



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

CANDIDATE  
NAME

CENTRE  
NUMBER

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**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.

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

Answer ..... [1]

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

Answer ..... [1]

2 (a) Evaluate  $0.02 \times 1.2$ .

Answer ..... [1]

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

22%       $\frac{2}{9}$       0.2

Answer ..... [1]  
smallest

- 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]

---

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

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

---

- 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<sup>2</sup> [1]

---

- 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]

---

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

*Answer* ..... [2]

---

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

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

Answer ..... [1]

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

Answer ..... [1]

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

Find the percentage discount.

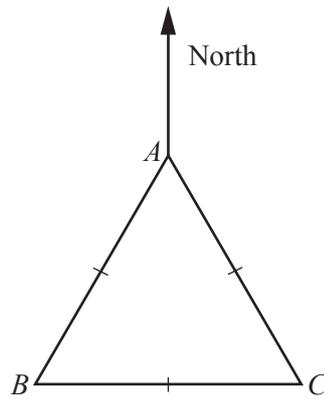
Answer .....% [1]

(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]

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]

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

Length ( $x$ centimetres)	$1 < x \leq 3$	$3 < x \leq 4$	$4 < x \leq 5$	$5 < x \leq 7$	$7 < x \leq 10$
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]

8

13

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

(a) Find  $f(4)$ .

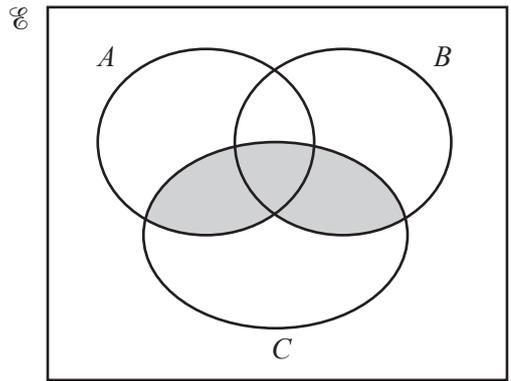
*Answer* ..... [1]

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

$P = \{a, b, c\}$

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

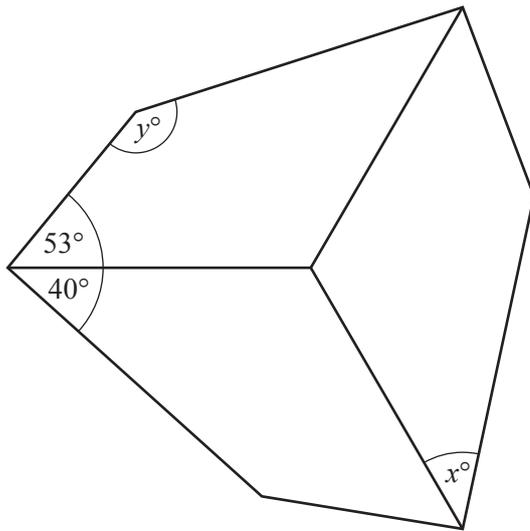
(i) Find  $n(P \cup Q)$ .

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     $x$

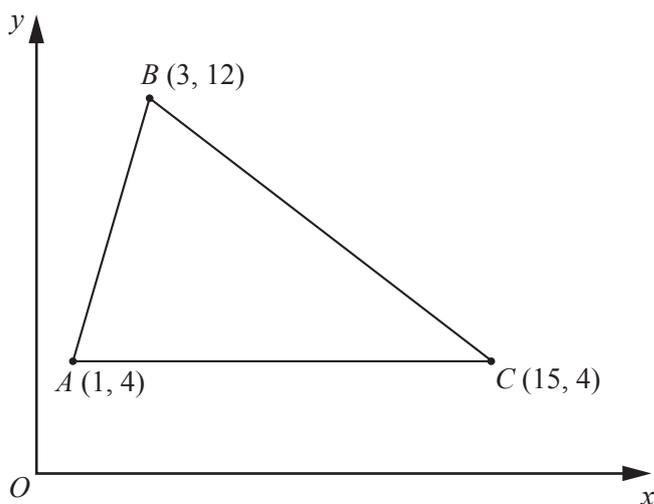
The mean of these three numbers is  $-5$ .

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 .....

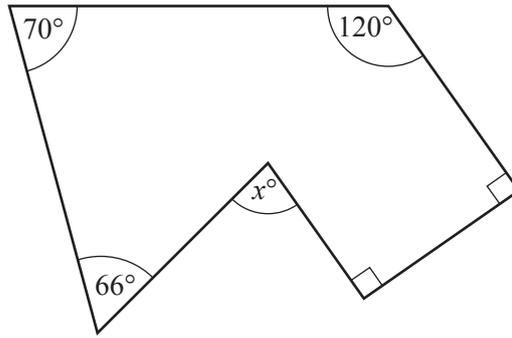
..... [2]

- (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*  $x = \dots\dots\dots$  [3]

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

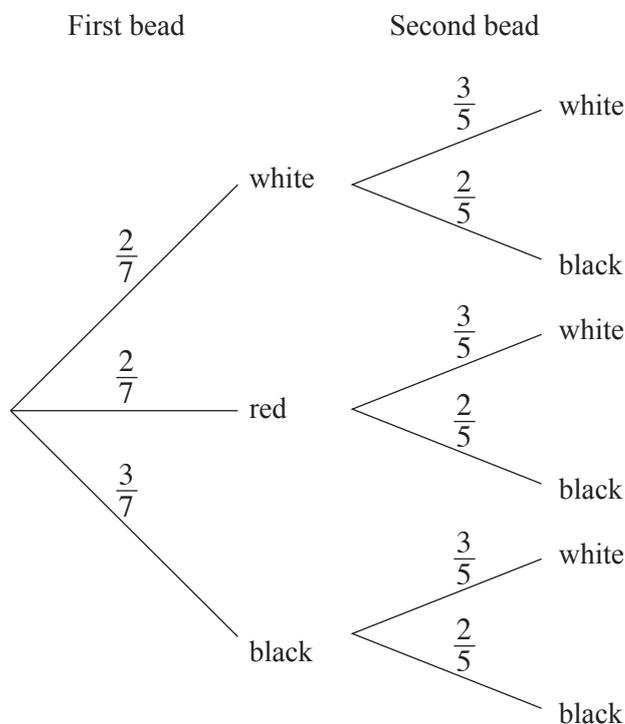
Cone 1 has radius  $2x$  cm and height  $7x$  cm.

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

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

*Answer*  $\dots\dots\dots \text{cm}^3$  [3]

- 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]

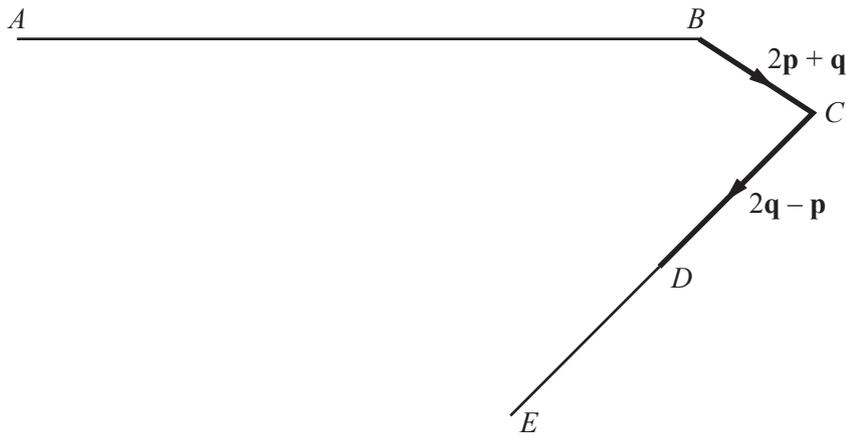
- (b) both beads are red,

Answer ..... [1]

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

Answer ..... [2]

21



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

(a) Express, in its simplest form, in terms of  $\mathbf{p}$  and/or  $\mathbf{q}$

(i)  $\vec{CE}$ ,

Answer ..... [1]

(ii)  $\vec{BE}$ .

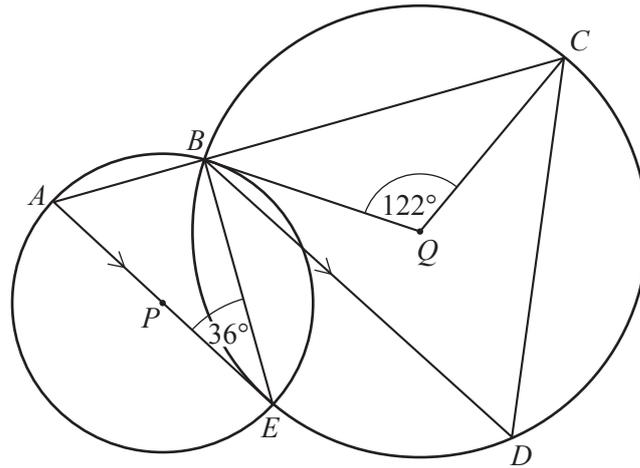
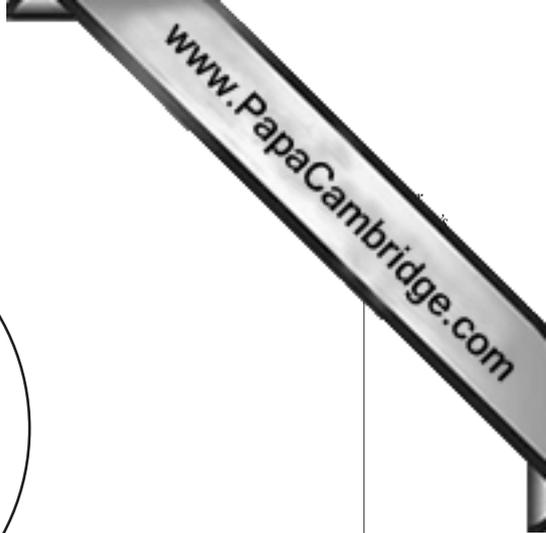
Answer ..... [1]

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

Answer ..... [1]

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

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



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

$\hat{BEA} = 36^\circ$  and  $\hat{BQC} = 122^\circ$ .

(a) Find  $\hat{BAE}$ .

Answer  $\hat{BAE} = \dots\dots\dots [1]$

(b) Find  $\hat{EBD}$ .

Answer  $\hat{EBD} = \dots\dots\dots [1]$

(c) Find  $\hat{BDC}$ .

Answer  $\hat{BDC} = \dots\dots\dots [1]$

(d) Find  $\hat{DBQ}$ .

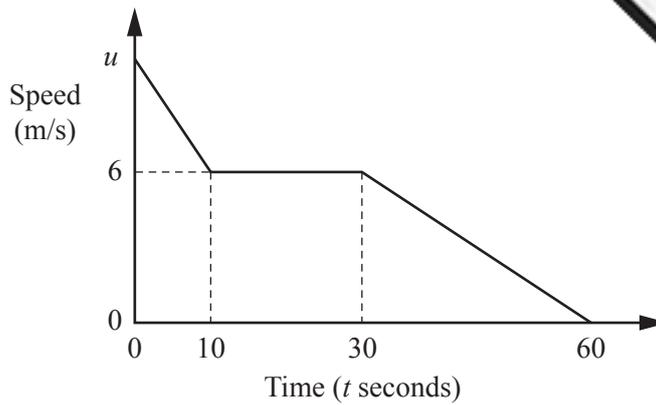
Answer  $\hat{DBQ} = \dots\dots\dots [1]$

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<sup>2</sup> [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  $n$ th 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.

$$\begin{aligned} A + B &= 5 \\ 4A + B &= 2 \end{aligned}$$

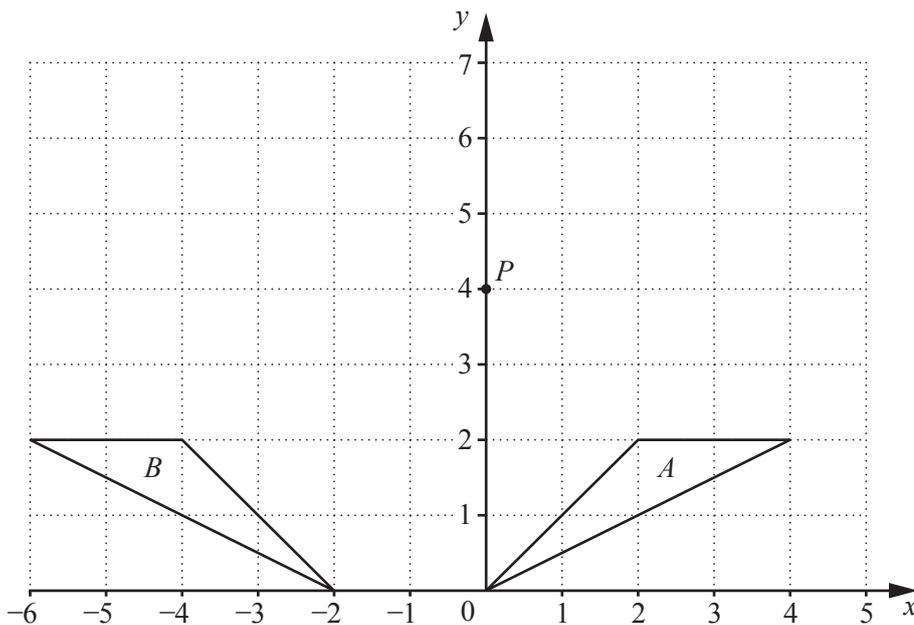
*Answer*  $A = \dots\dots\dots$

$B = \dots\dots\dots$  [2]

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

*Answer*  $\dots\dots\dots$  [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  $\frac{\text{area of triangle } A}{\text{area of triangle } C}$ .

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

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

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

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

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

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