



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

CANDIDATE  
NAME

CENTRE  
NUMBER

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**MATHEMATICS (SYLLABUS D)**

**4024/12**

Paper 1

**May/June 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.

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



**ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.**

1 (a) Evaluate  $12 + 6 \div 2 - 8$ .

*Answer* ..... [1]

(b) Evaluate  $2.6 \times 0.2$ .

*Answer* ..... [1]

---

2 (a) It is given that  $\frac{1}{5} < n < \frac{1}{4}$ .

Write down a decimal value of  $n$  that satisfies this inequality.

*Answer* ..... [1]

(b) Express  $\frac{48}{60}$  as a percentage.

*Answer* ..... % [1]

---

3 (a) Evaluate  $\frac{2}{3} - \frac{3}{8}$ .

*Answer* ..... [1]

(b) Evaluate  $1\frac{3}{4} \times \frac{2}{9}$ , giving your answer as a fraction in its lowest terms.

*Answer* ..... [1]

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4 (a) Solve  $5y - 3 > 3y + 12$ .

*Answer*  $y$  ..... [1]

(b) Write down all the integers that satisfy the inequality  $-6 \leq 3x < 6$ .

*Answer* ..... [1]

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$$5 \quad \mathbf{c} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad \mathbf{d} = \begin{pmatrix} 8 \\ -6 \end{pmatrix}$$

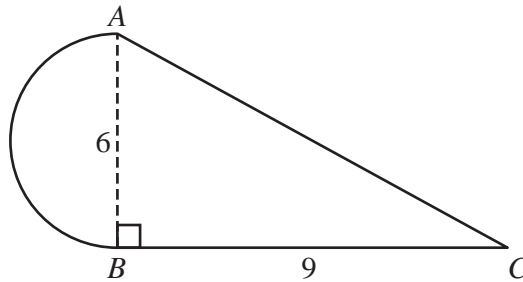
(a) Calculate  $2\mathbf{c} - \mathbf{d}$ .

Answer  $\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

(b) Calculate  $|\mathbf{d}|$ .

Answer ..... [1]

6



$ABC$  is a right-angled triangle with  $AB = 6$  cm and  $BC = 9$  cm.  
A semicircle of diameter 6 cm is joined to the triangle along  $AB$ .

Find an expression, in the form  $a + b\pi$ , for the **total** area of the shape.

Answer ..... cm<sup>2</sup> [2]

- 7 (a) The ratio of boys to girls in a class is  $4 : 5$ .

What fraction of the class are boys?

*Answer* ..... [1]

- (b) The ratio of boys to girls in a school is  $3 : 4$ .  
There are 120 more girls than boys.

How many students are in the school?

*Answer* ..... [1]

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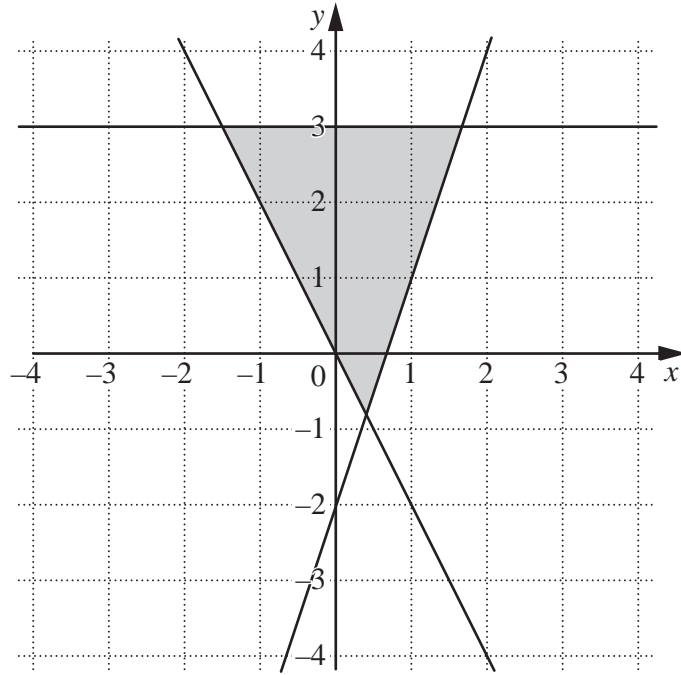
- 8  $y$  is directly proportional to the square of  $x$ .

Given that  $y = 2$  when  $x = 4$ , find  $y$  when  $x = 10$ .

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

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9



The shaded region on the diagram is represented by three inequalities.

One of these is  $y \geq 3x - 2$ .

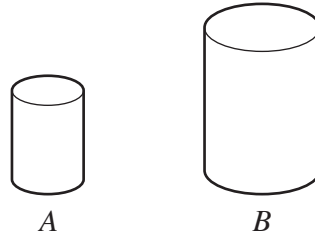
Write down the other two inequalities.

*Answer* .....

..... [2]

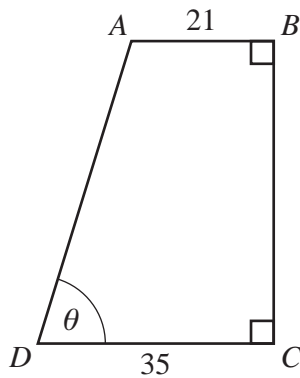
- 10 These two cylinders are similar.  
The ratio of their volumes is 8 : 27.  
The height of cylinder A is 12 cm.

Find the height of cylinder B.



Answer ..... cm [2]

11



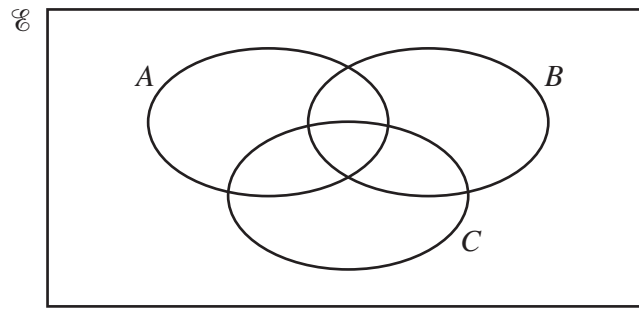
$\sin \theta$	$\frac{24}{25}$
$\cos \theta$	$\frac{7}{25}$
$\tan \theta$	$\frac{24}{7}$

$ABCD$  is a trapezium with  $AB = 21$  cm and  $CD = 35$  cm.  
 $\hat{A}BC = \hat{B}CD = 90^\circ$  and  $\hat{A}DC = \theta$ .

Using as much information from the table as is necessary, calculate  $AD$ .

Answer ..... cm [2]

- 12 (a) On the Venn diagram, shade the set  $A \cap B \cap C'$ .



[1]

- (b)  $U = \{2, 3, 4, 5, 6, 7, 8, 9, 10\}$   
 $P = \{x : x \text{ is a prime number}\}$   
 $Q = \{x : x \geq 5\}$

- (i) Find the value of  $n(P \cap Q)$ .

Answer ..... [1]

- (ii) List the elements of  $P \cup Q'$ .

Answer ..... [1]



- 13 (a) The mass of one grain of rice is 0.000 02 kg.

Write 0.000 02 in standard form.

*Answer* ..... [1]

- (b) The table shows the amount of rice grown in some countries in 2002.

	China	Brazil	India	Vietnam
Amount (tonnes)	$1.2 \times 10^8$	$7.6 \times 10^6$	$8.0 \times 10^7$	$2.1 \times 10^7$

- (i) Write these amounts in order, smallest first.

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

- (ii) Calculate the difference in the amount of rice grown in Brazil and Vietnam.  
Give your answer in standard form.

*Answer* ..... tonnes [1]

---

14 (a) Express 108 as a product of its prime factors.

*Answer* ..... [1]

(b) Written as products of their prime factors,  $N = 2^p \times 5^q \times 7^r$  and  $500 = 2^2 \times 5^3$ .

The highest common factor of  $N$  and 500 is  $2^2 \times 5^2$ .

The lowest common multiple of  $N$  and 500 is  $2^3 \times 5^3 \times 7$ .

Find  $p$ ,  $q$  and  $r$ .

*Answer*  $p = \dots\dots\dots$ ,  $q = \dots\dots\dots$ ,  $r = \dots\dots\dots$  [2]

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15 (a) Factorise completely  $9pq - 12q^2$ .

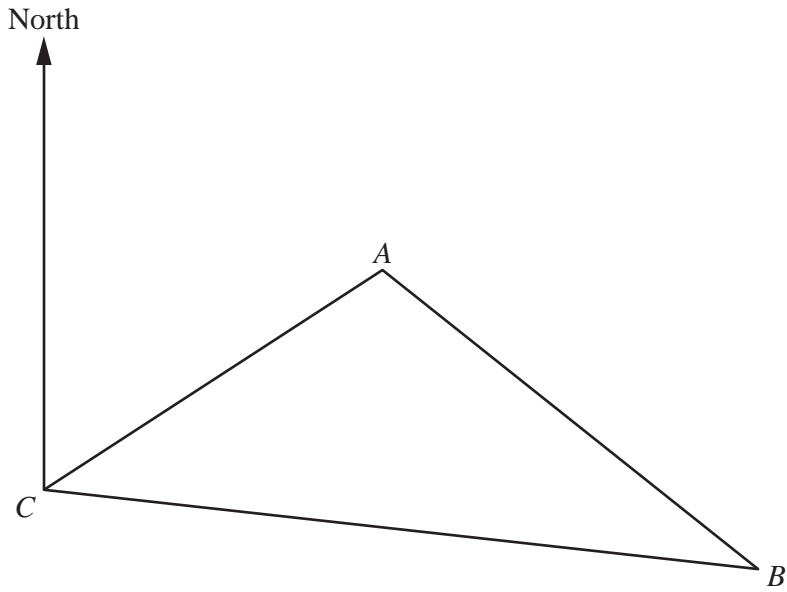
*Answer* ..... [1]

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

*Answer* ..... [2]

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- 16 The scale drawing shows three towns, *A*, *B* and *C*.  
The scale of the drawing is 1 cm to 25 km.



- (a) Measure the bearing of *A* from *C*.

*Answer* ..... [1]

- (b) Find the bearing of *C* from *A*.

*Answer* ..... [1]

- (c) Find the actual distance, in kilometres, from *B* to *C*.

*Answer* ..... km [1]

- 17 The table shows the height, in metres, above sea level of the highest and lowest points in some continents.

A negative value indicates a point below sea level.

	Asia	Africa	Europe	South America
Highest point (m)	8850	5963	5633	6959
Lowest point (m)	-409	-156	-28	-40

- (a) What is the height above sea level of the highest point in Africa?  
Give your answer in **kilometres**.

*Answer* ..... km [1]

- (b) In South America, how much higher is the highest point than the lowest point?  
Give your answer in metres.

*Answer* ..... m [1]

- (c) How much higher is the lowest point in Europe than the lowest point in Asia?  
Give your answer in metres.

*Answer* ..... m [1]

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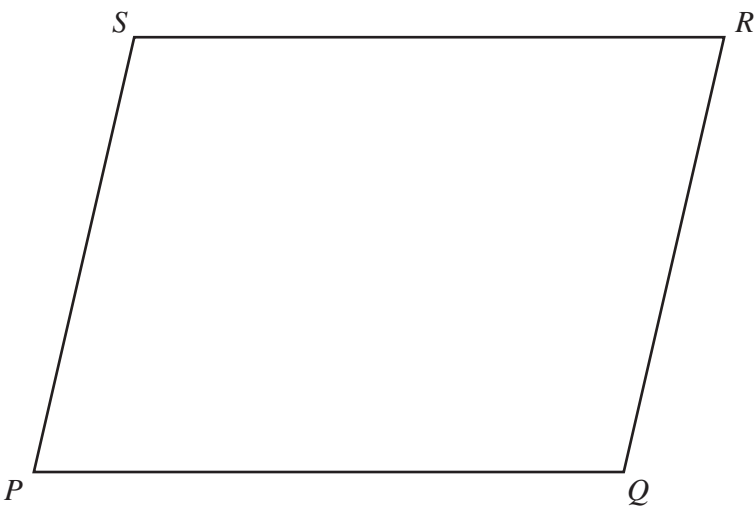
18 The diagram below shows the quadrilateral  $PQRS$ .

(a) On the diagram, construct

(i) the bisector of  $\hat{S}PQ$ , [1]

(ii) the perpendicular bisector of  $QR$ . [1]

(b) On the diagram, shade the region inside the quadrilateral containing the points that are closer to  $PQ$  than to  $PS$  and nearer to  $Q$  than to  $R$ . [1]



19 (a) Express 0.047 852 correct to two decimal places.

*Answer* ..... [1]

(b) Estimate the value of  $\sqrt{200}$ , giving your answer correct to two significant figures.

*Answer* ..... [1]

(c) By writing each number correct to one significant figure, estimate the value of

$$\frac{212 \times 1.97^2}{0.763}.$$

*Answer* ..... [2]

---

20 The table shows the distribution of the number of complete lengths swum by a group of swimmers.

Number of complete lengths ( $n$ )	$0 < n \leq 20$	$20 < n \leq 40$	$40 < n \leq 60$	$60 < n \leq 80$
Frequency	5	20	10	5

(a) Find the modal class.

Answer ..... [1]

(b) Calculate an estimate of the mean.

Answer ..... [3]

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

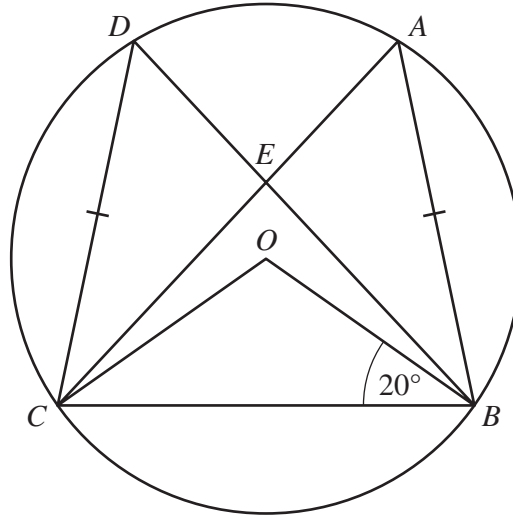
Answer ..... [1]

(b) Evaluate  $64^{\frac{2}{3}}$ .

Answer ..... [1]

(c) Simplify  $\left(\frac{4x^2y^9}{x^4y}\right)^{\frac{1}{2}}$ .

Answer ..... [2]



Points  $A, B, C$  and  $D$  lie on the circumference of a circle, centre  $O$ , and  $AB = CD$ .  
 $AC$  and  $BD$  intersect at  $E$ .  
 $\angle OBC = 20^\circ$ .

(a) Calculate  $\angle BOC$ .

Answer  $\angle BOC = \dots\dots\dots$  [1]

(b) Calculate  $\angle CAB$ .

Answer  $\angle CAB = \dots\dots\dots$  [1]

(c) Show that triangles  $AEB$  and  $DEC$  are congruent.

Answer .....

.....

.....

.....

.....

..... [3]



23 (a) Imran is paid \$16 per hour.

(i) One week he works 35 hours.

Calculate the amount he is paid for the week.

*Answer* \$..... [1]

(ii) Imran is paid 20% extra per hour for working at weekends.

Work out the total amount Imran is paid for working 4 hours at the weekend.

*Answer* \$..... [2]

(b) The exchange rate between pounds and dollars is £1 = \$1.80.  
Anna converts \$270 into pounds.

Calculate the number of pounds Anna receives.

*Answer* £..... [2]

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24  $P$  is the point  $(-2, 1)$  and  $Q$  is the point  $(3, 7)$ .

(a)  $M$  is the midpoint of  $PQ$ .

Find the coordinates of  $M$ .

*Answer*      $(\dots\dots\dots, \dots\dots\dots)$      [1]

(b) Find the gradient of the line  $PQ$ .

*Answer*      $\dots\dots\dots$  [1]

(c) The line with equation  $2y + 3x + k = 0$  passes through the point  $P$ .

(i) Find  $k$ .

*Answer*      $k = \dots\dots\dots$  [2]

(ii) Find the gradient of this line.

*Answer*      $\dots\dots\dots$  [1]

---

25 (a) Solve  $10 - 3(2x - 1) = 3x + 1$ .

*Answer*  $x = \dots\dots\dots$  [2]

(b) Solve the simultaneous equations.

$$\begin{aligned}4x + 3y &= 11 \\2x - 5y &= 25\end{aligned}$$

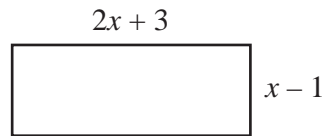
*Answer*  $x = \dots\dots\dots$

$y = \dots\dots\dots$  [3]

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**Question 26 is printed on the following page.**

26 The diagram shows a rectangle with length  $(2x + 3)$  cm and width  $(x - 1)$  cm .



(a) The area of the rectangle is  $12 \text{ cm}^2$ .

Form an equation in  $x$  and show that it reduces to  $2x^2 + x - 15 = 0$  .

[2]

(b) Solve  $2x^2 + x - 15 = 0$  .

*Answer*  $x = \dots\dots\dots$  or  $\dots\dots\dots$  [2]

(c) Find the perimeter of the rectangle.

*Answer*  $\dots\dots\dots$  cm [1]

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