UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5539296252

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

Paper 1 **October/November 2011**

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.

For Examiner's Use

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

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

1 **(a)** Evaluate $3 + 5(3 - 1.4)$.

Answer ..... [1]

(b) Evaluate 0.2×0.07 .

Answer ..... [1]

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2 **(a)** Evaluate $3\frac{2}{3} - 2\frac{4}{5}$.

Answer ..... [1]

(b) Express $\frac{48}{84}$ in its lowest terms.

Answer ..... [1]

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3 **(a)** Write the following numbers in order of size, starting with the smallest.

$$0.67 \qquad \frac{7}{9} \qquad \frac{2}{3} \qquad 66\,\%$$

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

(b) During one month, the volume of perfume in a bottle decreased from 5 ml to 4 ml.

Calculate the percentage decrease.

Answer .....% [1]

---

4 **(a)** Add 55 minutes to 2.4 hours, giving your answer in hours and minutes.

Answer ..... hours ..... minutes [1]

(b) The mass of a bag of sugar is given as 1.5 kg, correct to the nearest tenth of a kilogram.

Write down the upper bound of this mass, giving your answer in grams.

Answer ..... g [1]

5 Given that $f(x) = \frac{2x + 3}{5x}$, find $f^{-1}(x)$.

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

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6 By making suitable approximations, estimate the value of $\frac{304.3 \times \sqrt{15.98}}{0.1975}$.

Answer ..... [2]

---

7 Find the values of x and y, where

$$2\begin{pmatrix} x \\ 7 \end{pmatrix} = 3\begin{pmatrix} -2 \\ y \end{pmatrix} - \begin{pmatrix} 4 \\ -2 \end{pmatrix}.$$

Answer $x =$ .....

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

---

8 A large tank contained 2.3×10^6 litres of oil.
During a 4 week period, 1.2×10^5 litres were used.

(a) Calculate how many litres of oil remain in the tank after the 4 weeks.
Give your answer in standard form.

Answer ..... [1]

(b) Giving your answer in standard form, calculate the average number of litres used each week.

Answer ..... [1]

---

9 It is given that $13 < 7 - 2x < 18$ has the solution $a < x < b$.

Find the values of a and b.

Answer $a =$ .....

$b =$ ..... [2]

---

10 Factorise completely $2xy - 3x - 10y + 15$.

Answer ..... [2]

11

parallelogram		rhombus
	rectangle	square

Which of these quadrilaterals have

(a) exactly 2 lines of symmetry,

Answer ..... [1]

(b) rotational symmetry of order 2,

Answer ..... [1]

(c) diagonals that are equal?

Answer ..... [1]

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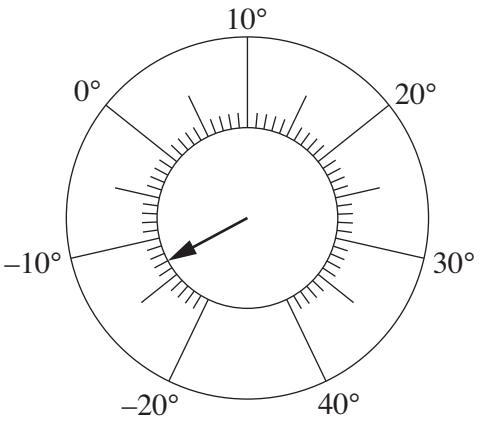
12 The diagram shows a thermometer, with a circular dial, that records temperatures in °C.



(a) Write down the temperature indicated by the pointer.

Answer ..... °C [1]

(b) When the temperature increases from –20 °C to 40 °C, the pointer turns through an angle of 300°.

Calculate the angle through which the pointer turns when there is a 7 °C rise in temperature.

Answer ..... [1]

(c) On one particular day, the temperature at 1 a.m. was 4 °C.
By 6 a.m. it had fallen by 9 °C.

Calculate the temperature at 6 a.m.

Answer ..... °C [1]

---

13 A map has a scale of 2 cm to 5 km.

(a) Express this scale in the form 1 : n.

Answer 1 : ..... [1]

(b) The actual distance between two places is 35 km.

Calculate the distance on the map between these two places.

Answer ..... cm [1]

(c) On the map, the area of a lake is 8 cm^2.

Calculate the actual area of the lake.

Answer ..... km^2 [1]

14 The table shows the results when a 6-sided die was thrown 50 times.

Score	1	2	3	4	5	6
Frequency	7	7	6	9	11	10

(a) Write down the modal score.

Answer ..... [1]

(b) Calculate the mean score.

Answer ..... [2]

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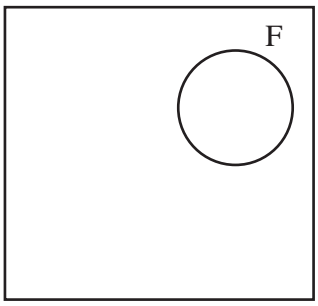
15 $\mathscr{E} = \{ x : x \text{ is an integer and } x > 5 \}$

$P = \{ x : x \text{ is a prime number} \}$
$F = \{ x : x \text{ is a multiple of } 4 \}$
$S = \{ x : x \text{ is a multiple of } 6 \}$

The Venn diagram shows the Universal set and the set F.



(a) Draw and label the two sets P and S to complete the Venn diagram. [2]

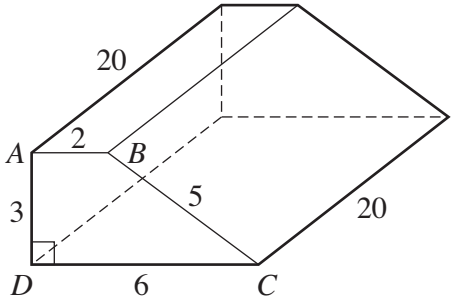
(b) Write down a possible element y such that y is an even number and $y \in (F \cup S)'$.

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

---

16 The diagram shows a solid prism of length 20 cm.
The cross-section, $ABCD$, is a trapezium.

$AB = 2$ cm, $BC = 5$ cm, $CD = 6$ cm, $DA = 3$ cm and angle $ADC = 90°$.



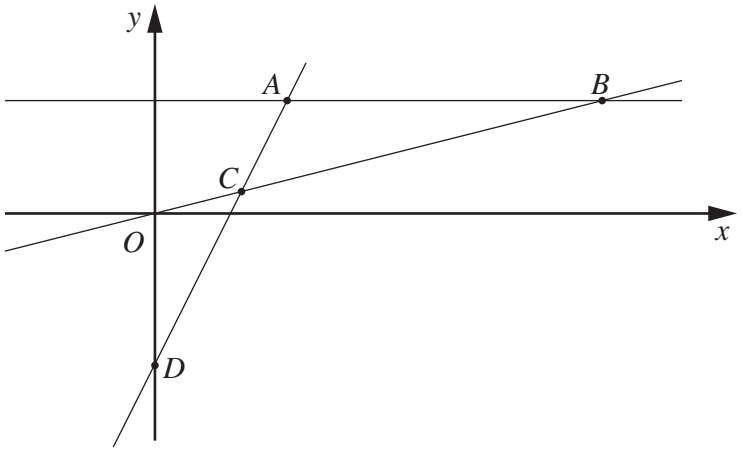
(a) Calculate the area of trapezium $ABCD$.

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

(b) Calculate the **total** surface area of the prism.

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

17



In the diagram, B is the point (8, 2).
The equation of the line AB is $y = 2$ and the equation of the line AC is $2x - y = 3$.
BC produced passes through the origin.

(a) AC produced intersects the y-axis at D.

Find the coordinates of D.

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

(b) The region **inside** triangle ABC is defined by three inequalities.
One of these is $y < 2$.

Find the other two inequalities.

Answer .....

..... [2]

18 **(a)** Simplify $(3a^4)^2$.

Answer ..... [1]

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

Answer ..... [1]

(c) Given that $x^3 = 27^0$, find x.

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

(d) Evaluate $\frac{12^{\frac{1}{2}}}{3^{\frac{3}{2}}}$.

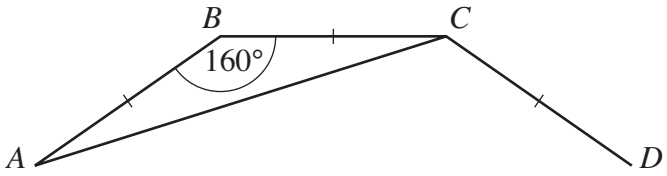
Answer ..... [1]

19 A regular polygon has interior angles of 160°.

(a) Calculate the number of sides of the polygon.

Answer ..... [2]

(b)



The diagram shows three sides, AB, BC and CD, of this polygon.

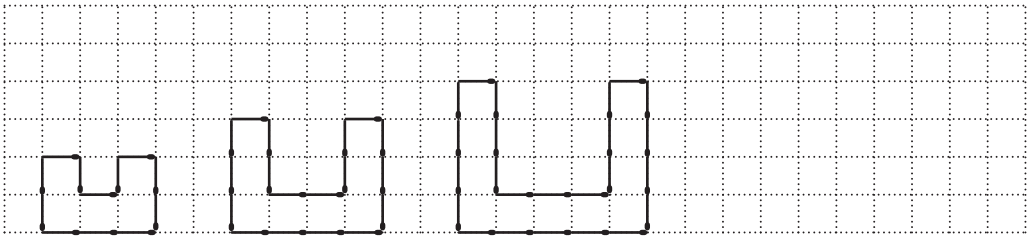
(i) Calculate $B\hat{A}C$.

Answer ..... [1]

(ii) Calculate $A\hat{C}D$.

Answer ..... [1]

20 A series of shapes, made of matchsticks, is shown below.



Shape 1 Shape 2 Shape 3 Shape 4

(a) Draw Shape 4. [1]

(b) The table shows the numbers of matchsticks used to make Shapes 1 and 2.

Shape	1	2	3	4
Number of matchsticks	12	18		

Complete the table for Shapes 3 and 4. [1]

(c) Find an expression, in terms of n, for the number of matchsticks used to make Shape n.

Answer ..... [1]

(d) Explain why there is not a shape that is made of 100 matchsticks.

Answer .....

.....

..... [1]

21 The time taken to fill a tank with water varies inversely as the area of cross-section of the inlet pipe. The time taken is 40 minutes when the area is $3\,cm^2$.

(a) Find the number of minutes taken to fill the tank when the area is $5\,cm^2$.

Answer ..... [2]

(b) It is given that the area is A square centimetres.

Find the expression, in terms of A, for the number of minutes taken to fill the tank.

Answer ..... [1]

(c) Water flowed into the empty tank through a pipe of area $4\,cm^2$.
It flowed for 9 minutes.

Find, in its simplest form, the fraction of the tank that now contained water.

Answer ..... [1]

22 $\mathbf{A} = \begin{pmatrix} 5 & 2 \\ -1 & 1 \end{pmatrix}$

(a) Find the determinant of $\mathbf{A}$.

Answer ..... [1]

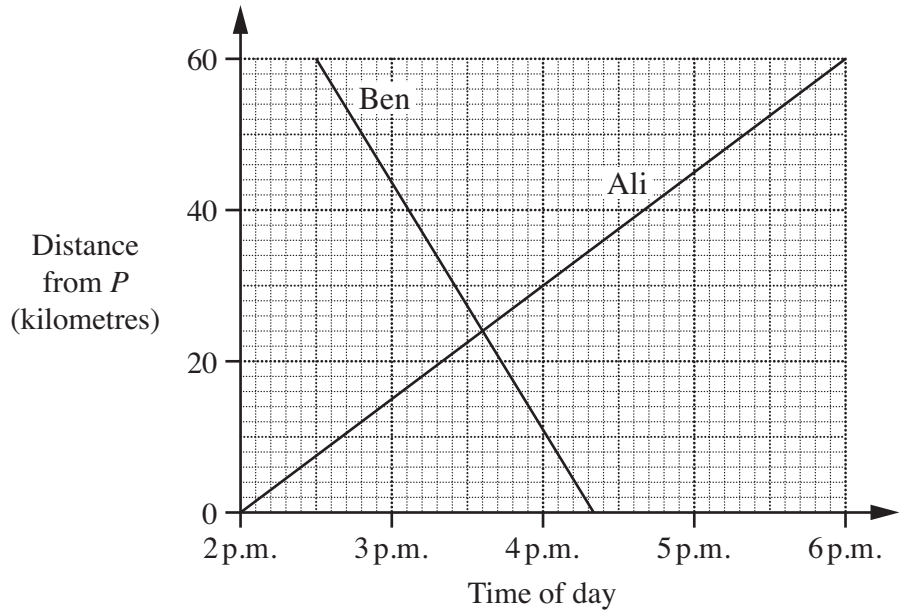
(b) Write down $\mathbf{A}^{-1}$.

Answer [1]

(c) Find the matrix $\mathbf{X}$, where $\mathbf{AX} = \begin{pmatrix} 11 \\ -5 \end{pmatrix}$.

Answer [2]

23



Ali and Ben each made a journey between two towns, P and Q, that are 60 km apart. These two journeys are shown on the travel graph.

(a) Calculate Ali's speed.

Answer ..... km/h [1]

(b) Find the number of minutes after 3 p.m. that Ali and Ben passed each other.

Answer ..... [1]

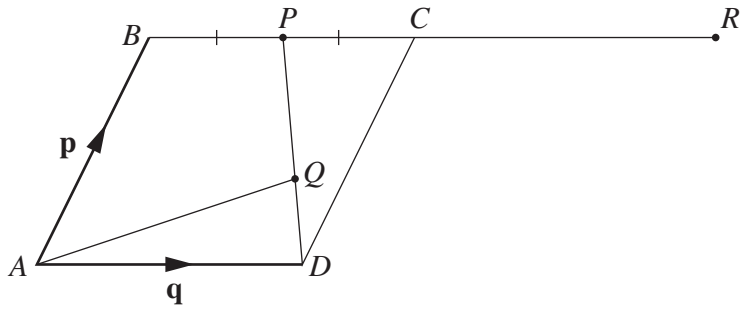
(c) Find how far Ben had travelled when he met Ali.

Answer ..... km [1]

(d) Chris left P at 3 p.m. and travelled to Q at a speed of 30 km/h.

On the diagram, draw the graph that represents Chris's journey. [1]

24



In the diagram, $ABCD$ is a parallelogram.
P is the midpoint of BC.
$DQ : QP = 1 : 2$.
$\overrightarrow{AB} = \mathbf{p}$ and $\overrightarrow{AD} = \mathbf{q}$.

(a) Express $\overrightarrow{DP}$ in terms of **p** and **q**.

Answer ..... [1]

(b) Express $\overrightarrow{DQ}$ in terms of **p** and **q**.

Answer ..... [1]

(c) Express $\overrightarrow{AQ}$ in terms of **p** and **q**, giving your answer in its simplest form.

Answer ..... [1]

(d) R is the point on BC produced such that $\overrightarrow{BR} = k\overrightarrow{BP}$.

(i) Express $\overrightarrow{AR}$ in terms of **p** and **q** and k.

Answer ..... [1]

(ii) Given that A, Q and R lie on a straight line, find the value of k.

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

25 The diagram below shows quadrilateral $ABCD$.

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

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

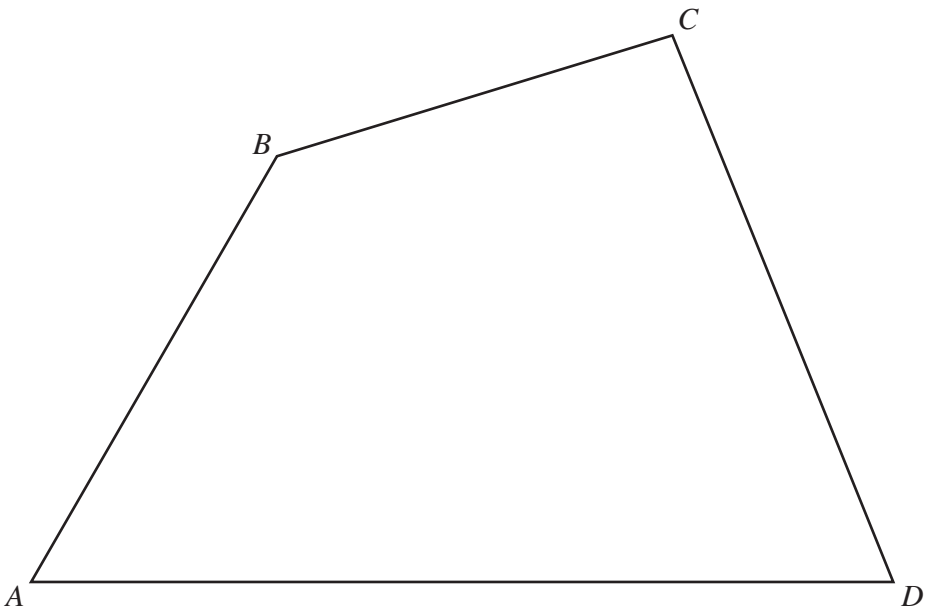
(b) On the diagram, construct the locus of points, **inside** the quadrilateral, that are

I 4 cm from AD,

II equidistant from A and D. [2]

(c) On the diagram, shade the region **inside** the quadrilateral, containing the points that are more than 4 cm from AD and nearer to D than to A. [1]

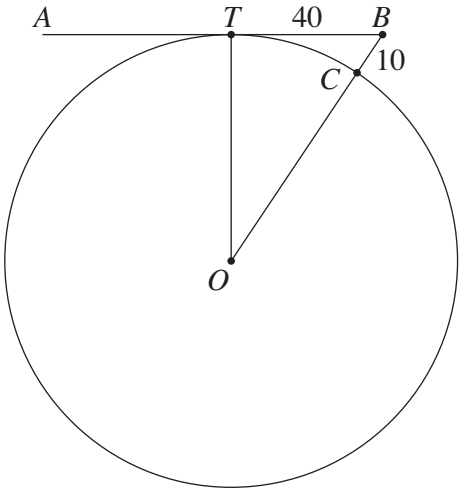
(d) The point P is 4 cm from AD and as near as possible to C.
Mark, and label, the position of P on the diagram. [1]



Question 26 is printed on the following page.

26 In the diagram, AB touches the circle, centre O, at T.

OB intersects the circle at C.



(a) State, with a reason, the value of $B\hat{T}O$.

Answer $B\hat{T}O$ = ... because .....

..... [1]

(b) Given that $TB = 40$ cm, $CB = 10$ cm, and the radius of the circle is x centimetres, form an equation in x, and hence find the radius of the circle.

Answer ..... cm [4]