Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

8036206348

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **October/November 2017**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 80.

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[Turn over

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

1 **(a)** Evaluate $\frac{6}{7} - \frac{3}{5}$.

Answer ..... [1]

(b) Evaluate $\frac{90}{0.45}$.

Answer ..... [1]

---

2 The masses, in kilograms, of 20 parcels sent by a dispatch centre are given in the table.

4.2	5.3	5.1	7.8	8.2	7.5	3.2	5.7	4.1	5.9
8.4	5.6	8.0	3.2	4.8	6.9	6.2	3.2	5.4	4.7

(a) By using tally marks, or otherwise, complete the grouped frequency distribution for these masses.

Mass (m kilograms)	Tally marks	Frequency
$3 < m \leqslant 5$		
$5 < m \leqslant 7$		
$7 < m \leqslant 9$		

[1]

(b) The results are to be shown in a pie chart.

Calculate the angle of the sector representing the group with the smallest frequency.

Answer ..... [1]

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3 y is inversely proportional to x.

Given that $y = \frac{1}{6}$ when $x = 30$, find y when $x = 10$.

Answer $y =$ ..... [2]

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4 $\mathrm{f}(x) = \frac{x}{4}$

(a) Find $\mathrm{f}\left(\frac{1}{2}\right)$.

Answer ..... [1]

(b) Find $\mathrm{f}^{-1}(x)$.

Answer $\mathrm{f}^{-1}(x) =$ ..... [1]

---

5 The timetable for buses from A to E, calling at B, C and D, is given below.

A	08 12	08 42	and every 30 minutes until	17 12
B	08 33	09 03	and every 30 minutes until	17 33
C	08 48	09 18	and every 30 minutes until	17 48
D	09 05	09 35	and every 30 minutes until	18 05
E	09 20	09 50	and every 30 minutes until	18 20

(a) How many minutes does each journey from A to E take?

Answer ..... minutes [1]

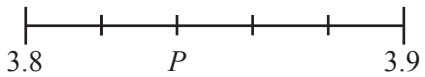
(b) Sharon has an appointment at D at 3.30 p.m.

What is the latest time she can catch a bus from B?

Answer ..... [1]

---

6 **(a)**



The diagram shows a scale from 3.8 to 3.9, divided into five equal parts.

What is the value at the mark labelled *P*?

Answer ..... [1]

(b)



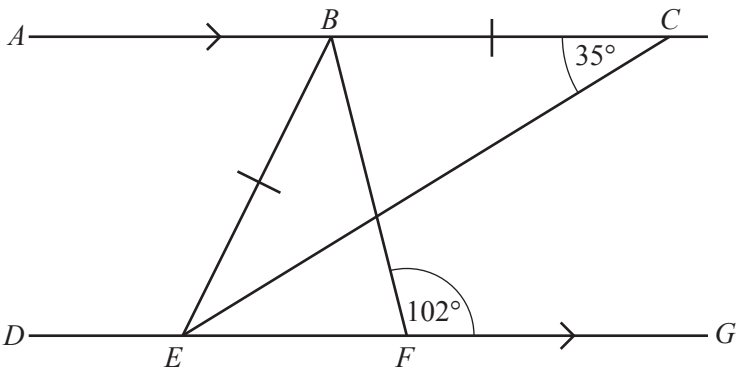
The points *X* and *Y* lie on the line *AB* such that $AX : XY : YB = 3 : 2 : 4$.
$AB = 18$ cm.

Find *XY*.

Answer ..... cm [1]

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7



In the diagram, ABC is parallel to $DEFG$.
$BC = BE$, $A\hat{C}E = 35°$ and $B\hat{F}G = 102°$.

(a) Find $C\hat{B}F$.

Answer $C\hat{B}F =$ ..... [1]

(b) Find $A\hat{B}E$.

Answer $A\hat{B}E =$ ..... [1]

---

8 Thirty students were asked on how many days they ate pasta last week.
The results are given in the table.

Number of days	0	1	2	3	4	5
Frequency	9	6	7	4	2	2

(a) Find the mode.

Answer ..... [1]

(b) Find the median.

Answer ..... [1]

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9 The area of a rectangle is given as $8\,cm^2$, correct to the nearest cm^2.

(a) Write down the lower bound for the area of the rectangle.

Answer ..... cm^2 [1]

(b) The width of the rectangle is given as 2 cm, correct to the nearest cm.

Calculate the lower bound for the length of the rectangle.

Answer ..... cm [1]

---

10 By making suitable approximations, calculate an estimate for $\dfrac{40.32 \times \sqrt{35.7}}{2980}$.

Show **clearly** the approximations you use and give your answer correct to 1 significant figure.

Answer ..... [2]

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11 The mean age of Ali, Ben and Chris is 14 years 3 months.
Dai's age is 15 years and 3 months.

Calculate the mean age of the four people.

Answer ..... years ..... months [2]

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12 $a^x = 5$

(a) Find a^{2x}.

Answer ..... [1]

(b) Find a^{-x}.

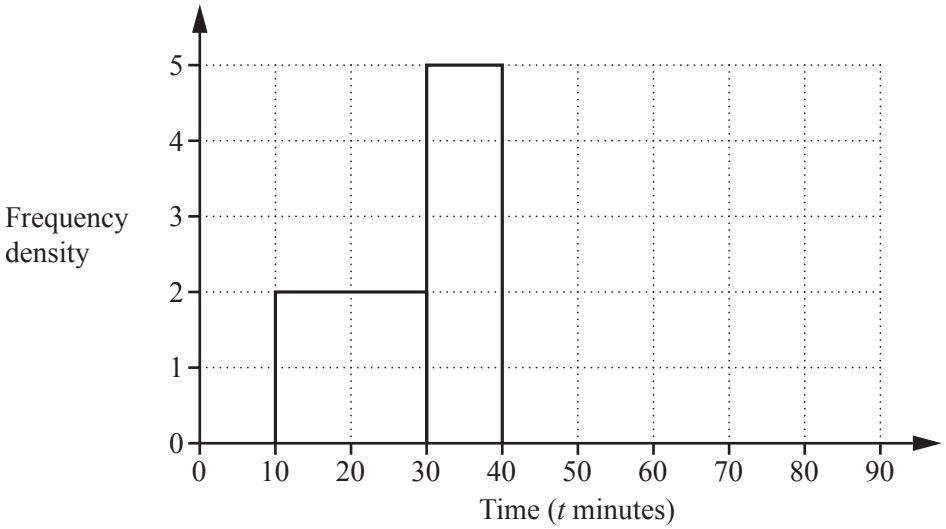
Answer ..... [1]

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13 The distribution of the lengths of time spent on the internet on a Monday by each member of a group of students is given in the table.

Time (t minutes)	$10 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 80$
Frequency	k	50	30	30

The histogram represents some of this information.



(a) Find k.

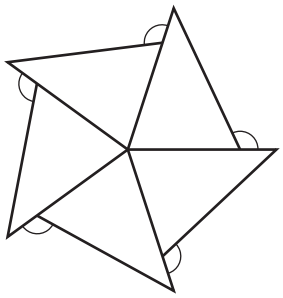
Answer $k =$ ..... [1]

(b) Complete the histogram. [2]

14 Find the two solutions of $\frac{x}{3} - 1 < \frac{3x}{4}$ which are negative integers.

Answer $x =$ ..... and ..... [3]

15



The diagram shows a figure made from five identical triangles.
The figure has rotational symmetry.

(a) Write down the order of rotational symmetry.

Answer ..... [1]

(b) Each marked angle is 110°.

Find the angles of one of the triangles.

Answer ..... , ... , ... [2]

---

16 **(a)** Write the number 360 million in standard form.

Answer ..... [1]

(b) $p = 5 \times 10^9$ $q = 9 \times 10^{-16}$

Expressing each answer in standard form, find

(i) $p \times q$,

Answer ..... [1]

(ii) $\sqrt{q}$.

Answer ..... [1]

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17 **(a)** Find 110% of 70.

Answer ..... [1]

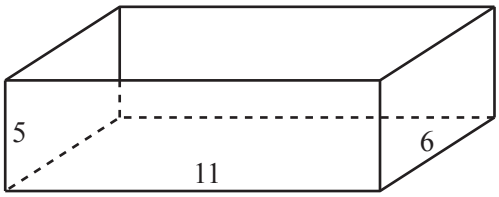
(b) When new, a car was worth \$15 000.
After one year it was worth \$12 000.

Calculate the percentage reduction in its value.

Answer ..... % [2]

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18



An **open** rectangular tray has inside measurements

length 11 cm width 6 cm height 5 cm.

(a) Calculate the total surface area of the four sides and base of the inside of the tray.

Answer ..... cm^2 [2]

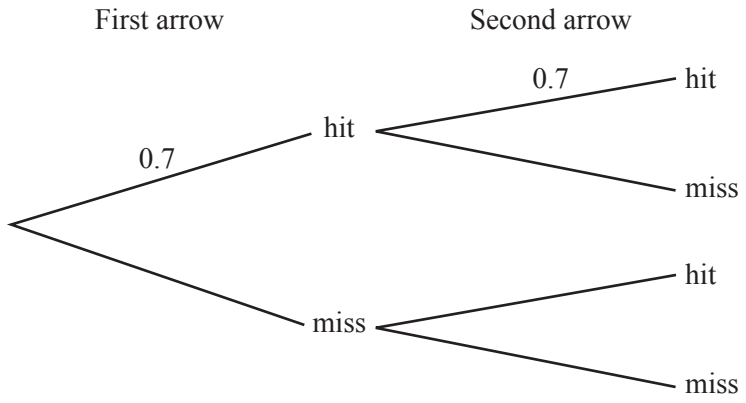
(b) Cubes are placed in the tray and a lid is placed on top.
Each cube has an edge of 2 cm.

Find the maximum number of cubes that can be placed in the tray.

Answer ..... [1]

19 Each time an archer fires an arrow, the probability that she hits the target is 0.7 .
She fires two arrows.

(a) Complete the tree diagram.



[1]

(b) Find the probability that

(i) she hits the target twice,

Answer ..... [1]

(ii) she hits the target exactly once.

Answer ..... [1]

20 The coordinates of P and M are $(-3, 10)$ and $(0, 4)$.

(a) Find the gradient of the line PM.

Answer ..... [1]

(b) Find the equation of the line PM.

Answer ..... [1]

(c) M is the midpoint of PQ.

Find the coordinates of Q.

Answer (..... , ...) [2]

21 **(a)** Express $3\begin{pmatrix} 3 & 1 \\ -5 & -4 \end{pmatrix} - 2\begin{pmatrix} 1 & -3 \\ 0 & 2 \end{pmatrix}$ as a single matrix.

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) Find the inverse of $\begin{pmatrix} 3 & 1 \\ -5 & -4 \end{pmatrix}$.

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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22 **(a)** Factorise $9a^2 - 6a$.

Answer ..... [1]

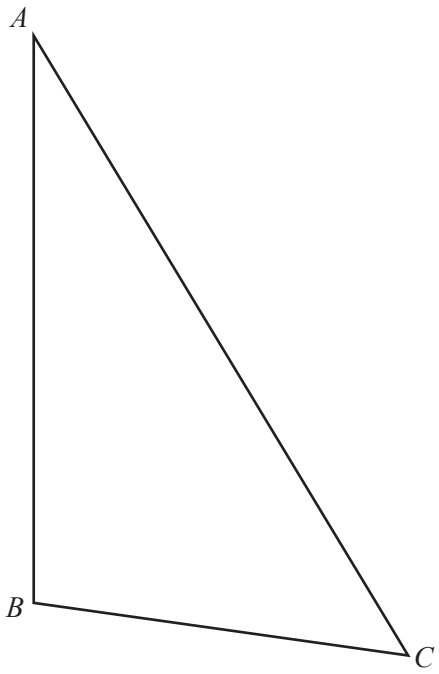
(b) Factorise $4 - 25t^2$.

Answer ..... [1]

(c) Factorise $6cd - xy + 2cx - 3dy$.

Answer ..... [2]

23



The diagram shows the triangle ABC.

(a) Measure angle ABC.

Answer ..... [1]

(b) On the diagram, construct the perpendicular bisector of AB. [1]

(c) On the diagram, construct the locus of points that are 5 cm from C. [1]

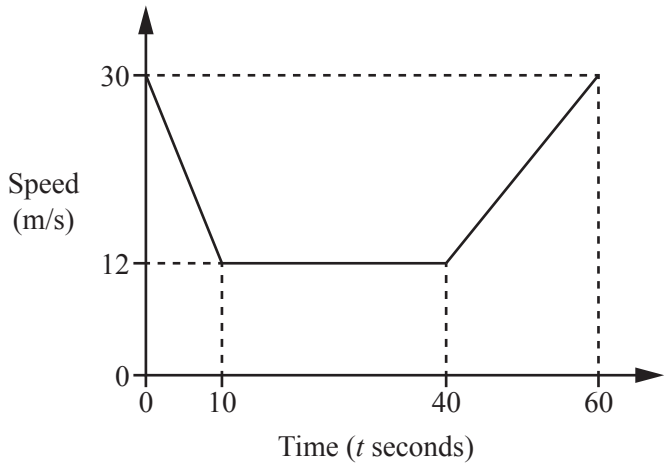
(d) The points P and Q lie on the perpendicular bisector of AB and are 5 cm from C.

Mark and label the points P and Q on the diagram and measure PQ.

Answer $PQ =$ ..... cm [1]

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24 The diagram is the speed-time graph of part of a train's journey.



(a) Calculate the speed when $t = 5$.

Answer ..... m/s [1]

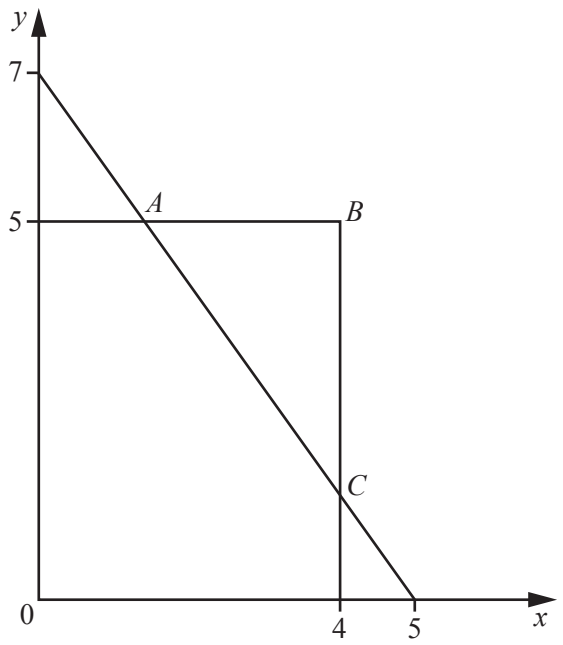
(b) Calculate the acceleration.

Answer ..... m/s^2 [1]

(c) Calculate the distance travelled from $t = 40$ to $t = 60$.

Answer ..... m [2]

25



In the diagram, the equation of the line AC is $7x + 5y = 35$.

(a) Write down the three inequalities that define the region **inside** triangle ABC.

Answer .....

.....

..... [2]

(b) The line $y = kx$, where k is an integer, passes through triangle ABC.

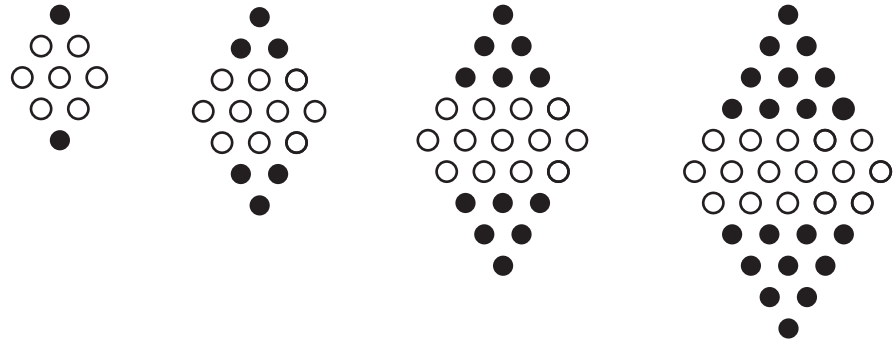
Find the greatest possible value of k.

Answer $k =$ ..... [2]

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26 The sequence of diagrams shows patterns made from some black beads and some white beads.
Each diagram has two rows more than the previous diagram.

Diagram 1 Diagram 2 Diagram 3 Diagram 4



(a) Complete the table for Diagram 5.

Diagram number	1	2	3	4	5
Total number of beads	9	16	25	36	
Number of white beads	7	10	13	16	
Number of black beads	2	6	12	20	

[1]

(b) Write down an expression, in terms of n, for

(i) the number of white beads in Diagram n,

Answer ..... [1]

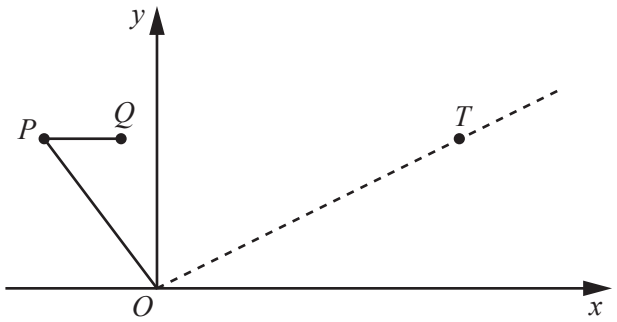
(ii) the total number of beads in Diagram n.

Answer ..... [1]

(c) Find an expression, in terms of n, for the number of black beads in Diagram n.
Give your answer in its simplest form.

Answer ..... [2]

27



In the diagram, $\overrightarrow{OP} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$ $\overrightarrow{PQ} = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$.

(a) Find $\left|\overrightarrow{OP}\right| + \left|\overrightarrow{PQ}\right|$.

Answer ..... [3]

(b) T is the point where $\overrightarrow{PT} = k\overrightarrow{PQ}$.

(i) Express $\overrightarrow{OT}$ as a column vector in terms of k.

Answer [1]

(ii) M is the point such that O, T and M lie on a straight line and $\overrightarrow{OM} = \begin{pmatrix} 24 \\ 16 \end{pmatrix}$.

Find the value of k.

Answer $k =$ ..... [2]

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