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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

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

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

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

1 **(a)** Evaluate $35 - 27.3$.

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

(b) Evaluate 1.3×0.03 .

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

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

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

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

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

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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]

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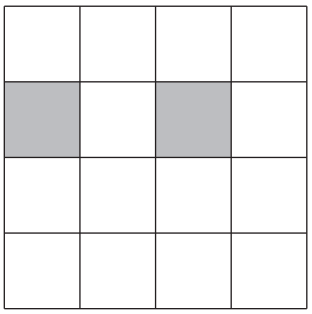
5 **(a)** In the diagram in the answer space, two small squares are shaded.

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

Answer (*a*)

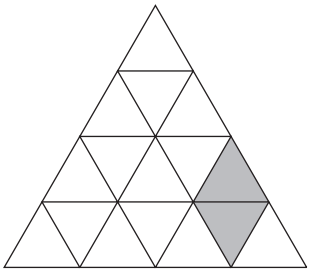


[1]

(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]

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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]

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

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

For Examiner Use

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

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

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

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

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10 The temperatures, in °C, at midnight on 12 consecutive days were

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

(a) Find the mode of these temperatures.

Answer (*a*) .....°C [1]

(b) Find the median of these temperatures.

Answer (*b*) .....°C [1]

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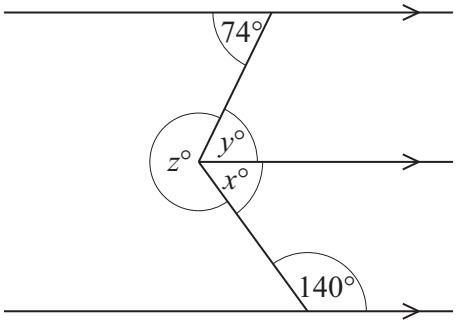
11 The diagram shows three parallel lines.



(a) Find x.

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

(b) Find y.

Answer (*b*) $y =$ .....[1]

(c) Find z.

Answer (*c*) $z =$ .....[1]

---

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

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

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

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

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

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

For Examiner Use

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

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

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

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

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14 The speed of light is given as 3×10^5 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]

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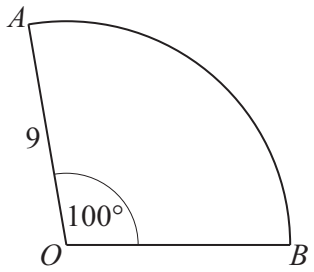
15 The diagram shows a sector of a circle, centre O.
The radius of the circle is 9 cm and the sector angle is 100°.
Taking the value of π to be 3.14, calculate



(a) the length of the arc AB,

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

(b) the perimeter of the sector.

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

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

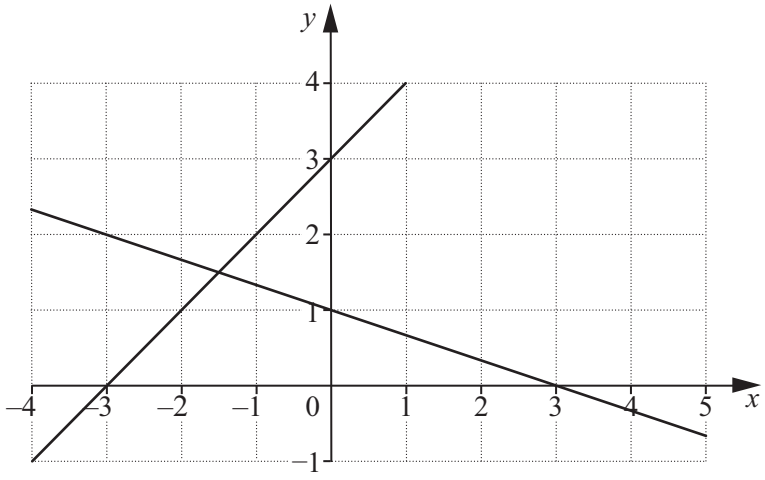
(a) Find the gradient of the line $3y + x = 3$.

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

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

$$3y + x \geqslant 3, \quad y \leqslant x + 3, \quad x \geqslant 0 .$$

Answer (*b*)



[2]

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

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

Answer (*a*) [2]

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

Answer (*b*) [1]

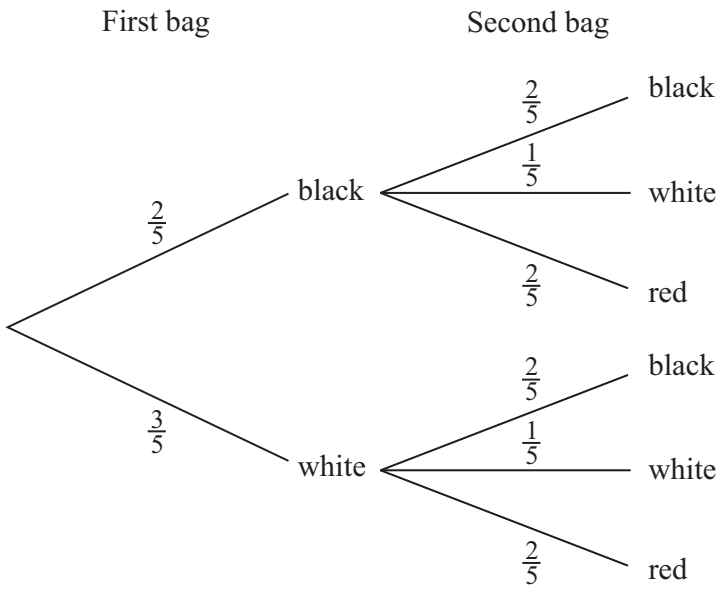
18 Solve the simultaneous equations

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

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 $PM : PR$.

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

(b) P is (1, –2) and Q is (5, 6).

(i) Find the coordinates of M.

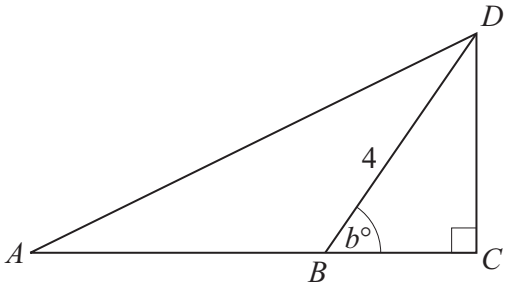
Answer (*b*)(i) (....., ...) [1]

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

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

21

sin $b°$	cos $b°$	tan $b°$
0.85	0.53	1.6



In the diagram, ABC is a straight line.
$BD = 4$ cm, $B\hat{C}D = 90°$ and $C\hat{B}D = b°$.

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

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

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.

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

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

Answer (*a*)

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

[2]

23 Look at this pattern.

$$2^2 - 0^2 = 4\times1$$

$$3^2 - 1^2 = 4\times2$$

$$4^2 - 2^2 = 4\times3$$

$$5^2 - 3^2 = 4\times4$$

(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*) .....

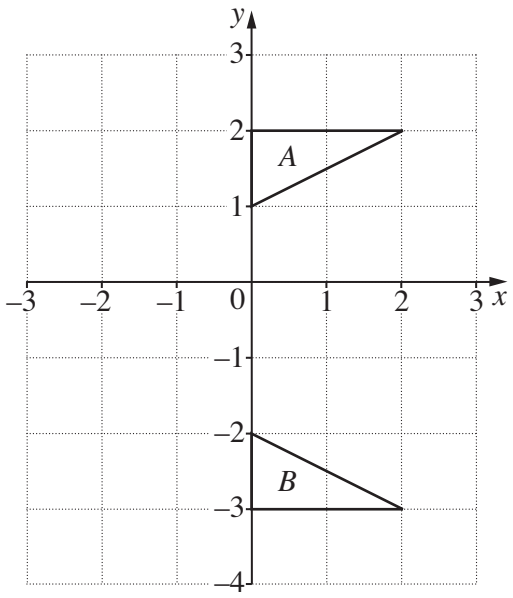
.....

..... [2]

(b) Triangle A is mapped onto triangle C by a rotation, centre the origin, through 90° anticlockwise.

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

Answer (*b*)(i)

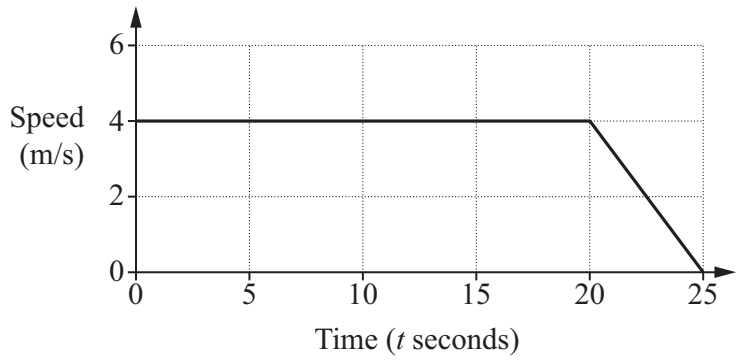


[1]

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

Answer (*b*)(ii) [1]

25



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*) ..... m/s^2 [1]

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

Answer (*b*) .....

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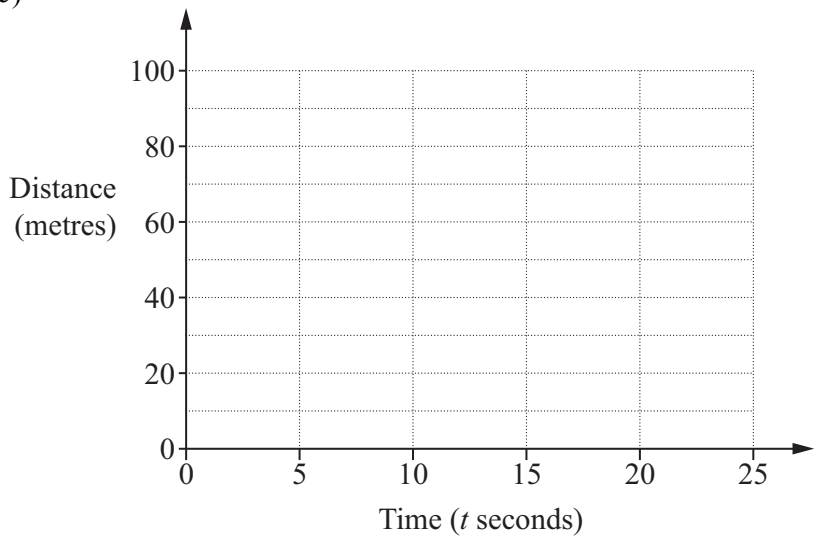
.....

.....

.....[1]

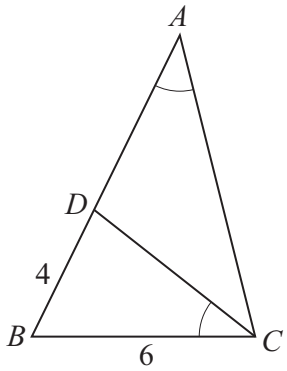
(c) On the grid below, draw the distance-time graph for the 25 seconds.

Answer (*c*)



[2]

26



The diagram shows triangle ABC.
D is the point on AB such that $B\hat{C}D = B\hat{A}C$.

(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 = ... cm [3]

Question 27 is printed on the following page

27 The diagram below shows triangle ABC.

(a) Measure $A\hat{B}C$.

Answer (*a*) $A\hat{B}C =$ ..... [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*)