 \\ 4 \end{array}\right)$	B2	B1 for each component
7	-2, -1, 0, 1, 2, 3	B2	B1 for -3, -2, -1, 0, 1, 2, 3 B1 for -2, -1, 0, 1, 2, 3, 4
8		B2	B1 for any enlargement that reduces the size of the shape and keeps the side in relative ratio. B1 for any 3 sides correct.
9	1.5 ÷ 2	M1	
	0.75	A1	
10 (a)	$\frac{4}{10} \text{ marked on}$ $\text{red and } \frac{6}{10}$ marked on blue	B1	

Question	Answer	Mark	Comments
10 (b)		M1	
	$\frac{4}{10} \times \frac{4}{10} \text{ or } \frac{6}{10}$		
	× 6/10		
	^ 10		
	$\frac{4}{10} \times \frac{4}{10} + \frac{6}{10}$	M1dep	
	$10^{-8} \times 10^{-4} \times 10^{-4}$		
	× 6/10		
	[^] 10		
	0.52	A1	oe
11	3x + 2y = 2 and	M1	
	3x + 12y = 27 or $6x + 4y = 4$		
	and $x + 4y = 9$		
	x = -1	A1	
	<i>y</i> = 2.5	A1	
12 (a)	(x+5)(x-5)	B1	
12 (b)	$x^2 + 4x + 4$ or	M1	(x + 2 + x + 1)
	$x^2 + 2x + 1$		(x + 2 - (x + 1))
	$x^2 + 4x + 4 - (x^2 + 2x + 1)$	Mildep	(2x + 3)(1)
	Shows	A1	
	subtraction of	/ ()	
	terms clearly		
13 (a)	12 × sin 32 =	B1	
42 (1-)	6.36 (2dp)	N 4 4	
13 (b)	$\pi \times 6.36 \times 12$ [236.6, 240]	M1 A1	
14	0.92	B1	
1-7	$0.92^n \text{ for } n > 3$	M1	
	9 years	A1	Accept just over
			8 or between 8
			and 9
15	ACB	B2	B1 for 1 correct
16	$4x^4y^6$	B2	B1 for 2 parts correct
17 (a)	B and D	B1	5511551
17 (b)	A and D	B1	
18 (a)	30 and 38	B2	B1 each
18 (b)	Works out	M1	
	second		
	difference as 2	144	
	Subtracts n^2 from series, ie 5, 6, 7,	M1dep	
	8, 9		
	Identifies n	A1	
	+ 4 as linear		
	sequence		
	$n^2 + n + 4$	A1	

0	A	14-1-	0
Question	Answer	Mark	Comments
19	Shows reflected triangle <i>B</i> at (7, 2),	M1	
	(7, 4) and (9, 4)		
	Shows reflected	M1dep	
	triangle C at		
	(1, 4), (3, 4) and (3, 2)		
	Rotation, 180°,	A2	A1 for 2 parts.
	about (5, 6)		Accept
			reflection in line $y + x = 11$ oe
20	x 11	M1	
	$\frac{x}{\sin 78} = \frac{11}{\sin 65}$		
	11×sin78	M1dep	
	$x = {\sin 65}$		
	[11.87, 11.9]	A1	
21	14 ÷ 8 or 1.75	M1	
	540 × (their 1.75) ³	M1dep	
	2890	A1	
22	$AC = \sqrt{8^2 + 6^2}$ or 10	M1	
	CX = 5	A1	
	$VX = \sqrt{12^2 - 5^2}$	M1dep	
	or $\sqrt{119}$ or 10.9		
	Angle VCX =	M1dep	Can use cos or
	$\sin^{-1}(10.9 \div 12)$		tan
	[65, 65.4]	A1	
23 (a)	$b = \sqrt[3]{2a - 3}$	B1	
23 (b)	- 1	B1	
23 (c)	-1.89	B2	B1 for any
			further iterations or 1.89

0	A	Maula	0
Question	Answer	Mark	Comments
24 (a)	$x^2 + y^2 = 16$	B1	
24 (b)	Angle = tan ⁻¹ (2) or 63.43	M1	
	(their 63.43 \div 360) \times 2 \times π \times their radius	M1dep	
	[4.36, 4.43]	A1	
25	$\frac{4}{9}x$	M1	
	$\frac{4}{9}x + 7$	M1dep	
	$\frac{4}{9}x + 7 = \frac{x+7}{2}$	M1dep	
	$\frac{1}{18}x = \frac{7}{2}$	M1dep	
	63	A1	T&I B1 for correct answer
26 (a)	<u>x+1</u> 3	B2	B1 for numerator of 3(x + 1) B1 for $\frac{x-1}{3}$
26 (b)	$3(x^2 + 2) - 1$	M1	
	$3x^2 + 5$	A1	
27	$x^2 + (x + 3)^2$	M1	
	$x^2 + x^2 + 6x + 9 = x + 12$	A1	
	$2x^2 + 5x - 3 = 0$	M1	
	(2x - 1)(x + 3)	A1	
	$\left(\frac{1}{2}, 3\frac{1}{2}\right)$ and	A1	
	(-3, 0)		