Collins

AQA

GCSE

Mathematics

SET B – Higher Tier

Author: Keith Gordon

H

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

Question	Answer	Mark	Comments
1	$x + 3$	B1	
2	$(x - 2)(x + 3) = 0$	B1	
3 (a)	$\sqrt{52}$ cm	B1	
3 (b)	$\dfrac{3}{4}$	B1	
4	$6x - 12 + 8 = x$	M1	
	$5x = 4$	M1dep	
	$x = 0.8$	A1	oe
5	Area of any face, i.e. 20×5 or 100 etc.	M1	
	$2 \times 100 + 2 \times 50 + 2 \times 200$	M1dep	
	700	A1	
6	$4x + 4 - 6x + 8$	M1	M1 for 3 terms correct
	$4x + 4 - 6x + 8$	A1	A1 for 4 terms correct
	$-2x + 12$	A1ft	ft on M1, e.g. $4x + 1 - 6x - 8 = -2x - 7$ is M1, A0, A1ft
7	$2x + 100 = 180$	M1	
	$360 \div 40$	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 $2 \times 3 - 1$	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	
	2	A1	
13	$x \leqslant 6$	B1	
	$x + y \geqslant 7$	B1	
	$y \leqslant x + 1$	B1	

Question	Answer	Mark	Comments
14	$27 + 9\sqrt{2} - 3\sqrt{8} - \sqrt{16}$	M1	oe
	$27 + 9\sqrt{2} - 6\sqrt{2} - 4$	A1	
	$23 + 3\sqrt{2}$	A1	
15	Vertical 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 45–50 to a height of 1	B3	B2 Scale marked and any two bars B1 Scale marked and any 1 bar
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)	$\mathbf{a} + \dfrac{3}{2}\mathbf{b}$	B1	

Question	Answer	Mark	Comments
19 (b)	$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AO}$ $+ \overrightarrow{OC} = -\mathbf{a}$ $+ \dfrac{1}{2}\,\mathbf{b}$ or $-\dfrac{3}{2}\mathbf{b} - \mathbf{a} + OC$ $= -\mathbf{a} + \dfrac{1}{2}\mathbf{b}$	M1	
	2**b**	A1	
20	$x = 0.733333...$ and $10x$ $= 7.33333$	M1	
	$9x = 6.6$ or $\dfrac{66}{90}$	A1	
	$3\dfrac{11}{15}$	A1	
21	$\dfrac{x^2}{2} = 9$	M1	
	$x = 3\sqrt{2}$	M1	
	Hypotenuse = 6	M1	
	$6 + 2 \times 3\sqrt{2}$	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 $\dfrac{7}{10}$, $\dfrac{3}{10}$, $\dfrac{6}{9}$ oe, $\dfrac{3}{9}$ oe, $\dfrac{7}{9}$ and $\dfrac{2}{9}$ or one of $\dfrac{7}{10}$ $\times \dfrac{3}{9}$ or $\dfrac{3}{10} \times \dfrac{7}{9}$	A1	
	$\dfrac{7}{10} \times \dfrac{3}{9} + \dfrac{3}{10}$ $\times \dfrac{7}{9}$	M1dep	
	$\dfrac{42}{90}$ or $\dfrac{7}{15}$	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
	$\dfrac{2x - 5}{2}$	B1	
24	Gradient AB $= -\dfrac{1}{2}$	M1	
	Gradient perpendicular 2	A1	
	Midpoint AB = (5, 9)	B1	
	$9 = 2 \times 5 + c$	M1	
	$y = 2x - 1$	A1	

Paper 2
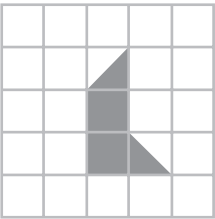
Question	Answer	Mark	Comments
1	$\dfrac{2}{5}$	B1	
2	(7, 6)	B1	
3 (a)	alternate angles	B1	
3 (b)	$a + b = 180$	B1	
4	Correct translation, i.e. (1, 1) → (–2, –3), etc.	B2	B1 for correct translation of one vector component
5	$6^2 + 11^2$	M1	
	$\sqrt{157}$	M1dep	
	12.5…	A1	
6	5 × 145 + 9 × 155 + 12 × 165 + 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 × 2 × 7 or $2^2 \times 7$	A1	
7 (b)	2 × 2 × 5 × 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	$\sqrt{\dfrac{402}{\pi}}$ or 11.3…	M1	
	11.3 × π + 2 × 11.3	M1dep	
	[58, 58.2]	A1	
12	Arc from A 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)	B3	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	

Question	Answer	Mark	Comments
18 (a)	$y = kx^2$ and $20 = k \times 2^2$	M1	
	$k = 5$	A1	
	500	A1	
18 (b)	$5 = 5 \times x^2$	M1	
	± 1	A1	Condone omission of ±
19	$x(x - 6) + 2x + x - 4 + x + 30 = 146$	M1	
	$x^2 - 2x - 120 = 0$	A1	
	$(x - 12)(x + 10) = 0$	A1	
	$x = 12$	A1	
	$\dfrac{8}{146}$ or $\dfrac{4}{73}$	A1	
20 (a)	$\cos x = \dfrac{10^2 + 7^2 - 13^2}{2 \times 10 \times 7}$	M1	
	$-\dfrac{1}{7}$	A1	
	98.2	A1	
20 (b)	$\dfrac{1}{2} \times 7 \times 10 \times \sin$ (their 98.2)	M1	
	34.6…	A1	
21	$\dfrac{6\left(3 + \sqrt{3}\right)}{\left(3 - \sqrt{3}\right)\left(3 + \sqrt{3}\right)}$	M1	
	$\dfrac{18 + 6\sqrt{3}}{9 - 3}$	A1	
	$\dfrac{6\left(3 + \sqrt{3}\right)}{6}$	A1	
22	11.5 or 12.5 or 8.25 or 8.35	M1	
	11.5 and 12.5 and 8.25 and 8.35	M1dep	
	8.25 ÷ 12.5 or 8.35 ÷ 11.5	M1	
	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	$\dfrac{\sqrt{3}}{2}$	B1	
3	729	B1	
4	125	B1	
5 (a)	x^9	B1	
5 (b)	x^{10}	B1	
6	$\begin{pmatrix} 10 \\ 4 \end{pmatrix}$	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)	$\dfrac{4}{10}$ marked on red and $\dfrac{6}{10}$ marked on blue	B1	

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

Question	Answer	Mark	Comments
19	Shows reflected triangle B at (7, 2), (7, 4) and (9, 4)	M1	
	Shows reflected triangle C at (1, 4), (3, 4) and (3, 2)	M1dep	
	Rotation, 180°, about (5, 6)	A2	A1 for 2 parts. Accept reflection in line $y + x = 11$ oe
20	$\dfrac{x}{\sin 78} = \dfrac{11}{\sin 65}$	M1	
	$x = \dfrac{11 \times \sin 78}{\sin 65}$	M1dep	
	[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	
	$VX = \sqrt{12^2 - 5^2}$ or $\sqrt{119}$ or 10.9..	M1dep	
	Angle $VCX = \sin^{-1}(10.9 \div 12)$	M1dep	Can use cos or 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….

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 ÷ 360) × 2 × π × their radius	M1dep	
	[4.36, 4.43]	A1	
25	$\dfrac{4}{9}x$	M1	
	$\dfrac{4}{9}x + 7$	M1dep	
	$\dfrac{4}{9}x + 7 = \dfrac{x+7}{2}$	M1dep	
	$\dfrac{1}{18}x = \dfrac{7}{2}$	M1dep	
	63	A1	T&I B1 for correct answer
26 (a)	$\dfrac{x+1}{3}$	B2	B1 for numerator of $3(x + 1)$ B1 for $\dfrac{x-1}{3}$
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	
	$\left(\dfrac{1}{2}, 3\dfrac{1}{2}\right)$ and (−3, 0)	A1	