For **AQA**

Mathematics

Paper 1 (Non-Calculator)

Higher Tier

Churchill Paper 1A – Marking Guide

Method marks (M) are awarded for a correct method which could lead to a correct answer

Accuracy marks (A) are awarded for a correct answer, having used a correct method, although this can be implied

(B) marks are awarded independent of method

Churchill Maths

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Churchill Paper 1A Marking Guide – AQA Higher Tier

1	$\cancel{2}$ $\cancel{4}$ $\cancel{4}$ $\cancel{4}$ 6 $\cancel{7}$ $\cancel{8}$ $\cancel{8}$ $\cancel{9}$		
	4 5 6 6.5	B1	Total 1

2	$3\frac{1}{2} \times £10 = £35$		
	$3\frac{1}{2} \times 60p = £1.80 + £0.30 = £2.10$		
	$3\frac{1}{2} \times £10.60 = £35 + £2.10 = £37.10$		
	£31.80 £35.30 £36.80 £37.10	B1	Total 1

3	2 6 18 54		
	×3 ×3 ×3 Next term = 3 × 54 = 162		
	72 162 166 2916	B1	Total 1

4	$\frac{3}{10} \div \frac{1}{2} = \frac{3}{10} \times \frac{2}{1} = \frac{6}{10} = \frac{3}{5}$		
	$\frac{3}{20}$ $\frac{3}{5}$ $\frac{5}{6}$ $1\frac{1}{5}$	B1	Total 1

5	**(a)** 1 chain costs 180 ÷ 20 = £9		
	1 bead costs 750 ÷ 500 = £1.50	M1	
	1 spacer costs 90 ÷ 100 = £0.90		
	1 heart charm costs 120 ÷ 30 = £4		
	Total = 9 + (8 × 1.50) + (4 × 0.90) + 4	M1	
	= 9 + 12 + 3.60 + 4		
	= £28.60	A1	
	(b) Profit on 1 bracelet = 39.90 – 28.60 = £11.30		
	Profit on 15 bracelets = 15 × 11.30	M1	
	= 10 × 11.30 + 5 × 11.30		
	= 113 + 56.50		
	= £169.50	A1	Total 5

6	The angles in a triangle add up to 180° so		
	$4x + 3x + 20 + 5x - 8 = 180$	M1	
	$12x + 12 = 180$		
	$12x = 168$		
	$x = 14$	A1	
	$4x = 56$, $3x + 20 = 62$ and $5x - 8 = 62$	M1	
	As angle *ABC* = angle *ACB* the triangle is isosceles		
	The two sides opposite the equal angles are the same length		
	Hence, *AB* = *AC*	A1	Total 4

7	**(a)**	$= 7 \times 6 = 42$ ways	B1	
	(b)	Smallest 2 frame sizes: no. of combinations $= 2 \times 7 \times 3 = 42$ Largest 3 frame sizes: no. of combinations $= 3 \times 7 \times 6 = 126$ Total no. of combinations $= 42 + 126 = 168$	M1 A1	Total 3
8	**(a)**	e.g. She can not be sure of this because 10 is a very small number of trials	B1	
	(b)	No. of times red bead picked $= 7 + 6 + 8 + 6 = 27$ No. of trials $= 40$ P(Faria picks a red bead) $= \frac{27}{40}$	M1 A1	
	(c)	No, she is wrong. We know the probability that one bead will be green is $\frac{6}{10}$. However, we don't know the probability that the second will be green, given that the first was green, because we don't know how many beads are in the bag. Her answer assumes that the bag contains 10 beads so that after removing one green bead there are 9 beads left, 5 of which are green.	B2	Total 5
9		$p = 4q - 7$ $p + 7 = 4q$ $q = \dfrac{p+7}{4}$ $\dfrac{p+7}{4}$ $7p - 4$ $\dfrac{p}{4} + 7$ $p + \dfrac{7}{4}$	B1	Total 1
10	**(a)**	Jeremy marks 1 homework in $60 \div 12 = 5$ minutes Kira marks 1 homework in $120 \div 30 = 4$ minutes Liz marks 1 homework in 6 minutes Therefore Kira is the quickest	M1 A1	
	(b)	In 20 minutes Jeremy marks 4 homeworks and Kira marks 5 homeworks Together they mark 9 homeworks in 20 minutes $36 \div 9 = 4$ so they take $4 \times 20 = 80$ minutes 4.30 pm + 80 minutes = 5.30 pm + 20 minutes = 5.50 pm They finish marking at 5.50 pm	 M1 M1 A1	Total 5
11		Last week = 100% This week = 120% = 240 So, 10% $= 240 \div 12 = 20$ 100% $= 10 \times 20 = 200$ Leanne sent 200 emails last week	 M1 A1	Total 2

12 Angle in semi-circle = 90º
a = 180 – (90 + 38)
a = 52

38 52 58 62 B1 Total 1

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13 2 + 3 = 5
600 ÷ 5 = 120
2 × 120 = 240

120 200 240 250 B1 Total 1

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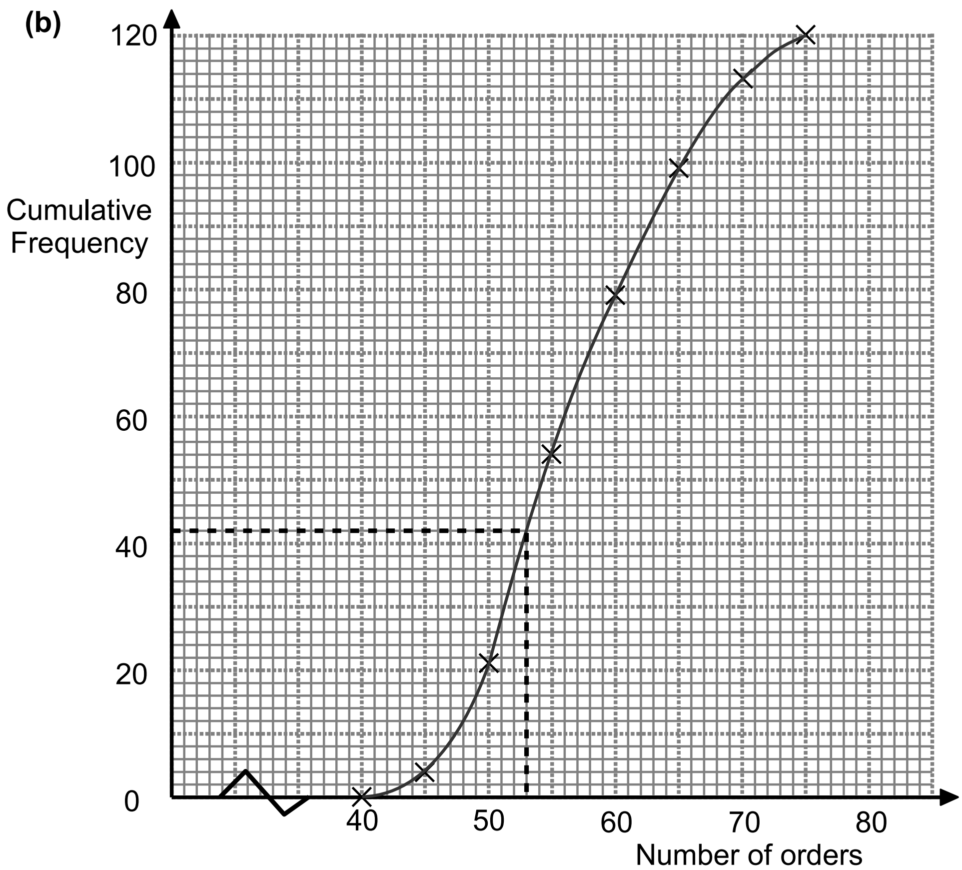
14 **(a)** M1 A1

Number of orders (N)	Cum. Freq.
$40 < N \leq 45$	4
$40 < N \leq 50$	21
$40 < N \leq 55$	54
$40 < N \leq 60$	79
$40 < N \leq 65$	99
$40 < N \leq 70$	113
$40 < N \leq 75$	120

(b) B3



(c) 42 (approx, from graph) B1 Total 6

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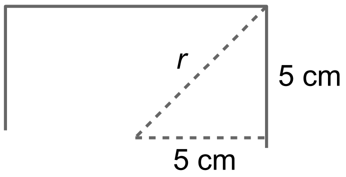
15 Radius of inner circle = $10 \div 2 = 5$

Area of inner circle = $\pi \times 5^2 = 25\pi$ — B1

Radius of outer circle = distance from centre to corner of square:



Pythagoras': $r^2 = 5^2 + 5^2 = 25 + 25 = 50$ — M1

Area of outer circle = $\pi \times 50 = 50\pi$

Shaded area = $50\pi - 25\pi = 25\pi$ — M1

Therefore shaded area = area of inner circle — A1 — Total 4

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16 In a normal week, let Henrik earn h and Rob earn r

$h : r = 3 : 2$ so $h = \frac{3}{2}r$ (1) — B1

$h + 20 : r + 20 = 4 : 3$ so $h + 20 = \frac{4}{3}(r + 20)$ — M1

$3(h + 20) = 4(r + 20)$

$3h + 60 = 4r + 80$ (2)

Sub (1) into (2) $3 \times \frac{3}{2}r + 60 = 4r + 80$ — M1

$\frac{9}{2}r + 60 = 4r + 80$

$\frac{1}{2}r = 20$

$r = 40$ so, $h = \frac{3}{2} \times 40 = 60$

In the week before Christmas, Henrik earns $h + 20 = £80$ — A1 — Total 4

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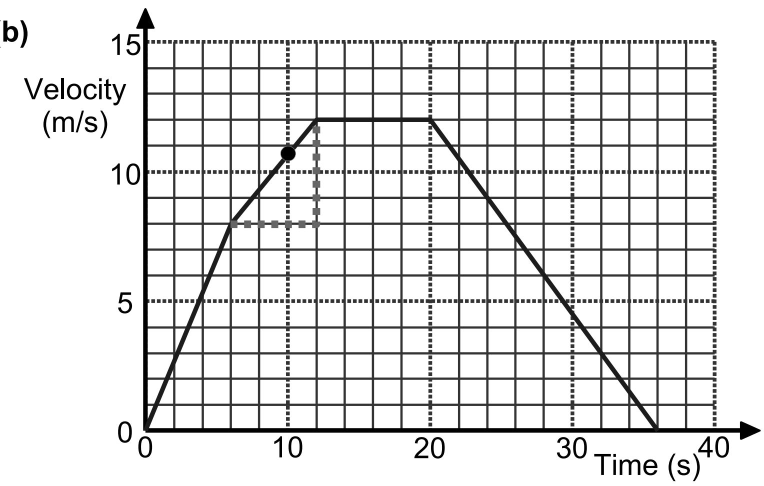
17 **(a)** 8 seconds — B1

(b)



Acceleration = gradient of line = $\frac{12 - 8}{12 - 6} = \frac{4}{6} = \frac{2}{3}$ m/s^2 — M1 A1

(c) Distance = area under graph

$= (\frac{1}{2} \times 6 \times 8) + [\frac{1}{2} \times (8 + 12) \times 6] + (8 \times 12) + (\frac{1}{2} \times 16 \times 12)$ — M2

$= 24 + 60 + 96 + 96$

$= 276$ m — A1 — Total 6

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18 $= \frac{8^3}{4^2} = \frac{8\times8\times8}{4\times4} = 2 \times 2 \times 8 = 32$

$\frac{1}{2}$ 32 64 128 B1 Total 1

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19 $5y = (4 \times 10^7) + (2 \times 10^6)$
$5y = (4 \times 10^7) + (0.2 \times 10^7)$
$5y = 4.2 \times 10^7$ M1
$10y = 8.4 \times 10^7$
$y = 8.4 \times 10^6$ M1 A1 Total 3

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20 David is not correct
e.g. When $x = \frac{1}{16}$: $\sqrt{x} = \sqrt{\frac{1}{16}} = \frac{1}{4}$ M1
$\sqrt[4]{x} = \sqrt[4]{\frac{1}{16}} = \frac{1}{2}$
$\frac{1}{4} < \frac{1}{2}$ making his statement incorrect A1 Total 2

[Any value in the interval $0 < x < 1$ can be used]

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21 **(a)** $g(5) = \frac{5+3}{2} = 4$ M1
$fg(5) = f(4) = 3 \times 4 - 1 = 11$ A1

(b) Let $g(x) = -2$
$\frac{x+3}{2} = -2$ M1
$x + 3 = -4$
$x = -7$
Therefore $g^{-1}(-2) = -7$ A1 Total 4

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22 **(a)** B1

sin 0º	sin 30º	sin 45º	sin 60º	sin 90º
0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1

(b) Area *ABC* $= \frac{1}{2} \times 6 \times 8 \times \sin 30^\circ$ M1
$= 24 \times \frac{1}{2}$
$= 12 \text{ cm}^2$
Area *PQR* $= \frac{1}{2} \times 3 \times 8 \times \sin 45^\circ$
$= 12 \times \frac{\sqrt{2}}{2}$
$= 6\sqrt{2} \text{ cm}^2$ M1
Triangle *ABC* has the larger area A1 Total 4

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23 Sub P $(2a, a)$ into equation: $(2a)^2 + a^2 = 80$ M1

$5a^2 = 80$

$a^2 = 16$

$a = 4$ [can't be -4 as positive constant]

P is (8, 4)

Gradient of $OP = \dfrac{4-0}{8-0} = \dfrac{1}{2}$ M1

Gradient of tangent $= \dfrac{-1}{\left(\frac{1}{2}\right)} = -2$ M1

Equation of tangent: $y = -2x + c$

$4 = (-2 \times 8) + c$ M1

$c = 4 + 16 = 20$

Hence, $y = -2x + 20$

y-intercept = 20 so R is (0, 20)

Crosses x-axis when $y = 0$: $0 = -2x + 20$

$2x = 20$

$x = 10$ so Q is (10, 0)

Area of $OQR = \frac{1}{2} \times 10 \times 20 = 100$ A1 Total 5

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24 **(a)** $\overrightarrow{XY} = \overrightarrow{XO} + \overrightarrow{OY}$

$= -\frac{1}{2}\overrightarrow{OA} + \frac{1}{3}\overrightarrow{OC}$ M1

$= -2\mathbf{p} + 2\mathbf{q}$ A1

(b) $\overrightarrow{BC} = \overrightarrow{BO} + \overrightarrow{OC}$

$= -\overrightarrow{OB} + \overrightarrow{OC}$

$= -(3\mathbf{p} + 3\mathbf{q}) + 6\mathbf{q}$ M1

$= -3\mathbf{p} + 3\mathbf{q}$

$= \frac{3}{2}\overrightarrow{XY}$

As $\overrightarrow{BC}$ is a multiple of $\overrightarrow{XY}$ they have the same direction

so BC is parallel to XY A1 Total 4

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25 **(a)** $x^2 + 4x - 3 = (x+2)^2 - 2^2 - 3$ M1

$= (x+2)^2 - 7$ A1

(b) $(x+2)^2 - 7 = 0$

$(x+2)^2 = 7$

$x + 2 = \pm\sqrt{7}$

$x = -2 \pm \sqrt{7}$ B1

(c) $y = 1 \pm \sqrt{2}$

$y - 1 = \pm\sqrt{2}$

$(y-1)^2 = 2$ M1

$y^2 - 2y + 1 = 2$ M1

$y^2 - 2y - 1 = 0$

$a = -2$ and $b = -1$ A1 Total 6

TOTAL FOR PAPER: 80 MARKS

