For **OCR**

Mathematics

Paper 4 (Calculator)

Higher Tier

Churchill Paper 4A – Marking Guide

Method marks (M) are awarded for using a correct method and are not lost for purely numerical errors

Accuracy marks (A) are awarded for a correct answer and depend on preceding M marks

(B) marks are awarded independent of method

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Churchill Paper 4A Marking Guide – OCR Higher Tier

1 **(a)** $= \frac{3}{2} \times 4 = 6$ eggs — B1

(b) $75 \div 30 = 2.5$ — M1
$2.5 \times 250 = 625$ ml of milk — A1

(c) $20 \div 4 = 5$ lots of 4 eggs
$2000 \div 250 = 8$ lots of 250 ml milk — M1
$500 \div 30 = 16$ and a bit lots of 30 g butter
Smallest of these is 5 lots of 4 eggs — M1
She can make $5 \times 2 = 10$ portions — A1 — Total 6

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2 y-intercept = –1 — B1

Gradient [using (–4, 1) to (4, –3)] = $\frac{-3-1}{4-(-4)} = \frac{-4}{8} = -\frac{1}{2}$ — M1

Equation is $y = -\frac{1}{2}x - 1$ — A1 — Total 3

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3 £500 = €1.38 × 500 = €690 — M1
€690 – €465 = €225
€225 = £225 ÷ 1.31 = £171.76 [or £172 to nearest pound] — M1 A1 — Total 3

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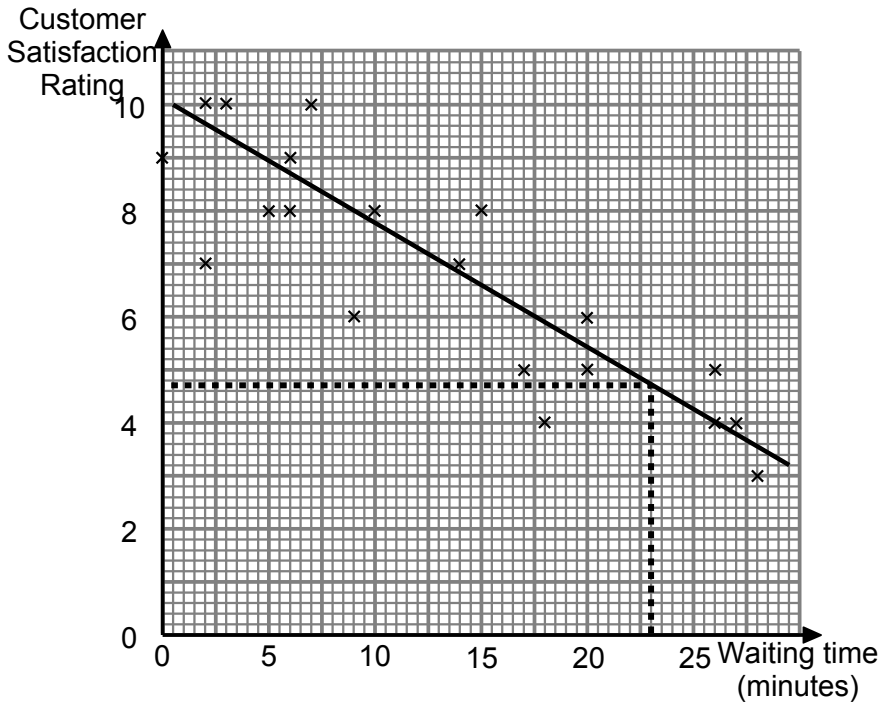
4 **(a)** 9 callers gave a rating of 8 or more
Percentage = $\frac{9}{20} \times 100\% = 45\%$ — M1 A1

(b)



M1

5 (from their line – nearest whole number or raw value) — A1

(c) e.g. The line of best fit would predict a negative score but the rating is on a scale of 1 to 10 so this is not possible — B1 — Total 5

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5 **(a)** Median = $\frac{1}{2}(n + 1)$th value = $\frac{1}{2}(31 + 1)$th value = 16^{th} value

There are 6 in first class

There are 6 + 10 = 16 in 1st & 2nd classes so 16^{th} is in second class M1

The median is in the class $25 < N \leq 30$ A1

(b) e.g. The class intervals have different widths and the 5 large values between 50 and 70 could pull the mean above 35 B1 Total 3

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6 Let the amount Eileen received be £x

Layla received £(x + 60)

Naira received £1.5x B1

Total = £900 so: $x + x + 60 + 1.5x = 900$ M1

$3.5x = 840$

$x = 840 \div 3.5 = 240$ M1

Naira received 1.5×240 = £360 A1 Total 4

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7 Radius = 49 244 ÷ 2 = 24 622

Mean dist. From Sun = 30.069 × 149 597 871 = 4 498 258 383 M1

Mean dist. ÷ radius = 4 498 258 383 ÷ 24 622 M1

= 182692.6...

= 1.83×10^5 times (3sf) M1 A1 Total 4

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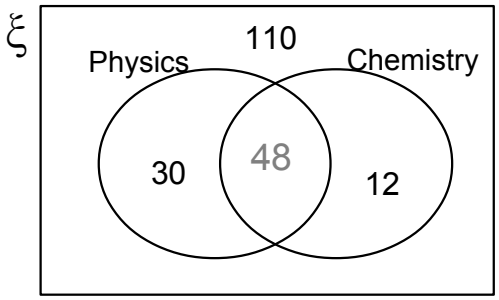
8 **(a)** 78 – 48 = 30, 60 – 48 = 12

30 + 48 + 12 = 90 M1

200 – 90 = 110



A1

(b) **(i)** = $\frac{110}{200}$ [= $\frac{11}{20}$] B1

(ii) = $\frac{12}{60}$ [= $\frac{1}{5}$] M1 A1 Total 5

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9 **(a)** This approximation will have lowered her estimate as the actual value of π is larger than 3, i.e. 3.14... B1

(b) She has assumed the lichen covers a circular area. B1

The shape of the lichen will not be a perfect circle. It will have indents and bits sticking out which means that her estimate could be too big or too small. B1 Total 3

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10 **(a)** Common difference = 7 so nth term = $7n$ + ? M1
0th term = 4 – 7 = –3
nth term = $7n$ – 3 A1

(b) $1^{st} = 1$, $2^{nd} = 2$, $3^{rd} = 2^2$, $4^{th} = 2^3$ so nth = 2^{n-1} M1

On 30^{th} she gives $2^{(30-1)} = 2^{29}$ A1

On 31^{st} she gives 2×2^{29}

Extra = $2 \times 2^{29} - 2^{29} = 2^{29}$ pence M1 A1 Total 6

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11 **(a)** As a is even, let $a = 2n$ where n is a whole number
Now $a^2 = (2n)^2 = 4n^2 = 2 \times 2n^2$ M1
As $2n^2$ is a whole number, a^2 is divisible by 2 and is therefore even A1

(b) **(i)** e.g. When $p = 3$ and $q = 1$: B1
$(pq + 1)^2 = (3 + 1)^2 = 16$ which is even B1

(ii) If $(pq + 1)^2$ is even then $pq + 1$ must be even
Hence pq must be odd M1
Therefore both the numbers p and q must be odd A1 Total 6

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12 **(a)** $P \propto Q$
$P = kQ$
When $Q = 6$, $P = 15$ so $15 = k \times 6$ M1
$k = 15 \div 6 = 2.5$
$P = 2.5Q$
When $Q = 3.5$ $P = 2.5 \times 3.5 = 8.75$ M1 A1

(b) e.g. If Cyrus is correct, $y = \frac{c}{x}$ so xy = a constant
$2 \times 20 = 40$ and $4 \times 5 = 20$ M1
So Cyrus cannot be correct

If Dinah is correct, $y = \frac{d}{x^2}$ so x^2y = a constant
$2^2 \times 20 = 80$ and $4^2 \times 5 = 80$ M1
So Dinah could be correct A1 Total 6

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13 **(a)** Angle ACB = angle DCE as they are opposite B1
Angle ABE = angle ADE as they are angles in the same segment M1
Hence, angle ABC = angle CDE
Angle BAD = angle BED as they are angles in the same segment
Hence, angle BAC = angle CED
As the three angles in triangles ABC and CDE are equal the triangles must be similar A1

(b) $\frac{CD}{BC} = \frac{DE}{AB}$
$\frac{CD}{4.6} = \frac{7.8}{5.2}$ M1
$CD = 4.6 \times \frac{7.8}{5.2} = 6.9$ cm A1 Total 5

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14 $700 = \dfrac{7}{\text{area}}$

$700 \times \text{area} = 7$

Area $= 7 \div 700 = 0.01\ m^2$ M1 A1

Side length of cube $= \sqrt{0.01} = 0.1$ m M1

Volume of cube $= (0.1)^3 = 0.001\ m^3$ M1

$\text{Density} = \dfrac{\text{mass}}{\text{volume}}$

$720 = \dfrac{\text{mass}}{0.001}$

Mass $= 720 \times 0.001 = 0.72$ kg A1 Total 5

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15 e.g. $4^{-2} = (2^2)^{-2} = 2^{-4}$ M1

$8^3 = (2^3)^3 = 2^9$

$4^{-2} \times 8^3 = 2^{-4} \times 2^9 = 2^5 = 32$ M1 A1 Total 3

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16 Width of vent $= (x + 4)$ cm

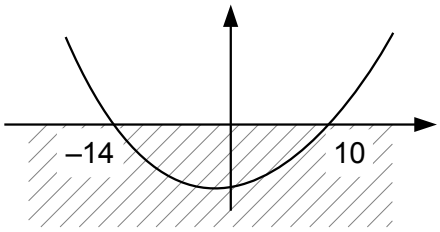
Area of XS $= x(x + 4)\ cm^2$

Therefore $x(x + 4) \geq 140$ M1

$x^2 + 4x - 140 \geq 0$

For c.v. $(x + 14)(x - 10) = 0$ M1

$x = -14$ or 10 A1



$x \leq -14$ or $x \geq 10$ M1

x is a length so can't be negative

The smallest value of x is 10 A1 Total 5

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17 **(a)** On 1st Jan 2016, $t = 1$

When $t = 1$, $V = 2500 \times 1.3 = £3250$ M1 A1

(b) 30% B1

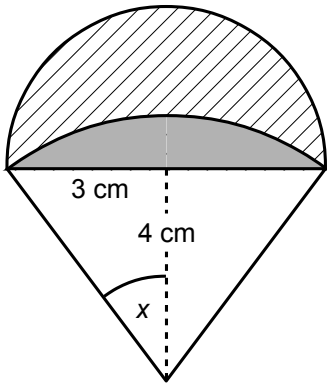
(c) When $t = 2$, $V = 3660$

Sub in: $3660 = 2500 \times k^2$ M1

$k^2 = \dfrac{3660}{2500} = 1.464$

$k = \sqrt{1.464} = 1.2099... = 1.21$ (3sf) M1 A1 Total 6

18



Small circle: area = $\pi r^2 = \pi \times 3^2 = 28.274...$ M1

Semi-circle: area = $\frac{1}{2} \times 28.27 = 14.137...$ A1

Triangle: area = $\frac{1}{2} \times 6 \times 4 = 12$ B1

Angle: $\tan x = \frac{\text{opposite}}{\text{adjacent}} = \frac{3}{4}$ M1

$x = \tan^{-1} \frac{3}{4} = 36.869...$

Sector: angle = $2x = 73.739...$

area = $\frac{\text{angle}}{360} \times \pi r^2$

$= \frac{73.74}{360} \times \pi \times 5^2$ M1

$= 16.087...$

Segment: area = sector – triangle

$= 16.09 - 12 = 4.087...$ M1

Crescent = semi-circle – segment

$= 14.14 - 4.09 = 10.049... = 10.0$ cm^2 (3sf) A1 Total 7

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19 Width of shelf < 1.25 m B1

Thickness of game ≥ 13.5 mm

1.25 m = 125 cm and 13.5 mm = 1.35 cm

Max. no. on shelf = $125 \div 1.35 = 92.59...$ M1

The maximum is 92 A1 Total 3

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20 Volume scale factor = $625 \div 40 = 15.625$ M1

Length scale factor = $\sqrt[3]{15.625} = 2.5$ M1

Let Don's model be d cm tall $2.5 \times d = d + 21$ M1

$1.5d = 21$

$d = 21 \div 1.5 = 14$ M1

$14 + 21 = 35$

Paul's model is 35 cm tall A1 Total 5

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21 Perimeter = 8 m so width + length = 4 m

$x - 1 + \frac{4x}{2x - 1} = 4$ M1

$(2x - 1)(x - 1) + 4x = 4(2x - 1)$ M1

$2x^2 - 3x + 1 + 4x = 8x - 4$

$2x^2 - 7x + 5 = 0$ A1

$(2x - 5)(x - 1) = 0$ M1

$x = \frac{5}{2}$ or $x = 1$

x can't be 1 as the width, $x - 1$, would be 0 so $x = \frac{5}{2}$ A1

Width = $\frac{5}{2} - 1 = \frac{3}{2}$; Length = $\frac{4 \times \frac{5}{2}}{2 \times \frac{5}{2} - 1} = \frac{10}{5 - 1} = \frac{5}{2}$ M1

Area = $\frac{3}{2} \times \frac{5}{2} = \frac{15}{4} = 3\frac{3}{4} = 3.75$ m^2 A1 Total 7

TOTAL FOR PAPER: 100 MARKS

