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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

6749011495

MATHEMATICS (SYLLABUS D) **4024/11**

Paper 1 **October/November 2013**

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, highlighters, 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.

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

For Examiner's Use

1 **(a)** Evaluate $2\frac{3}{4} - 1\frac{13}{16}$.

Answer ..... [1]

(b) Evaluate $5 + 3 \times 2 + 2(2 - 3)$.

Answer ..... [1]

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2 **(a)** Evaluate 0.02×1.2.

Answer ..... [1]

(b) Arrange these values in order of size, starting with the smallest.

22% $\frac{2}{9}$ 0.2

Answer ..... , ... , ... [1]
smallest

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3 **(a)** Express the ratio 30 minutes to $2\frac{1}{4}$ hours in its lowest terms.
Give your answer in the form $m : n$, where m and n are integers.

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

(b) Find the simple interest on \$200 for 4 years at 0.6% per year.

Answer \$ ..... [1]

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4 Find **two** solutions of the inequality $3x + 4 < 11$ that lie **between** 2 and 3.

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

For Examiner Use

5 The length of a side of a square is given as d cm, correct to the nearest 10 cm.

Find an expression in terms of d for

(a) the **upper** bound of the perimeter of the square,

Answer ..... cm [1]

(b) the **lower** bound of the area of the square.

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

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6 **(a)** Evaluate $5 \times 10^0 + 3 \times 10^1 + 1 \times 10^2$.

Answer ..... [1]

(b) Find $(5 \times 10^8) \times (2.4 \times 10^{-3})$.
Give your answer in standard form.

Answer ..... [1]

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7 **By making suitable approximations**, estimate the value of $\dfrac{38.982 \times \sqrt{8.8536}}{6.0122}$.
Show clearly the approximate values you use.

Answer ..... [2]

For Examiner Use

8 Giving each answer as a fraction in its lowest terms, evaluate

(a) $\dfrac{3\times(2)^3}{6\times 9}$,

Answer ..... [1]

(b) $\left(\dfrac{3^2}{2}\right)^{-2}$.

Answer ..... [1]

---

9 **(a)** A television priced at \$500 is sold for \$400.

Find the percentage discount.

Answer .....% [1]

(b) Tax on the original price of a radio is charged at 20% of the original price.
After tax was included, a customer paid \$60 for the radio.

Calculate the tax charged.

Answer \$ ..... [2]

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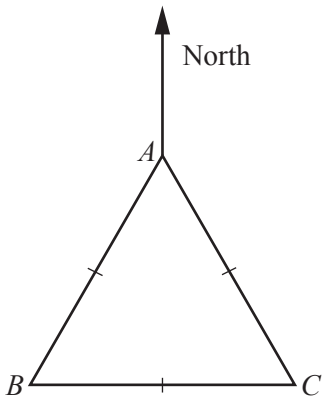
10 In the diagram, the triangle ABC is equilateral.



C is due East of B.

(a) Find the bearing of B from A.

Answer ..... [1]

(b) Find the bearing of A from C.

Answer ..... [1]

(c) A boat sails around a course represented by triangle ABC.
It started at 13 38 and finished at 14 21.

How many minutes did it take?

Answer ..... [1]

11 A model of a car is made to a scale of $\frac{1}{40}$.

(a) The height of the actual car is 1.5 m.

Find the height, in **centimetres**, of the model.

Answer ..... cm [1]

(b) The luggage capacity of the model is 5 millilitres.

Find the luggage capacity, in **litres**, of the actual car.

Answer ..... litres [2]

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12 The lengths of the leaves of a plant were measured.
The results are shown in the table.

Length (x centimetres)	$1 < x \leqslant 3$	$3 < x \leqslant 4$	$4 < x \leqslant 5$	$5 < x \leqslant 7$	$7 < x \leqslant 10$
Frequency	8	5	6	12	12
Frequency density					

(a) Complete the table to show the frequency densities. [2]

(b) One leaf is chosen at random.

Find an estimate of the probability that this leaf is more than 6 cm long.

Answer ..... [1]

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13 $f(x) = \dfrac{7 - 3x}{2x}$

For Examiner Use

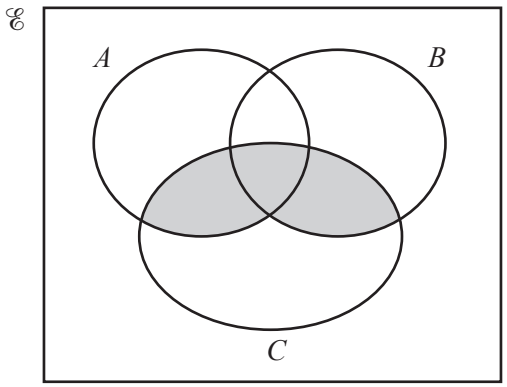
(a) Find $f(4)$.

Answer ..... [1]

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

Answer $f^{-1}(x) =$ ..... [2]

14 **(a)** Express, in set notation, the subset shaded in the diagram.



Answer .....[1]

(b) $\mathscr{E}$ = {a, b, c, d, e, f, g, h}

P = {a, b, c}

Q = {b, c, d, e, f}

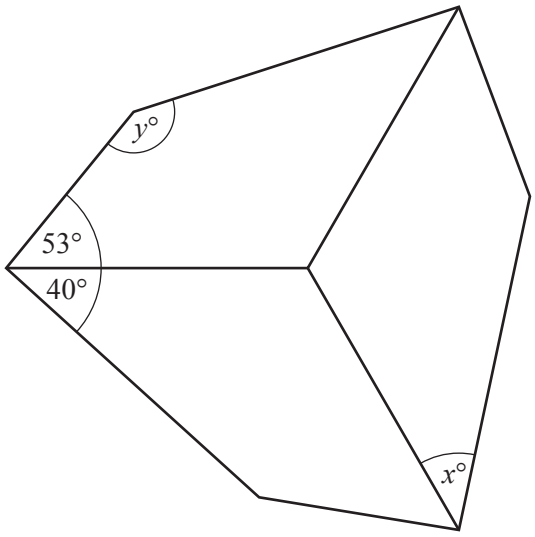
(i) Find $n(P \cup Q)$.

Answer .....[1]

(ii) List the members of the subset $P' \cap Q$.

Answer .....[1]

15 This figure has rotational symmetry of order 3.



(a) How many lines of symmetry does the figure have?

Answer ..... [1]

(b) Find x.

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

(c) Find y.

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

16 **(a)** An ordinary die is thrown 15 times.
These are the numbers thrown.

4 5 3 2 2 5 6 1 6 3 5 2 5 1 3

(i) Find the mode.

Answer ..... [1]

(ii) Find the median.

Answer ..... [1]

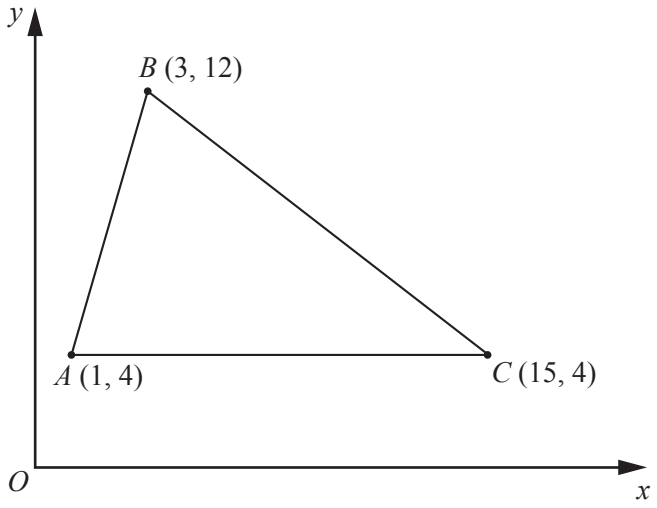
(b) –20 –8 x

The mean of these three numbers is –5.

Find x.

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

17 The diagram shows the points $A(1, 4)$, $B(3, 12)$ and $C(15, 4)$.
The equation of the line through B and C is $2x + 3y = 42$.



The region **inside** triangle ABC is defined by three inequalities.
One of these is $2x + 3y < 42$.

(a) Write down the other two inequalities.

Answer .....

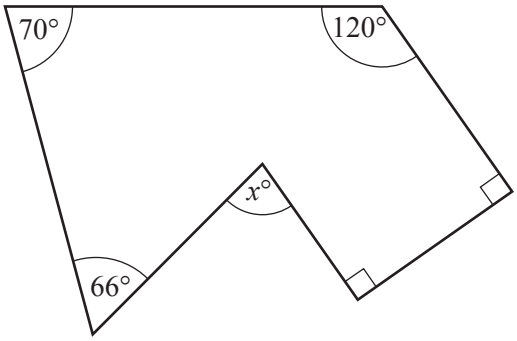
..... [2]

(b) How many points, with coordinates $(10, k)$, where k is an **integer**, lie **inside** the triangle ABC?

Answer ..... [1]

18 The diagram shows a hexagon.

Find x.



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

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19 [**Volume of a cone** $= \frac{1}{3}\pi r^2 h$]

Cone 1 has radius $2x$ cm and height $7x$ cm.

Cone 2 has radius x cm and height $4x$ cm.

Find an expression, in terms of π and x, for the **difference** in the volume of the two cones. Give your answer in its simplest form.

Answer .....cm^3 [3]

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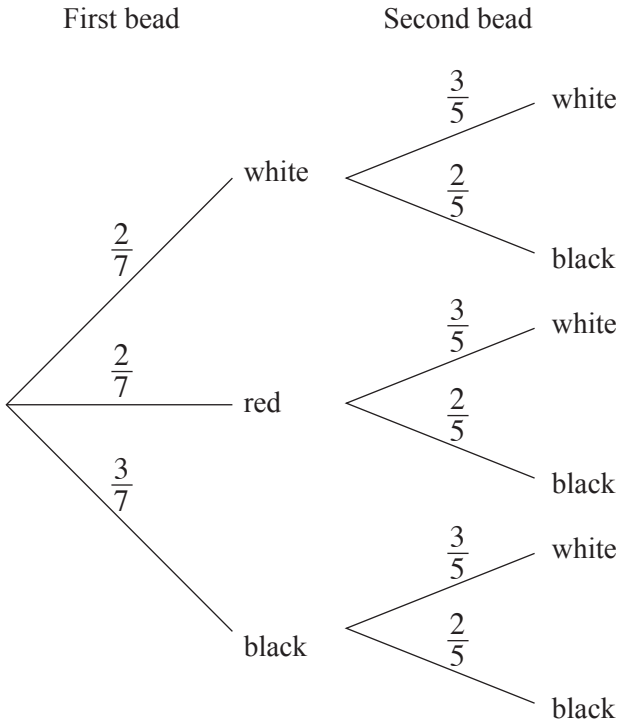
20 Two bags contain beads.
The first bag contains 2 white, 2 red and 3 black beads.
The second bag contains 3 white and 2 black beads.
One bead is taken, at random, from each bag.
The tree diagram is shown below.



Find the probability that

(a) both beads are white,

Answer ..... [1]

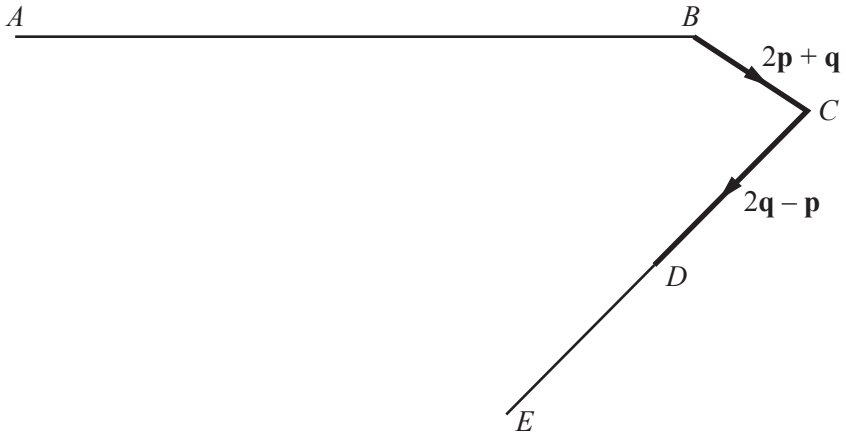
(b) both beads are red,

Answer ..... [1]

(c) **exactly** one bead is black.

Answer ..... [2]

21



In the diagram, $\overrightarrow{BC} = 2\mathbf{p} + \mathbf{q}$, $\overrightarrow{CD} = 2\mathbf{q} - \mathbf{p}$ and D is the midpoint of CE.

(a) Express, in its simplest form, in terms of **p** and/or **q**

(i) $\overrightarrow{CE}$,

Answer ..... [1]

(ii) $\overrightarrow{BE}$.

Answer ..... [1]

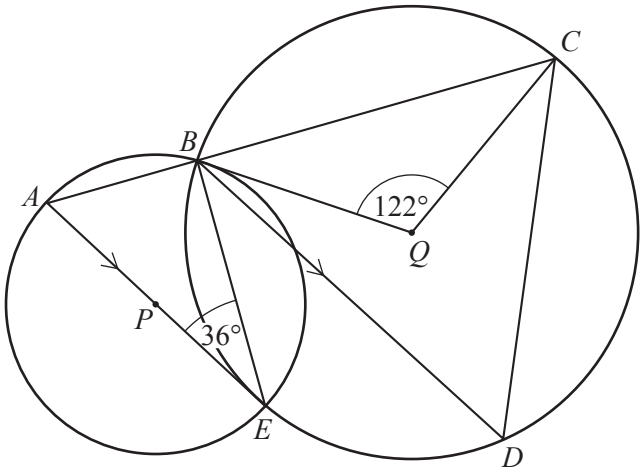
(b) Given that $\overrightarrow{AB} = k\mathbf{p}$, express $\overrightarrow{AE}$ in terms of k, **p** and **q**.

Answer ..... [1]

(c) Given that AE is parallel to BC, find k.

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

22



In the diagram, the circles, centres P and Q, intersect at B and E.
ABC and APE are straight lines. BD is parallel to AE.

$B\hat{E}A = 36°$ and $B\hat{Q}C = 122°$.

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

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

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

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

(c) Find $B\hat{D}C$.

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

(d) Find $D\hat{B}Q$.

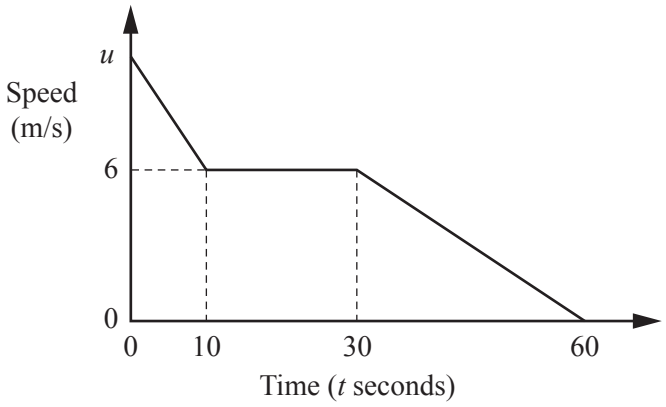
Answer $D\hat{B}Q =$ ..... [1]

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

The train slows down uniformly from a speed of u m/s to a speed of 6 m/s in 10 seconds.

During the next 20 seconds it travels at a constant speed of 6 m/s.

It then slows down uniformly to a stop after a further 30 seconds.



(a) Calculate the retardation from $t = 30$ to $t = 60$.

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

(b) Calculate the speed of the train when $t = 40$.

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

(c) The distance travelled by the train from $t = 0$ to $t = 10$ is 85 m.

Find u.

Answer $u =$ .....[2]

24 The **first** and **second** terms of a sequence are 15 and 11 respectively.

The nth term of the sequence is $10 + An + \frac{B}{n}$.

(a) Show that $A + B = 5$ and $4A + B = 2$.

[2]

(b) Solve the simultaneous equations.

$$A + B = 5$$
$$4A + B = 2$$

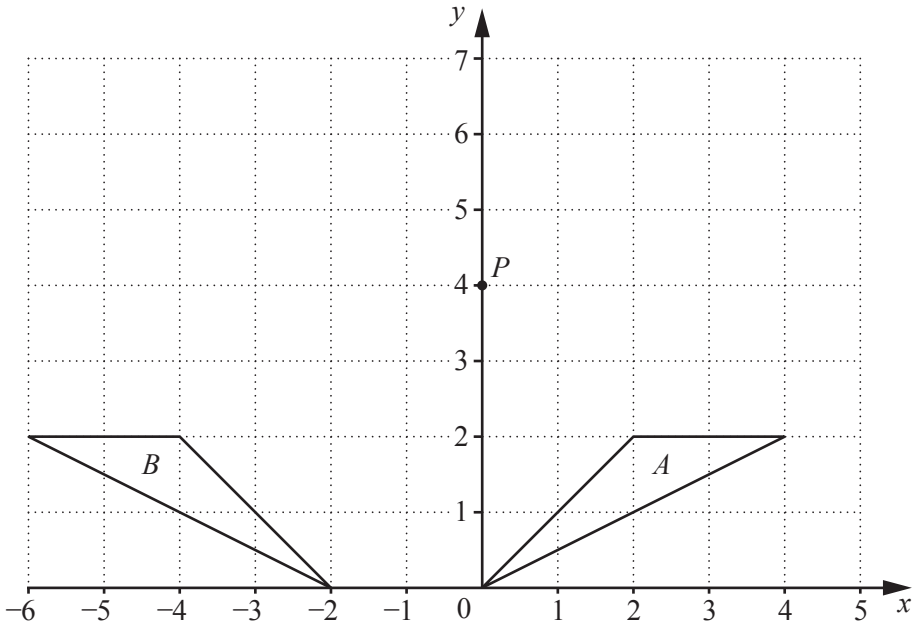
Answer $A =$ .....

$B =$ ..... [2]

(c) Hence find the third term of the sequence.

Answer ..... [1]

25 The diagram shows triangles A and B and the point $P(0, 4)$.



(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

Answer .....

..... [2]

(b) Triangle A is mapped onto triangle C by an enlargement, centre P, scale factor $-\frac{1}{2}$.

On the diagram, draw triangle C. [2]

(c) Find the value of $\dfrac{\text{area of triangle } A}{\text{area of triangle } C}$.

Answer ..... [1]

Question 26 is printed on the following page.

26

$$\mathbf{A} = \begin{pmatrix} 2 & -3 \\ 1 & 4 \end{pmatrix}$$

(a) Find $\begin{pmatrix} 5 & -3 \\ 2 & 6 \end{pmatrix} - 2\mathbf{A}$.

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

(b) Find $\mathbf{A} \times \mathbf{A}$.

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

(c) **Write down**, as a 2×2 matrix, the answer to $3 \times \mathbf{A} \times \mathbf{A}^{-1}$.

Answer $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [1]