For **AQA**

Mathematics

Paper 1 (Non-Calculator)

Higher Tier

Churchill Paper 1E – 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

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Churchill Paper 1E Marking Guide – AQA Higher Tier

1 $3 \times 1.2 = 3.6$
$1.6 \div 2 = 0.8$
$3.6 + 0.8 = 4.4$

[✓ 4.4]   4.2   3.8   2.6   B1   Total 1

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2 $\frac{3}{5} - \frac{2}{9} = \frac{27}{45} - \frac{10}{45} = \frac{17}{45}$

$-\frac{1}{4}$ $\frac{1}{45}$ $\frac{6}{45}$ [✓ $\frac{17}{45}$]   B1   Total 1

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3 (3, 1)   (3, –1)   [✓ (–3, 1)]   (–3, –1)   B1   Total 1

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4 e.g. 7.9 is just 7.9 (!)
$\sqrt{65}$ is a bit bigger than $\sqrt{64}$ so a bit bigger than 8
$(2.1)^3$ is a bit bigger than 2^3 so a bit bigger than 8
$\frac{1}{0.1}$ = 10 and as 0.09 is less than 0.1, $\frac{1}{0.09}$ > 10 so is the largest

$\sqrt{65}$ [✓ $\frac{1}{0.09}$]   7.9 $(2.1)^3$ B1   Total 1

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5 e.g.

C S V
5 : 4   5 : 4 = 15 : 12
   3 : 2   3 : 2 = 12 : 8   M1

Giving

C S V
15 : 12 : 8   Choc to Vanilla = 15 : 8   M1 A1   Total 3

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6 e.g. Total cost = 140 + 315 = £455
Total income = 12×62
= 620 + 124 = £744   B1
Money raised = 744 – 455 = £289
Money raised per person = £289 ÷ 62:

$$\begin{array}{r} 4.6\,6\,1\ldots \\ 62\,\overline{)\,2\,8\,9.0\,0\,0\ldots} \\ \underline{2\,4\,8} \\ 4\,1\,0 \\ \underline{3\,7\,2} \\ 3\,8\,0 \\ \underline{3\,7\,2} \\ 8\,0 \end{array}$$

M2

£4.66 (to the nearest penny)   A1   Total 4

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7 **(a)** In the 5th week he will have added 10 minutes on four times M1
1 hour + 4 × 10 minutes = 1 hour 40 minutes A1

(b) 2 hours has been added on to the original time
2 hours = 120 minutes = 12 × 10 minutes M1
He spends 3 hours in the 13th week of the year A1

(c) In 52nd week he'd spend 1 hour + 51 × 10 minutes M1
51 × 10 minutes = 510 minutes
510 minutes = 510 ÷ 60 hours = 8.5 hours
In 52nd week he'd spend 1 + 8.5 = 9.5 hours on the treadmill
There are 24 × 7 = 168 hours in a week M1
Naz is wrong, 9.5 hours is less than a tenth of the hours in a week A1 Total 7

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8 **(a)** $\frac{1}{2}x + 9 > 3x - 6$
$\frac{1}{2}x + 15 > 3x$
$x + 30 > 6x$ M1
$30 > 5x$
$x < 6$ A1

(b) B1

(c) By inspection, x can be +ve or -ve but it's magnitude must be larger than or equal to $\sqrt{16}$ = 4

$x \le -4$ or $x \ge 4$ M1 A1

[OR: $x^2 - 16 \ge 0$, $(x + 4)(x - 4) \ge 0$, c.v. = ±4
graph or table etc. leading to above answer] Total 5

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9 e.g. $\frac{\sqrt{26}+1.98}{(5.9)^2-8.3} \approx \frac{5+2}{36-8}$

$= \frac{7}{28}$

$= \frac{1}{4}$

–8 –3.5 [✓ 0.25] 1.4 B1 Total 1

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10 $1 - \frac{3}{8} = \frac{5}{8}$ of income not on rent

$1 - \frac{6}{11} = \frac{5}{11}$ of rest of income is saved M1

Fraction saved = $\frac{5}{11} \times \frac{5}{8} = \frac{25}{88}$ M1 A1 Total 3

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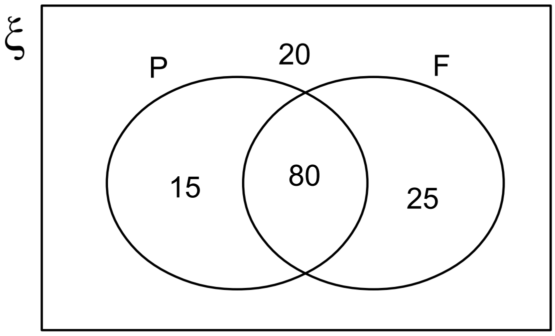
11 **(a)** $\frac{1}{7}$ of 140 = 20

Let the no. of non-fiction paperbacks be x
The number of fiction hardbacks must be $140 - (80 + 20 + x)$
$= 40 - x$

So $80 + (40 - x) = 80 + x + 10$
$120 - x = 90 + x$
$30 = 2x$
$x = 15$ *[Intuitive methods are easier and fine!]*



(20 and 80) B1

(15 and 25) M1 A1

(b) $\frac{20}{45}$ $[= \frac{4}{9}]$ B1 Total 4

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12 **(a)** $f(11) = \dfrac{11 + 1}{2} = 6$ B1

(b) $\dfrac{3}{x} = 9$ M1
$3 = 9x$
$x = \frac{3}{9} = \frac{1}{3}$ A1

(c) $f(\frac{1}{2}) = \dfrac{\frac{1}{2} + 1}{2} = \dfrac{\frac{3}{2}}{2} = \frac{3}{4}$

$gf(\frac{1}{2}) = g(\frac{3}{4}) = \dfrac{3}{\frac{3}{4}} = 3 \times \frac{4}{3} = 4$ M1 A1 Total 5

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13 **(a)** 4 hours = 4 × 60 minutes = 6 × 40 minutes
Doubling 6 times $= \times 2^6 = \times 64$
$64 \times \frac{3}{4}$ million = 48 million

12 million 24 million [✓ 48 million] 96 million B1

(b) Each year the previous year's value is multiplied by 0.63
So new value = 63% of previous value
Annual % decrease = 100 – 63 = 37%

0.63% [✓ 37%] 50.4% 63% B1 Total 2

14 **(a)** $= (93 \times 10^6) + (8 \times 10^6)$
$= 101 \times 10^6$ M1
$= 1.01 \times 10^8$ A1

(b) $= \dfrac{4.2}{1.4} \times \dfrac{10^4}{10^{-6}}$
$= 3 \times 10^{10}$ M1 A1 Total 4

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15 Tangent perpendicular to radius:
Angle OAP = angle $OCP = 90°$
Angles in quadrilateral total 360º:
Angle $AOC = 360 – (90 + 90 + 36) = 360 – 216 = 144°$ M1
Angles around a point total 360º:
Reflex angle $AOC = 360 – 144 = 216°$ M1
Angle subtended at centre is twice angle subtended on circumference:
Angle $ABC = 216 \div 2 = 108°$ A1 Total 3

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16 e.g. Let the average speed of both drivers be v mph

Speed $= \dfrac{\text{distance}}{\text{time}}$ so time $= \dfrac{\text{distance}}{\text{speed}}$

For Gethin, time $= \dfrac{85}{v}$ and for Bella, time $= \dfrac{75}{v}$ M1

Gethin's journey takes 12 minutes longer $= \frac{1}{5}$ hour longer

So, $\dfrac{85}{v} = \dfrac{75}{v} + \dfrac{1}{5}$ M1

$85 = 75 + \frac{1}{5}v$

$\frac{1}{5}v = 10$

$v = 50$ M1

Bella's journey time $= \dfrac{75}{50} = 1.5$ hours = 1 hour 30 mins

They arrive at 10.42 am A1

[Note, quick method: Gethin must have covered 10 miles in 12 minutes] Total 4

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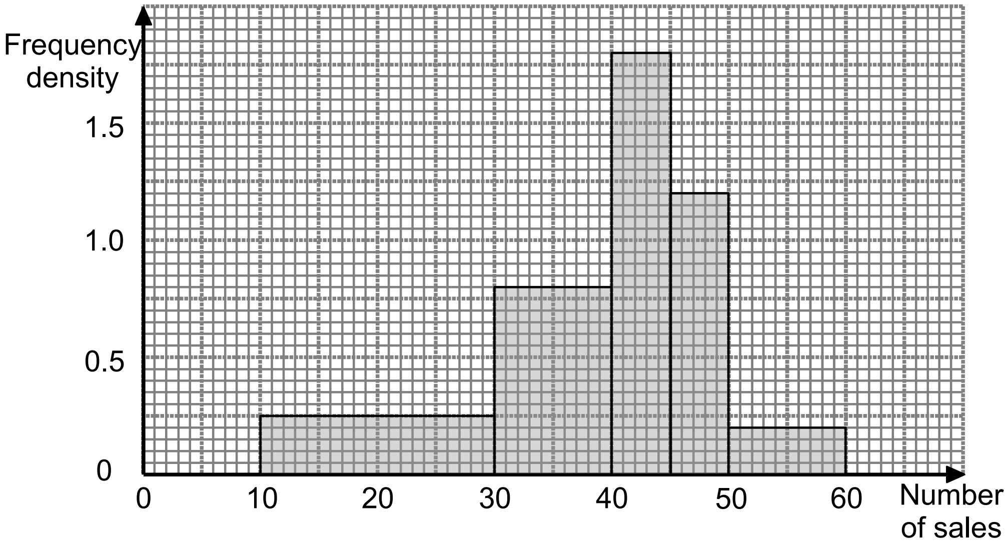
17 **(a)**

Number of sales (S)	**Number of days**	Class width	Frequency density
$10 \le S < 30$	5	20	0.25
$30 \le S < 40$	8	10	0.8
$40 \le S < 45$	9	5	1.8
$45 \le S < 50$	6	5	1.2
$50 \le S < 60$	2	10	0.2

M1 A1



A1

(b) e.g. The advert has been successful as there is a higher frequency density for more than 40 sales and a lower frequency density for less than 40 sales meaning that sales have increased B1

(c) 5 × 0.6 + 5 × 2.0 + 5 × 1.4 + 10 × 0.4 M1
= 3 + 10 + 7 + 4 = 24 days A1

(d) e.g. It assumed that the days in the 30 to 40 class were split evenly with half being below 35 and half being 35 or over B1 Total 7

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18 Triangle BDE is equilateral so each internal angle = 60º

Angle CBD = angle BDE = 60º (alternate angles) M1

$\tan 60º = \frac{CD}{BD}$ so $\sqrt{3} = \frac{CD}{8}$ M1

$CD = 8\sqrt{3}$ cm

$\cos 60º = \frac{BD}{BC}$ so $\frac{1}{2} = \frac{8}{BC}$

$\frac{1}{2}BC = 8$

$BC = 16$ cm A1

$AB = 21 - 16 = 5$ cm

Angle ABE = angle BED = 60º (alternate angles)

$AE^2 = AB^2 + BE^2 - 2 \times AB \times BE \times \cos 60º$ M1

$AE^2 = 5^2 + 8^2 - 2 \times 5 \times 8 \times \frac{1}{2}$

$AE^2 = 25 + 64 - 40 = 49$

$AE = 7$ cm (length so positive)

Perimeter = $21 + 8\sqrt{3} + 8 + 7 = (36 + 8\sqrt{3})$ cm A1 Total 5

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19 Triangle ABC is similar to triangle AMN

Length scale factor = $\frac{15}{6} = \frac{5}{2}$

Area scale factor = $(\frac{5}{2})^2 = \frac{25}{4}$

Area of triangle AMN to area of triangle ABC = 4 : 25

Area of triangle AMN to area of quadrilateral $BCNM$ = 4 : 21

2 : 5 [✓ 4 : 21] 4 : 25 8 : 117 B1 Total 1

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20 **(a)** $27^{\frac{2}{3}} = \left(27^{\frac{1}{3}}\right)^2 = 3^2 = 9$ M1 A1

(b) $25^x = (5^2)^x = 5^{2x}$ B1

$125^{-\frac{1}{3}} = (5^3)^{-\frac{1}{3}} = 5^{-1}$

So, $5^{2x} = 5^{\frac{7}{2}} \times 5^{-1}$

$5^{2x} = 5^{\frac{7}{2}+(-1)} = 5^{\frac{5}{2}}$ M1

$2x = \frac{5}{2}$

$x = \frac{5}{4}$ A1 Total 5

21	e.g. Regular hexagon so length of *PQ* = length of *ST*		
	PS is common to both triangles so length is the same	B1	
	Regular hexagon so opposite sides are parallel		
	Therefore angles *QPS* and *TSP* are alternate and equal	M1	
	We have two pairs of equal sides and the angle between them is also equal, hence congruent by SAS	A1	Total 3

22	Rearrange: $3x + 2y = 26$		
	$2y = 26 - 3x$		
	$y = 13 - \frac{3}{2}x$		
	Gradient of tangent = $-\frac{3}{2}$	M1	
	Gradient of radius perpendicular to tangent = $\frac{-1}{\left(-\frac{3}{2}\right)} = \frac{2}{3}$	M1	
	Radius passes through origin so equation is $y = \frac{2}{3}x$		
	Sub $y = \frac{2}{3}x$ into $3x + 2y = 26$ to find point on circle:		
	$3x + 2(\frac{2}{3}x) = 26$	M1	
	$9x + 4x = 78$		
	$13x = 78$		
	$x = 6$		
	When $x = 6$, $y = \frac{2}{3} \times 6 = 4$		
	Hence (6, 4) is point where tangent touches circle		
	Let radius be r: $r^2 = 6^2 + 4^2$	M1	
	$r^2 = 36 + 16 = 52$		
	Equation of circle is $x^2 + y^2 = r^2$		
	So, $x^2 + y^2 = 52$	A1	Total 5

23	$(4x + a)(x - 2) = 4x^2 - 8x + ax - 2a$	M1	
	$(2x + 1)^2 = 4x^2 + 4x + 1$	B1	
	So, $4x^2 - 8x + ax - 2a \equiv 4x^2 + 4x + 1 + b$		
	Hence: $-8 + a = 4$	M1	
	$a = 12$	A1	
	And: $-2a = 1 + b$		
	$-24 = 1 + b$		
	$b = -25$	A1	Total 5

TOTAL FOR PAPER: 80 MARKS