



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 2010**

**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.

**NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY 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.

**For Examiner's Use**

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



NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES  
MAY BE USED IN THIS PAPER.

For  
Examiner's  
Use

1 (a) Evaluate  $35 - 27.3$ .

Answer (a) ..... [1]

(b) Evaluate  $1.3 \times 0.03$ .

Answer (b) ..... [1]

---

2 (a) Evaluate  $\frac{1}{3} + \frac{3}{7}$ .

Answer (a) ..... [1]

(b) Evaluate  $2 \div 2\frac{2}{3}$ .

Answer (b) ..... [1]

- 3 (a) Express 60% as a fraction, giving your answer in its lowest terms.

Answer (a) ..... [1]

- (b) The mass of a jar and its contents is 1.6 kg.  
The contents have a mass of 875 grams.

Calculate the mass, in grams, of the jar.

Answer (b) ..... g [1]

---

- 4 (a) Evaluate  $4^0 + 4^1$ .

Answer (a) ..... [1]

- (b) Evaluate  $\left(\frac{1}{4}\right)^{-2}$ .

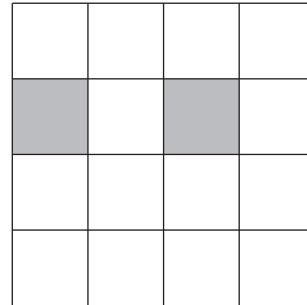
Answer (b) ..... [1]

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- 5 (a) In the diagram in the answer space, two small squares are shaded.

Shade one more small square, so that the figure will then have one line of symmetry.

Answer (a)

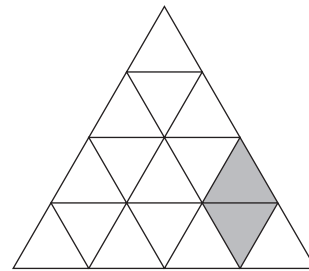


[1]

- (b) In the diagram in the answer space, two small triangles are shaded.

Shade four more small triangles, so that the figure will then have rotational symmetry of order 3.

Answer (b)



[1]

- 6 The length of a side of an equilateral triangle is given as 41 mm, correct to the nearest millimetre.

- (a) Write down the lower bound for the length of a side.

Answer (a) ..... mm [1]

- (b) Giving your answer in **centimetres**, calculate the lower bound for the perimeter of the triangle.

Answer (b) ..... cm [1]

- 7  $y$  varies inversely as the square of  $x$ .  
Given that  $y = 4$  when  $x = 3$ , find the value of  $y$  when  $x = 2$ .

For  
Examiner's  
Use

Answer  $y = \dots\dots\dots$  [2]

---

- 8 By writing each number correct to one significant figure, estimate the value of

$$\frac{0.387 \times 7.03^2}{\sqrt[3]{8.11}}$$

Answer  $\dots\dots\dots$  [2]

---

- 9 (a) Solve the inequality  $18 - 3x < x$ .

For  
Examiner's  
Use

Answer (a)  $x$  ..... [1]

- (b) Given that  $n$  is an integer, where  $-10 \leq 3n < -3$ , find the possible values of  $n$ .

Answer (b)  $n =$  ..... [1]

---

- 10 The temperatures, in  $^{\circ}\text{C}$ , at midnight on 12 consecutive days were

$-1, 0, -4, 1, 2, -2, -1, -3, 1, 2, 3, 2$ .

- (a) Find the mode of these temperatures.

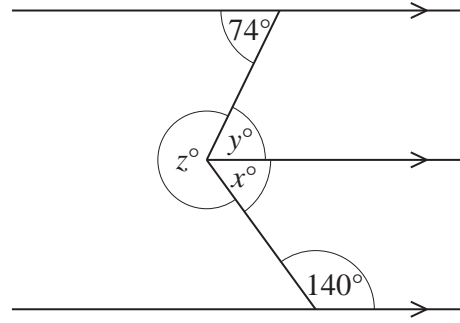
Answer (a) .....  $^{\circ}\text{C}$  [1]

- (b) Find the median of these temperatures.

Answer (b) .....  $^{\circ}\text{C}$  [1]

---

11 The diagram shows three parallel lines.



For  
Examiner's  
Use

(a) Find  $x$ .

Answer (a)  $x = \dots\dots\dots$  [1]

(b) Find  $y$ .

Answer (b)  $y = \dots\dots\dots$  [1]

(c) Find  $z$ .

Answer (c)  $z = \dots\dots\dots$  [1]

12 (a) Remove the brackets and simplify  $4(7x - 3) - 3(5x - 4)$ .

Answer (a)  $\dots\dots\dots$  [1]

(b) Express as a single fraction in its simplest form  $\frac{4}{3y} - \frac{5}{4y}$ .

Answer (b)  $\dots\dots\dots$  [1]

(c) Simplify  $(4a^2b) \times (3ab^3)$ .

Answer (c)  $\dots\dots\dots$  [1]

13 (a) Factorise completely  $16a^2 - 6a$ .

Answer (a) ..... [1]

(b) Factorise completely  $6x + 3xy - 4y - 8$ .

Answer (b) ..... [2]

---

14 The speed of light is given as  $3 \times 10^5$  km/s.  
Writing each answer in standard form, calculate

(a) the distance, in kilometres, that light travels in one minute,

Answer (a) ..... km [1]

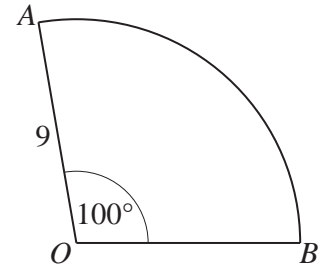
(b) the time, in seconds, that light takes to travel 150 km.

Answer (b) ..... seconds [2]

---



- 15 The diagram shows a sector of a circle, centre  $O$ .  
The radius of the circle is 9 cm and the sector angle is  $100^\circ$ .  
Taking the value of  $\pi$  to be 3.14, calculate



For  
Examiner's  
Use

- (a) the length of the arc  $AB$ ,

Answer (a) ..... cm [2]

- (b) the perimeter of the sector.

Answer (b) ..... cm [1]

- 16 The lines  $3y + x = 3$  and  $y = x + 3$  are shown in the diagram below.

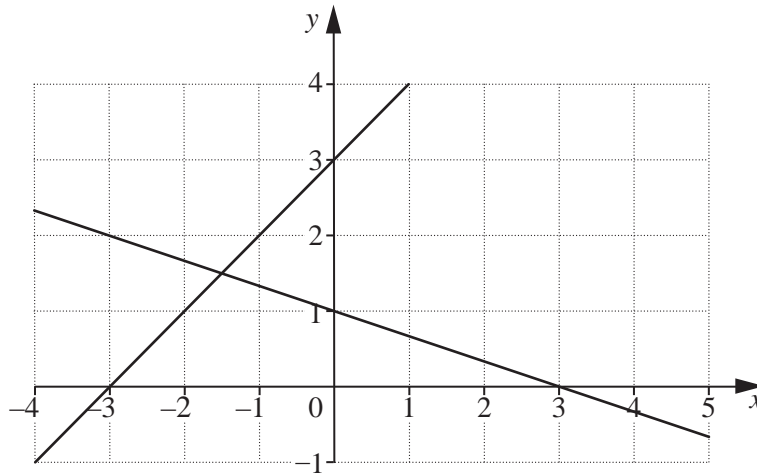
- (a) Find the gradient of the line  $3y + x = 3$ .

Answer (a) ..... [1]

- (b) On the diagram shade, and label with the letter  $R$ , the region defined by the inequalities

$$3y + x \geq 3, \quad y \leq x + 3, \quad x \geq 0.$$

Answer (b)



[2]

$$17 \quad \mathbf{A} = \begin{pmatrix} 4 & -3 & 0 \\ 0 & 6 & -2 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} 5 & -4 & -1 \\ 0 & 6 & 2 \end{pmatrix} \quad \mathbf{C} = (2 \quad 1)$$

For  
Examiner's  
Use

(a) Find  $2\mathbf{A} - \mathbf{B}$ .

*Answer (a)*

[2]

(b) Find  $\mathbf{CA}$ .

*Answer (b)*

[1]

18 Solve the simultaneous equations

$$\begin{aligned}x + 2y &= 8, \\ y &= \frac{1}{3}x + 9.\end{aligned}$$

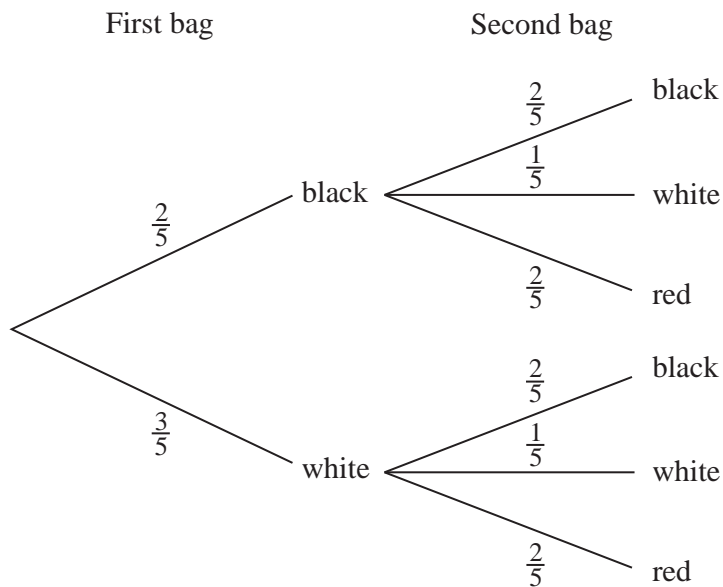
For  
Examiner's  
Use

Answer  $x =$  .....

$y =$  ..... [3]

---

- 19 Two bags contain beads.  
 The first bag contains 2 black and 3 white beads.  
 The second bag contains 2 black, 1 white and 2 red beads.  
 A bead is taken, at random, from each bag.  
 The tree diagram that represents these outcomes is drawn below.



Giving each answer in its simplest form, find the probability that

- (a) both beads are black,

Answer (a) ..... [1]

- (b) both beads are red,

Answer (b) ..... [1]

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

Answer (c) ..... [2]

20  $M$  is the midpoint of the line joining  $P$  and  $Q$ .

- (a)  $R$  lies on  $PQ$  produced, such that  $PR = 3PQ$ .  
Find  $PM : PR$ .

For  
Examiner's  
Use

Answer (a) ..... : ..... [1]

(b)  $P$  is  $(1, -2)$  and  $Q$  is  $(5, 6)$ .

- (i) Find the coordinates of  $M$ .

Answer (b)(i) (.....,.....) [1]

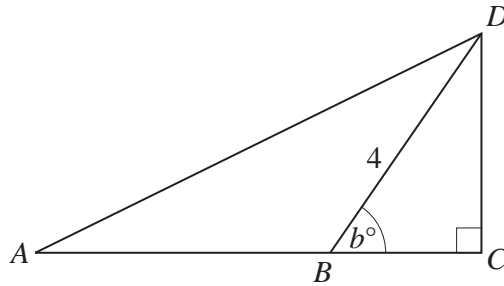
- (ii) The line  $4x + ky + 10 = 0$  passes through  $Q(5, 6)$ .  
Find the value of  $k$ .

Answer (b)(ii)  $k =$  ..... [2]

21

For  
Examiner's  
Use

$\sin b^\circ$	$\cos b^\circ$	$\tan b^\circ$
0.85	0.53	1.6



In the diagram,  $ABC$  is a straight line.  
 $BD = 4$  cm,  $\hat{BCD} = 90^\circ$  and  $\hat{CBD} = b^\circ$ .

Use as much information given in the table as is necessary to answer the following questions.

(a) Calculate the value of  $\sin \hat{ABD} + \cos \hat{ABD}$ .

Answer (a) ..... [2]

(b) Calculate  $BC$ .

Answer (b)  $BC =$  ..... cm [2]

- 22 The grouped frequency table below shows the times taken for 70 students to solve a problem.

For  
Examiner's  
Use

Time ( $t$ minutes)	$0 < t \leq 3$	$3 < t \leq 4$	$4 < t \leq 5$	$5 < t \leq 6$	$6 < t \leq 8$
Number of students	24	12	16	10	8

- (a) Complete the cumulative frequency table for this information.

Answer (a)

Time ( $t$ minutes)	$t \leq 3$	$t \leq 4$	$t \leq 5$	$t \leq 6$	$t \leq 8$
Number of students	24				

[1]

- (b) In which group of the frequency table does the 40th percentile lie?

Answer (b) ..... [1]

- (c) Complete the frequency density table for this information.

Answer (c)

Time ( $t$ minutes)	$0 < t \leq 3$	$3 < t \leq 4$	$4 < t \leq 5$	$5 < t \leq 6$	$6 < t \leq 8$
Frequency density	8	12	16		

[2]

23 Look at this pattern.

$$2^2 - 0^2 = 4 \times 1$$

$$3^2 - 1^2 = 4 \times 2$$

$$4^2 - 2^2 = 4 \times 3$$

$$5^2 - 3^2 = 4 \times 4$$

For  
Examiner's  
Use

(a) Write down the 7th line of the pattern.

Answer (a) ..... [1]

(b) Write down the  $n$ th line of the pattern.

Answer (b) ..... [1]

(c) Use the pattern to find  $521^2 - 519^2$ .

Answer (c) ..... [1]

(d) Use the pattern to find the positive integers  $x$  and  $y$  such that  $x^2 - y^2 = 484$ .

Answer (d)  $x =$  .....

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



24 The diagram below shows triangle *A* and triangle *B*.

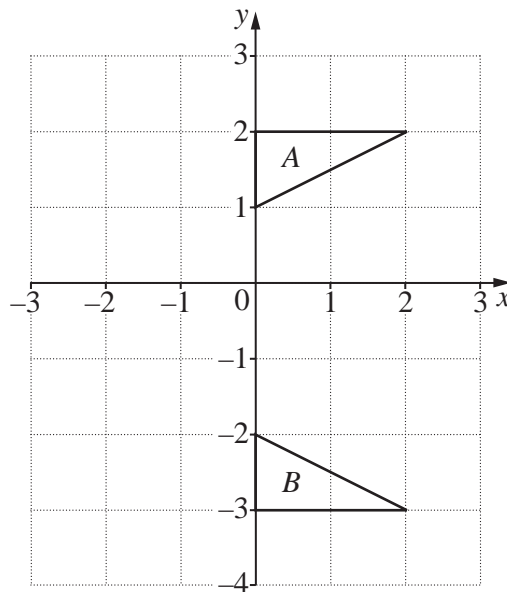
(a) Describe **fully** the **single** transformation that maps triangle *A* onto triangle *B*.

Answer (a) .....  
 .....  
 ..... [2]

(b) Triangle *A* is mapped onto triangle *C* by a rotation, centre the origin, through  $90^\circ$  anticlockwise.

(i) Draw, and label, triangle *C* on the diagram.

Answer (b)(i)

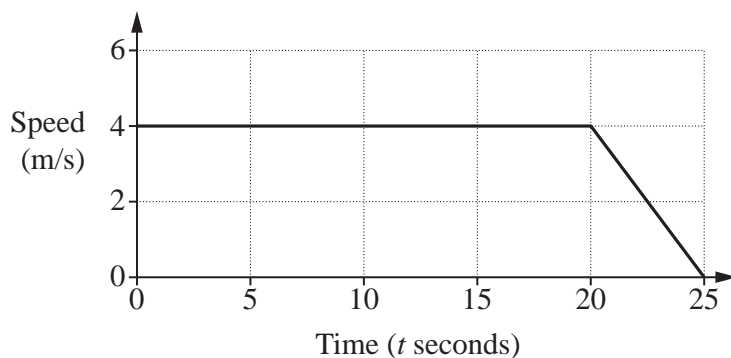


[1]

(ii) Write down the matrix that represents this transformation.

Answer (b)(ii)

[1]



The diagram is the speed-time graph of the last 25 seconds of a car's journey.  
 From  $t = 0$  to  $t = 20$  the car moves with a constant speed of 4 m/s.  
 From  $t = 20$  to  $t = 25$  the car moves with a constant retardation.

(a) Calculate the retardation when  $t = 22.5$ .

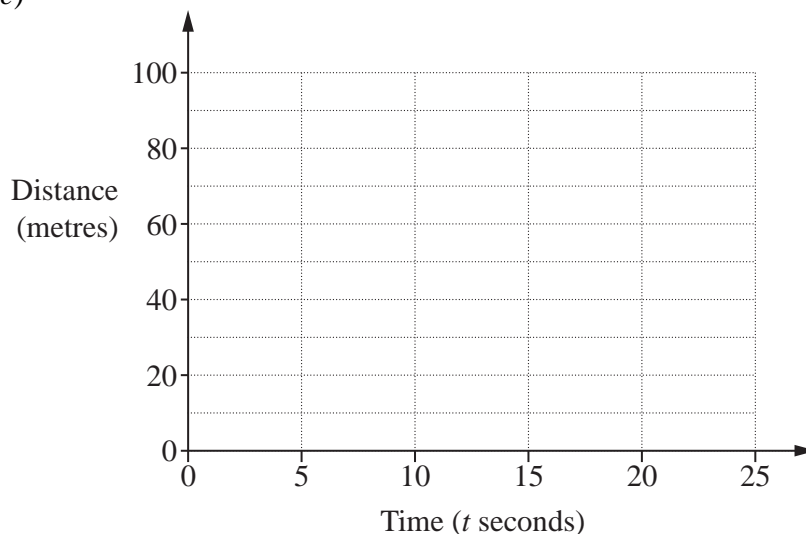
Answer (a) .....  $\text{m/s}^2$  [1]

(b) Show that the distance travelled during the 25 seconds is 90 m.

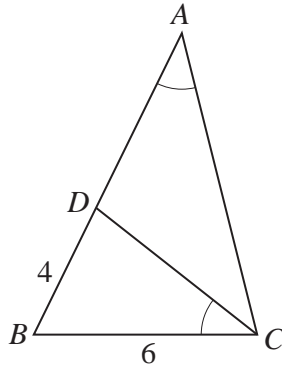
Answer (b) .....  
 .....  
 .....  
 .....  
 ..... [1]

(c) On the grid below, draw the distance-time graph for the 25 seconds.

Answer (c)



[2]



The diagram shows triangle  $ABC$ .  
 $D$  is the point on  $AB$  such that  $\widehat{BCD} = \widehat{BAC}$ .

- (a) Explain why triangle  $ABC$  is similar to triangle  $CBD$ .

Answer (a) .....

.....

.....

.....

..... [1]

- (b) Given that  $BD = 4$  cm and  $BC = 6$  cm, calculate  $AD$ .

Answer (b)  $AD = \dots\dots\dots$  cm [3]

Question 27 is printed on the following page

27 The diagram below shows triangle  $ABC$ .

(a) Measure  $\hat{A}BC$ .

Answer (a)  $\hat{A}BC = \dots\dots\dots$  [1]

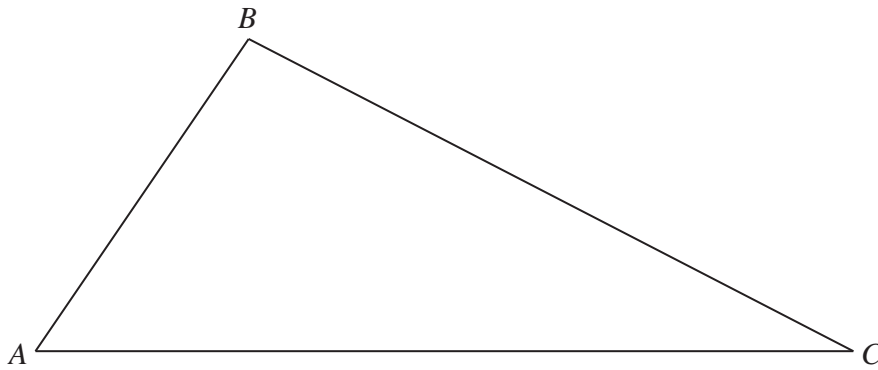
(b) On the diagram, construct the locus of points inside the triangle that are

(i) 8 cm from  $C$ , [1]

(ii) equidistant from  $AB$  and  $AC$ . [1]

(c) On the diagram, shade the region inside the triangle containing the points that are more than 8 cm from  $C$  and nearer to  $AB$  than to  $AC$ . [1]

Answer (b),(c)



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