For **AQA**

Mathematics

Paper 2 (Calculator)

Higher Tier

Churchill Paper 2B – 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

Written by Shaun Armstrong

Churchill Paper 2B Marking Guide – AQA Higher Tier

1 $\frac{5}{8}$ $\frac{3}{5}$ $\frac{1}{3}$ $\frac{3}{8}$ B1 Total 1

---

2 $y = 4x + 1$ $y = x - 3$ $y = 1 - 3x$ $y = 2x - 1$ B1 Total 1

---

3 1% = 400000, 0.01% = 4000, 0.02% = 8000

£800 000 £80 000 £8000 £800 B1 Total 1

---

4 $2\mathbf{a} = \begin{pmatrix} 8 \\ 2 \end{pmatrix}$

$2\mathbf{a} - \mathbf{b} = \begin{pmatrix} 8 \\ 2 \end{pmatrix} - \begin{pmatrix} -2 \\ 3 \end{pmatrix} = \begin{pmatrix} 10 \\ -1 \end{pmatrix}$

$\begin{pmatrix} 6 \\ -1 \end{pmatrix}$ $\begin{pmatrix} 6 \\ -5 \end{pmatrix}$ $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ $\begin{pmatrix} 10 \\ -1 \end{pmatrix}$ B1 Total 1

---

5 Let rain in January be x mm
Rain in February = $(x + 16)$ mm
Rain in March = $[(x + 16) + 5] = (x + 21)$ mm M1
So, $x + (x + 16) + (x + 21) = 172$ M1
$3x + 37 = 172$
$3x = 135$
$x = 45$
There was 45 mm of rain in January A1 Total 3

---

6 Angles on a straight line add up to 180º
$180 - 124 = 56°$ M1
Angles in small right-angled triangle add up to 180º
$180 - (90 + 56) = 180 - 146 = 34°$ M1
Angles in large right-angled triangle add up to 180º
$180 - (90 + 34) = 180 - 124 = 56°$
$x = 56$ A1 Total 3

---

7 Time = $\dfrac{\text{distance}}{\text{speed}}$

Giving: $\dfrac{70}{0.1}$ = 700 seconds $\dfrac{4}{40} = \frac{1}{10}$ hour = 360 seconds

$\dfrac{2000}{4}$ = 500 seconds $\dfrac{500}{4500} = \frac{1}{9}$ hour = 400 seconds

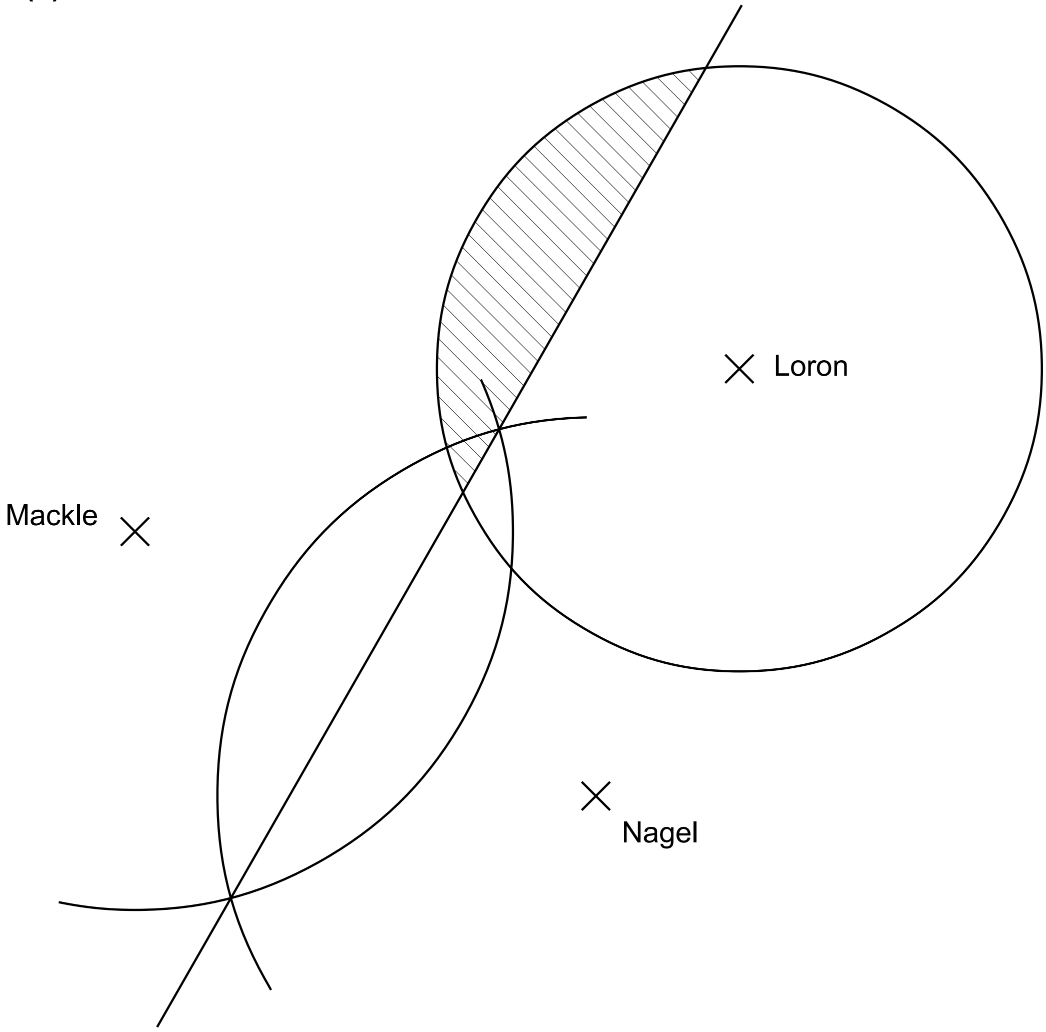
70 metres at 0.1 m/s 4 kilometres at 40 km/h

2 kilometres at 4 m/s 500 kilometres at 4500 km/h B1 Total 1

---

8 **(a)**	Distance on map ≈ 8.4 cm	M1	
	Distance = 16.8 km *[Accept 16.5 to 17.1]*	A1	

(b)



Circle, radius 4 cm, centre Loron	B1	
Correct method for perpendicular bisector of Mackle and Nagel	M1	
Correct region shaded and accurate	A1	Total 5

---

9 **(a)** January 2014 January 2016 June 2014 January 2017 B1

(b) e.g. No. Although the trend is for the number of applicants to decrease, there is a seasonal variation in which each June has more applicants than the previous January. Hence, June 17 will probably have more applicants than January 17. B2 Total 3

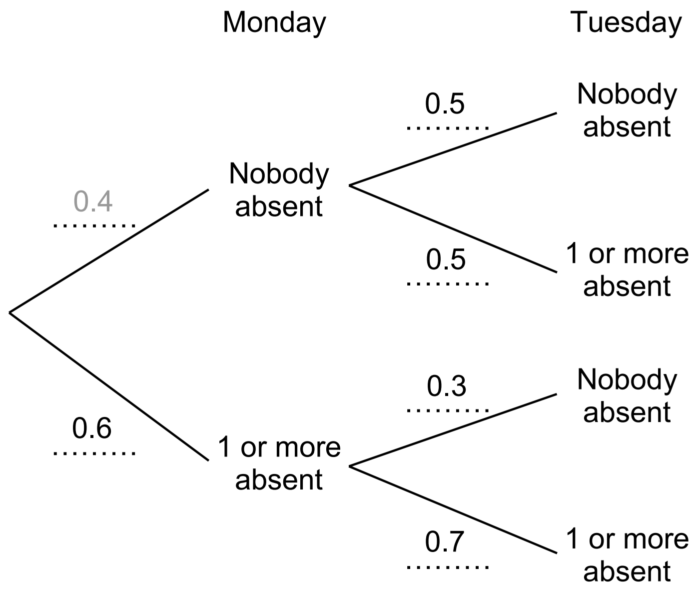
---

10 $p + 3p(2p - 1) = p + 6p^2 - 3p$
$= 6p^2 - 2p$
$= 2p(3p - 1)$

$p(6p - 1)$ $2p(3p - 1)$ $2p(3p - 2)$ $2p(3p + 2)$ B1 Total 1

11	$2 + 3 = 5$ $60 \div 5 = 12$ $2 \times 12 = 24$, so she needs 24 litres of pineapple $24 \div 1.5 = 16$, so she needs 16 cartons of pineapple Each carton costs £1.30 so 16 cartons cost 16 × £1.30 = £20.80 $3 \times 12 = 36$, so she needs 36 litres of mango $36 \div 4 = 9$, so she needs 9 packs of 4 cartons 1 pack costs £3.20 so 9 packs cost 9 × £3.20 = £28.80 Total cost = £20.80 + £28.80 = £49.60 Total sales = 190 × 50p = £(190 ÷ 2) = £95 Profit = £95 – £49.60 = £45.40	 M1 A1 M1 A1	 Total 4
12	Total score in 9 tests = 9 × 59 = 531 Total score in 10 tests = 10 × 58.5 = 585 Score in 10th test = 585 – 531 = 54 Total score in 11 tests = 11 × 60 = 660 Score in 11th test = 660 – 585 = 75 Difference = 75 – 54 = 21	M1 M1 A1	 Total 3
13	e.g. Let common difference be d 7^{th} term = 1^{st} term + $6 \times d$ So, $9a = a + 6d$ $8a = 6d$ $d = \frac{8a}{6} = \frac{4}{3}a$ 4^{th} term = 1^{st} term + $3 \times d$ So, $ka = a + 3 \times \frac{4}{3}a$ $ka = a + 4a = 5a$ $k = 5$	 M1 M1 A1	 Total 3
14	**(a)** $2p(2p - 3) = 0$ $p = 0$ or $\frac{3}{2}$ **(b)** $(5m + 3)(m - 2)$ $(5m - 3)(m + 2)$ $(5m - 6)(m + 1)$ $(5m + 1)(m - 6)$	M1 A1 B1	 Total 3
15	T tonnes = $1000T$ kg 2.5 g/cm^3 = $(100)^3 \times 2.5$ g/m^3 = 2500000 g/m^3 = 2500 kg/m^3 Density = $\frac{\text{mass}}{\text{volume}}$ $2500 = \frac{1000T}{\text{volume}}$ $2500 \times \text{volume} = 1000T$ Volume = $\frac{1000T}{2500}$ m^3 $= \frac{10}{25}T = \frac{2}{5}T = 0.4T$ m^3	 M1 M1 A1	 Total 3

16 **(a)**



M1 A1

(b) $= 0.4 \times 0.5 + 0.6 \times 0.3$ M1
$= 0.2 + 0.18$
$= 0.38$ A1

(c) = 1 – P(nobody absent either day)
$= 1 - 0.4 \times 0.5$ M1
$= 1 - 0.2$
$= 0.8$ A1 Total 6

---

17 30% drop is to $0.7 \times$ value M1
15% drop is to $0.85 \times$ value

After 3 years value will be $0.7 \times 0.85 \times 0.85 \times$ new value M1
$= 0.50575 \times$ new value
$= 50.575\%$ of new value

EITHER: Greg is not correct as the value is still above half A1
OR: Greg is correct as the value is about half of the new value Total 3

---

18 **(a)** Let E be point on AD such that $ED = 7.3$ cm
Angle AEB will be a right angle

$\cos 58^\circ = \dfrac{AE}{AB} = \dfrac{AE}{4.7}$ M1

$AE = 4.7 \times \cos 58^\circ$ M1
$AE = 2.490...$ cm
$AD = 7.3 + 2.490... = 9.790... = 9.8$ cm (1dp) A1

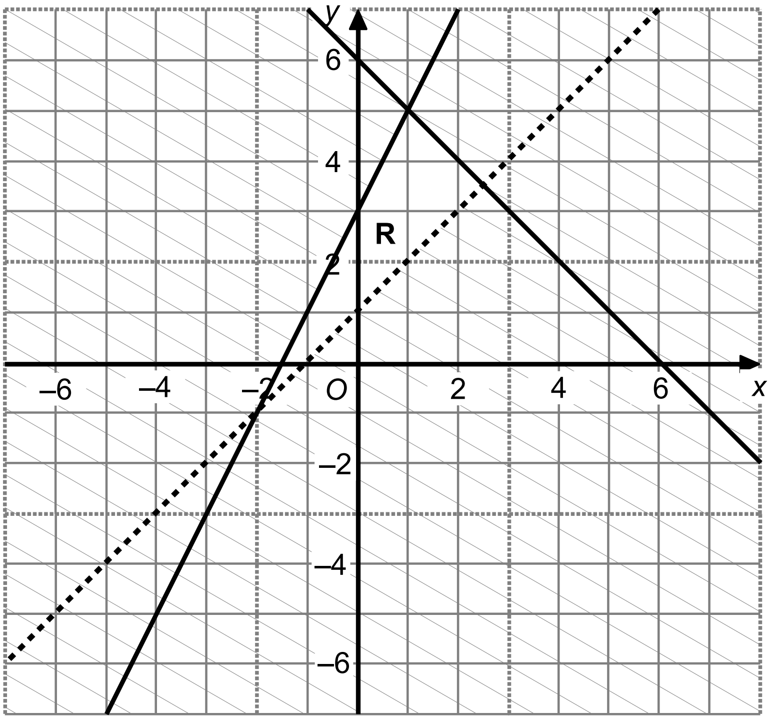
(b) e.g. $\sin 58^\circ = \dfrac{BE}{AB} = \dfrac{BE}{4.7}$

$BE = 4.7 \times \sin 58^\circ = 3.985...$
$CD = BE = 3.985...$ cm M1

tan (angle ACD) $= \dfrac{AD}{CD} = \dfrac{9.790}{3.985} = 2.456...$ M1

Angle $ACD = \tan^{-1} 2.456... = 67.848...^\circ$
Angle $ACB = 90^\circ -$ angle $ACD = 90 - 67.848...$
$= 22.151... = 22.2^\circ$ (3sf) A1 Total 6

19



M2 A2

Total 4

20 **(a)** $13 \le L < 14$ B1

(b) $13.15 \le L < 13.25$ B1

(c) For C $13.3 \le L < 13.4$
For D $12.5 \le L < 13.5$
No, it is not possible
e.g. The lower bound for C's value is greater than the upper bound for B's value so they cannot both be correct M1 A1 Total 4

21 **(a)** e.g. Angle *CAD* is common to both triangles
Angle *AEB* = angle *ADC* as they are corresponding M1
Angle *ABE* = angle *ACD* as they are corresponding
All three angles are the same so the triangles are similar A1

(b) As area *BCDE* = area *ABE*, we know area *ACD* = 2 × area *ABE*
Therefore area scale factor = 2, so length scale factor = $\sqrt{2}$ M1

Hence $\frac{AC}{AB} = \sqrt{2}$

$\frac{AB + 3}{AB} = \sqrt{2}$ M1

$AB + 3 = \sqrt{2}\,AB$

$3 = \sqrt{2}\,AB - AB = AB(\sqrt{2} - 1)$ M1

$AB = \frac{3}{\sqrt{2} - 1} = 7.2426... = 7.24$ cm (3sf) A1 Total 6

22 **(a)** $\frac{2}{\sqrt{3}} = \frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3} = \frac{2}{3}\sqrt{3}$ M1

$\sqrt{3} - \frac{2}{\sqrt{3}} = \sqrt{3} - \frac{2}{3}\sqrt{3} = \frac{1}{3}\sqrt{3}$ [or $\frac{\sqrt{3}}{3}$] A1

(b) $\frac{2\sqrt{5}}{2+\sqrt{5}} \times \frac{2-\sqrt{5}}{2-\sqrt{5}}$ M1

$= \frac{2\sqrt{5}(2-\sqrt{5})}{2^2-(\sqrt{5})^2}$

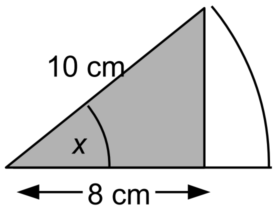
$= \frac{4\sqrt{5}-10}{4-5}$ M1

$= \frac{4\sqrt{5}-10}{-1}$

$= 10 - 4\sqrt{5}$ A1 Total 5

---

23 *O* to RH edge of rectangle = 18 – 10 = 8 cm



$\cos x = \frac{8}{10}$ M1

$x = \cos^{-1}\frac{8}{10} = 36.869...^\circ$ A1

Area of triangle = $\frac{1}{2} \times 8 \times 10 \times \sin 36.9^\circ = 24$ cm^2 M1

Angle of sector (rest of shaded area) = 180 – 36.869... = 143.130...º

Area of sector = $\frac{143.1}{360} \times \pi \times 10^2$ M1

= 124.90... cm^2

Shaded area = 24 + 124.9 = 148.90... = 149 cm^2 (3sf) A1 Total 5

---

24 1st equation $\rightarrow$ $y^2 = x + 2$

2nd equation $\rightarrow$ $y^2 - x^2 = 0$

$\rightarrow$ $y^2 = x^2$

So, $x + 2 = x^2$ M1 A1

$x^2 - x - 2 = 0$

$(x + 1)(x - 2) = 0$ M1

$x = -1$ or 2 A1

When $x = -1$, $y = 1$

When $x = 2$, $y = 2$ A1 Total 5

TOTAL FOR PAPER: 80 MARKS

