Cambridge
O Level

**Cambridge International Examinations**
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*7011706635*

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

Paper 1 **October/November 2014**

**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 a 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.

This document consists of **20** printed pages.


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CAMBRIDGE International Examinations

**ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER**

**1** Mavis went to a café to meet some friends.

**(a)** She bought 3 drinks at \$1.42 each and 1 cake for 85 cents.

How much did she spend altogether?

*Answer* \$ ..... [1]

**(b)** She left home at 10.45 a.m. and returned at 1.20 p.m.

How long, in hours and minutes, was she away from home?

*Answer* ..... hours and ..... minutes [1]

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**2** A cookery book states that the time it takes to cook some meat is

13 minutes for every 500 grams of meat + 20 minutes.

**(a)** Calculate the number of minutes it takes to cook 1.5 kg of meat.

*Answer* ..... [1]

**(b)** It takes $T$ minutes to cook $M$ grams of meat.

Find a formula for $T$.

*Answer* ..... [1]

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**3** In an experiment, a red die and a blue die were thrown 10 times.
Each time, the score on the red die was subtracted from the score on the blue die.
The results are given below.

5 −4 −3 4 0 2 −1 −3 3 −2

For these results, find

**(a)** the median,

*Answer* ..... [1]

**(b)** the mean.

*Answer* ..... [1]

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**4** $f(x) = 2(x - 3)$

**(a)** Evaluate $f\left(\frac{1}{2}\right)$.

*Answer* ..... [1]

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

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

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**5** **(a)** Write the value of 1234.567, correct to 2 significant figures.

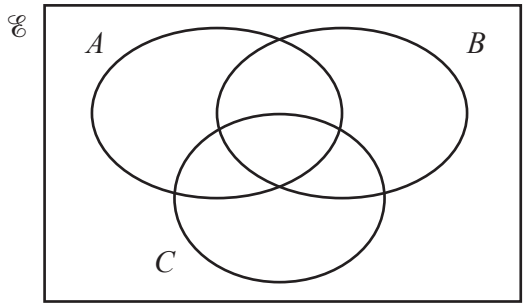
*Answer* ..... [1]

**(b)** **Write down** an estimate for the value of $\sqrt{\frac{28}{\pi}}$.

*Answer* ..... [1]

---

**6** **(a)** On the Venn diagram, shade the set $C' \cap (A \cup B)$.




[1]

**(b)** $\mathscr{E} = \{ -1, 0, 1, 2, 3, 4, 5, 6 \}$

$P = \{ -1, 0, 1, 2 \}$

$Q = \{ x^2 : x \in P \}$

Find n( $Q$ ).

*Answer* ..... [1]

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**7** A car travels at 90 km / h.

How many metres does it travel in 1 second?

*Answer* ..... [2]

---

**8** Two bottles are geometrically similar.
The ratio of the areas of their bases is 1 : 4.

Write down the ratios of their

**(a)** heights,

*Answer* ..... : ..... [1]

**(b)** volumes.

*Answer* ..... : ..... [1]

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**9** The time taken to run a race is given as 54.3 seconds, correct to the nearest 0.1 of a second.

**(a)** Find the lower bound for the time taken.

*Answer* ..... s [1]

**(b)** The distance run is given as $d$ metres, correct to the nearest metre.

Write down an expression, in terms of $d$, for the maximum possible average speed, in metres per second.

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

---

**10** $y$ is inversely proportional to $x$.

Given that $y = 9$ when $x = 8$, find $y$ when $x = 6$.

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

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**11** The sequence of diagrams below shows small black and small white squares in an arrangement to form large squares.

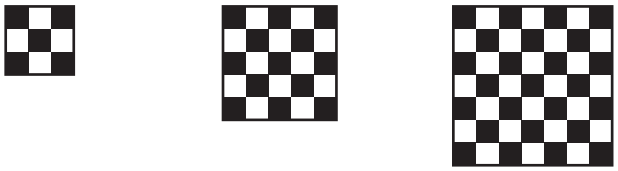


Diagram 1 Diagram 2 Diagram 3

The table below shows the numbers of black and white squares in each diagram.

| Diagram ($n$) | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Black squares | 5 | 13 | 25 | |
| White squares | 4 | 12 | 24 | |
| Total number of black and white squares | 9 | 25 | 49 | |

**(a)** For each diagram, how many more black squares are there than white squares?

*Answer* ..... [1]

**(b)** On the table, complete the column for Diagram 4. [1]

**(c)** Write down an expression, in terms of $n$, for the total number of black and white squares in Diagram $n$.

*Answer* ..... [1]

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**12** **(a)** Write the number $0.000\,567$ in standard form.

*Answer* ..... [1]

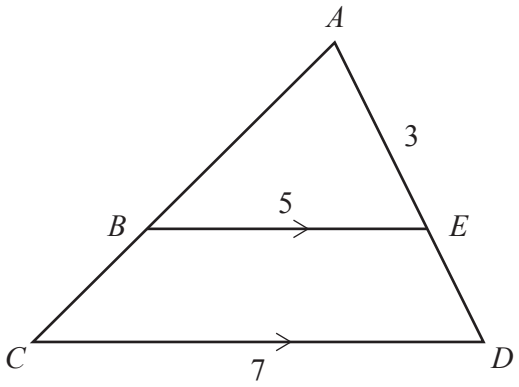
**(b)** Giving your answer in standard form, evaluate $\dfrac{3 \times 10^{-5}}{5 \times 10^{6}}$.

*Answer* ..... [2]

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**13**




In the diagram, $BE = 5$ cm, $CD = 7$ cm and $AE = 3$ cm.

$BE$ is parallel to $CD$.

**(a)** Express $CD$ as a percentage of $BE$.

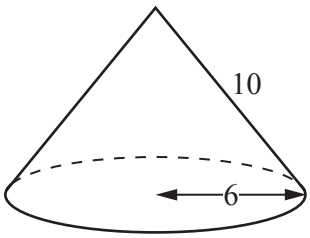
*Answer* ..... % [1]

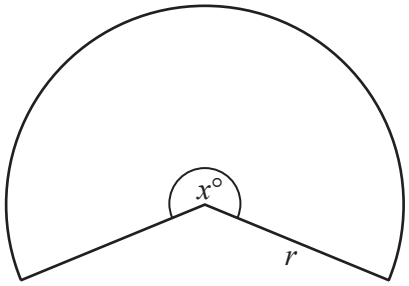
**(b)** Find $ED$.

*Answer* ..... cm [2]

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**14**




A hollow cone has a base radius 6 cm and slant height 10 cm.
The curved surface of the cone is cut, and opened out into the shape of a sector of a circle, with angle $x°$ and radius $r$ cm.

**(a)** Write down the value of $r$.

*Answer* $r =$ ..... [1]

**(b)** Calculate $x$.

*Answer* $x =$ ..... [2]

**15 [The volume of a sphere is $\frac{4}{3}\pi r^3$]**

20 spheres, each of radius 3 cm, have a total volume of $k\pi$ cm$^3$.

**(a)** Find the value of $k$.

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

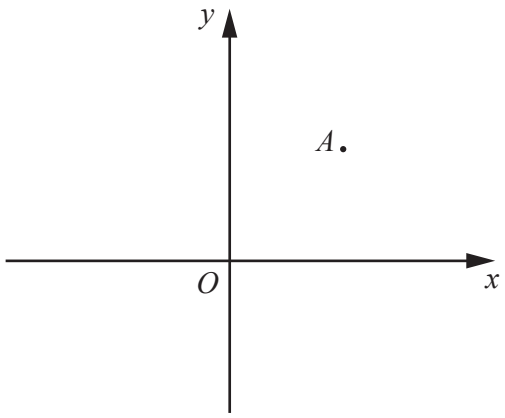
**(b)** The spheres are inside an open cylinder, with radius 6 cm.
The cylinder stands on a horizontal surface and contains enough water to cover the spheres.

Calculate the change in depth of the water when the spheres are taken out of the cylinder.

*Answer* ..... cm [2]

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**16**




$A$ is the point (5, 5) $\quad \overrightarrow{AB} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$

**(a)** $AB$ is mapped onto $CD$ by a reflection in the $y$-axis.

Find $\overrightarrow{CD}$.

*Answer* ..... [1]

**(b)** $AB$ is mapped onto $AE$ by a rotation, centre $A$, through an angle of 90° clockwise.

Find $\overrightarrow{AE}$.

*Answer* ..... [1]

**(c)** Find $|\overrightarrow{AB}|$.

*Answer* ..... [1]

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**17** **(a)** Simplify $p^2(p^3 - 3p^{-2})$.

*Answer* ..... [2]

**(b)** Simplify $(27x^6)^{\frac{1}{3}}$.

*Answer* ..... [2]

---

**18** **(a)** Factorise completely $4a - 16a^2$.

*Answer* ..... [1]

**(b)** Factorise $9b^2 - c^2$.

*Answer* ..... [1]

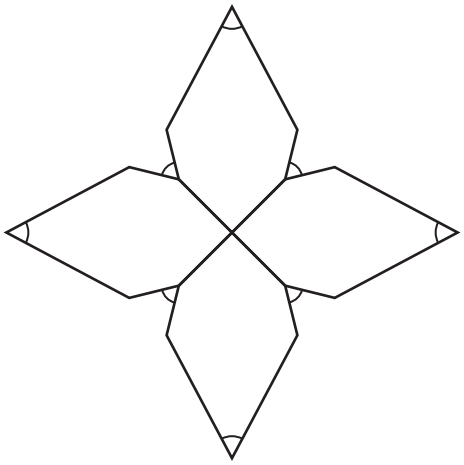
**(c)** Factorise $x^2 - 5y - xy + 5x$.

*Answer* ..... [2]

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**19**



The diagram shows a figure made from four identical hexagons.

It has both line and rotational symmetry.

**(a)** What is the order of the rotational symmetry?

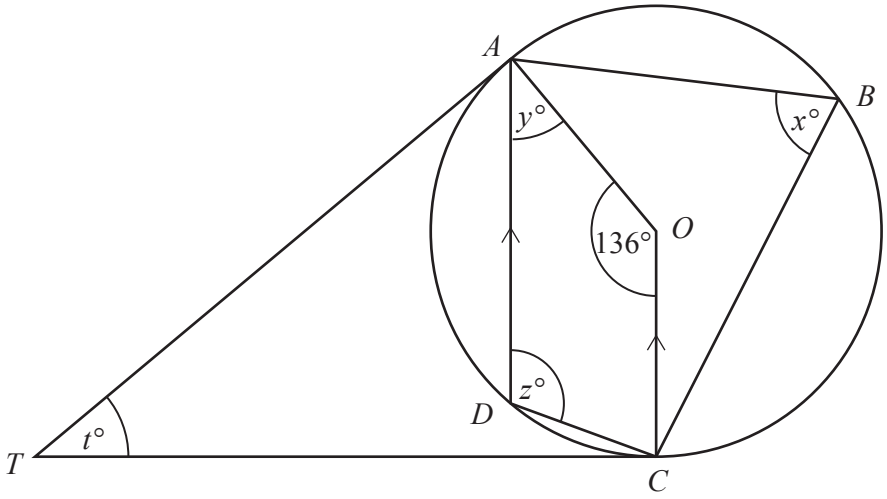
*Answer* ..... [1]

**(b)** Each marked angle is 60°.

Find the other angles in one of the hexagons.

*Answer* ..... , ..... , ..... , ..... , ..... [3]

**20**




In the diagram, $A$, $B$, $C$ and $D$ lie on the circle, centre $O$.
$CO$ is parallel to $DA$.
The tangents to the circle at $A$ and $C$ meet at $T$.

$A\hat{O}C = 136°$.

**(a)** Find $x$.

*Answer* $x =$ ..... [1]

**(b)** Find $y$.

*Answer* $y =$ ..... [1]

**(c)** Find $z$.

*Answer* $z =$ ..... [1]

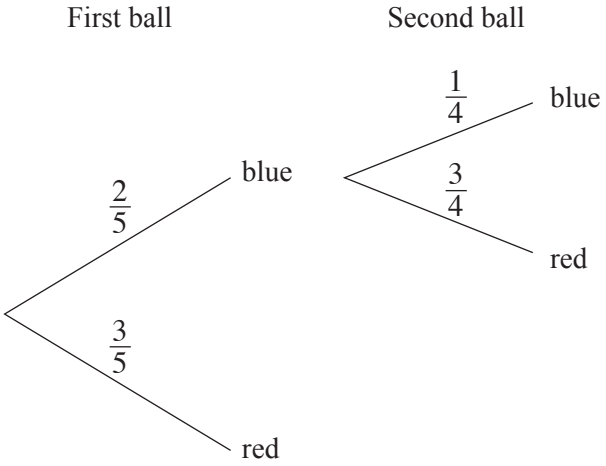
**(d)** Find $t$.

*Answer* $t =$ ..... [1]

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**21** A bag contains 5 balls, 2 of which are blue and 3 are red.
One ball is taken, at random, from the bag.
If it is red it is put back into the bag.
If it is blue it is **not** put back into the bag.

A second ball is taken, at random, from the bag.
Part of the tree diagram that represents these outcomes is drawn below.




**(a)** Complete the tree diagram. [1]

**(b)** Expressing each answer as a fraction in its simplest form, find the probability that

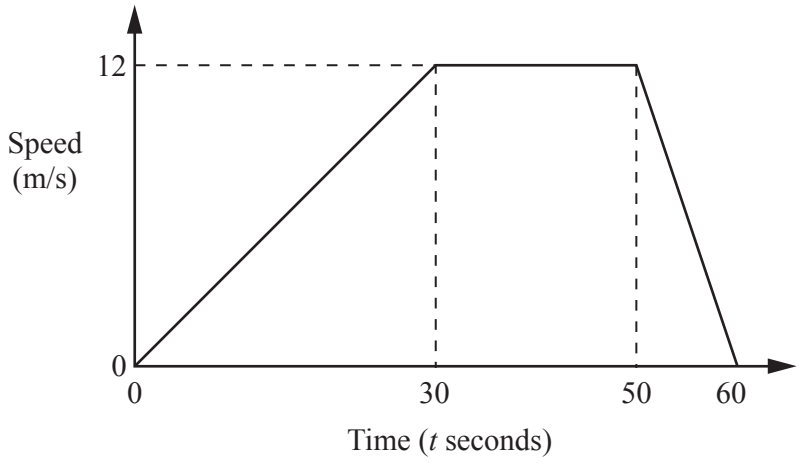
**(i)** both balls taken are blue,

*Answer* ..... [1]

**(ii)** the second ball taken is blue.

*Answer* ..... [2]

**22** The diagram shows the speed-time graph of a cyclist's journey.




**(a)** Find the retardation.

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

**(b)** Find the speed when $t = 9$.

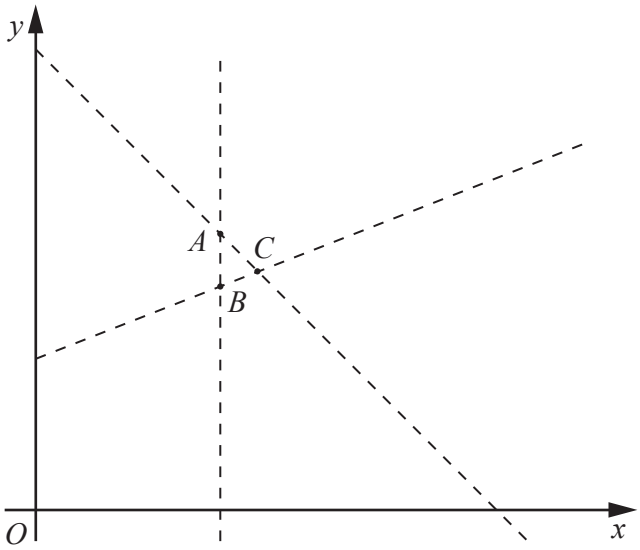
*Answer* ..... m/s [1]

**(c)** Find the distance travelled by the cyclist from $t = 0$ to $t = 60$.

*Answer* ..... m [2]

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**23**




The diagram shows the three lines $x = 8$, $x + y = 21$ and $2y = 12 + x$ which intersect at the points $A$, $B$ and $C$.

**(a)** Find the coordinates of $B$.

*Answer* ( ..... , .....) [1]

**(b)** The region **inside** triangle $ABC$ is defined by three inequalities.

One of these is $x + y < 21$.

Write down the other two inequalities.

*Answer* .....

..... [2]

**(c)** Find the coordinates of the point, with integer coordinates, that is inside triangle $ABC$.

*Answer* ( ..... , .....) [1]

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**24** The diagram shows the positions, on a map, of three boats $A$, $B$ and $C$.
The map has a scale of 1 cm to 1 km.

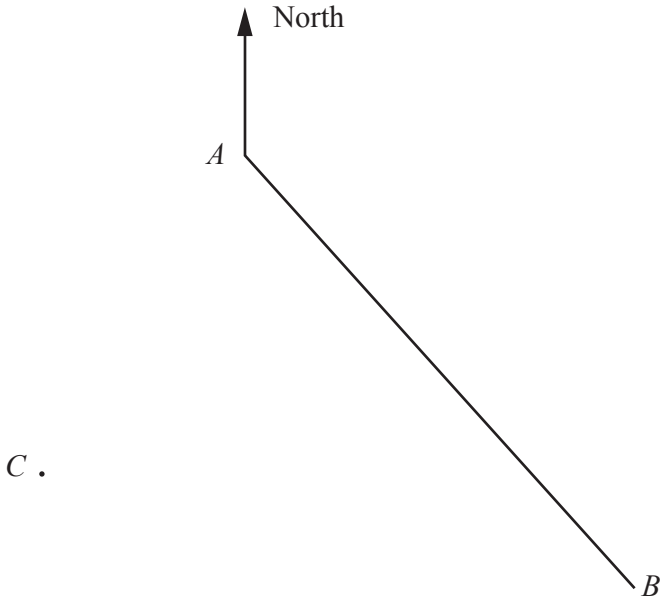
**(a)** Find the bearing of $B$ from $A$.

*Answer* ..... [1]

**(b)** A fourth boat, $D$, is

- closer to $B$ than to $A$,
- less than 4 km from $C$.

By drawing appropriate loci find, and shade, the region in which $D$ is situated. [3]



**25** $P$ is $(-4, 4)$ and $Q$ is $(3, -2)$.

$M$ is the midpoint of $PQ$.

**(a)** Find the coordinates of $M$.

*Answer* ( ..... , .....) [1]

**(b)** Find the gradient of the line $PQ$.

*Answer* ..... [1]

**(c)** $Q$ is the midpoint of the line $PQR$.

**(i)** Find the coordinates of $R$.

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

**(ii)** **Write down** the value of $\frac{PM}{MR}$.

*Answer* ..... [1]

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**Question 26 is printed on the following page.**

**26**

$$\mathbf{A} = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix} \qquad \mathbf{A}^{-1} = k\begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$$

**(a)** Find the value of $k$.

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

**(b)** Find the matrix $\mathbf{X}$, where $2\mathbf{A} + \mathbf{X} = \begin{pmatrix} 5 & -2 \\ 0 & 4 \end{pmatrix}$.

*Answer* [2]

**(c)** Find the matrix $\mathbf{Y}$, where $\mathbf{YA} = (6 \quad 2)$.

*Answer* [2]

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