



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

CANDIDATE  
NAME

CENTRE  
NUMBER

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**MATHEMATICS (SYLLABUS D)**

**4024/01**

Paper 1

**May/June 2008**

**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.**

At the end of the examination, fasten all your work securely together.

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 **14** printed pages and **2** blank pages.



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

**1** Evaluate

**(a)**  $\frac{1}{2} - \frac{3}{7}$ ,

**(b)**  $2\frac{2}{3} \times 1\frac{3}{4}$ .

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

(b) .....[1]

**2** Evaluate

**(a)**  $25 - 18.3$ ,

**(b)**  $1.7 \times 0.03$ .

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

(b) .....[1]

**3** It is given that  $f(x) = 5x + 2$ .

Find

**(a)**  $f(-2)$ ,

**(b)**  $f^{-1}(x)$ .

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

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

- 4 By writing each number correct to 1 significant figure, estimate the value of

$$\frac{8.62 \times 2.04^2}{0.285}$$

Answer .....[2]

- 5 It is given that  $68.2 \times 0.235 = 16.027$ .

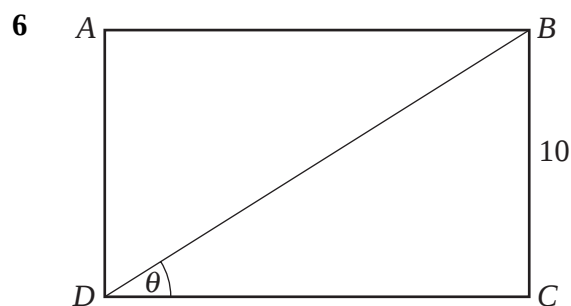
Hence evaluate

(a)  $0.0682 \times 2350$ ,

(b)  $160.27 \div 0.0235$ .

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

(b) .....[1]



|               |                 |
|---------------|-----------------|
| $\sin \theta$ | $\frac{5}{13}$  |
| $\cos \theta$ | $\frac{12}{13}$ |
| $\tan \theta$ | $\frac{5}{12}$  |

$ABCD$  is a rectangle with  $BC = 10$  cm.

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

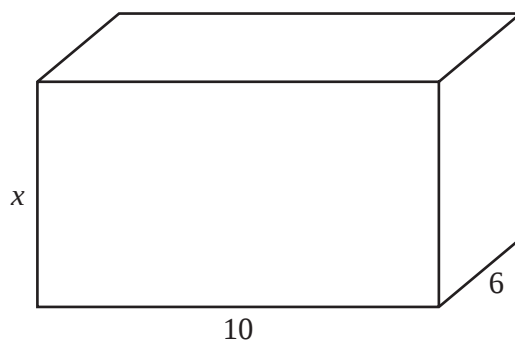
Answer  $BD =$  ..... cm [2]

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- 7 The diagram shows a solid cuboid with base 10 cm by 6 cm.  
The height of the cuboid is  $x$  centimetres.



- (a) Find an expression, in terms of  $x$ , for the total surface area of the cuboid.  
(b) The total surface area of the cuboid is  $376 \text{ cm}^2$ .

Form an equation in  $x$  and solve it to find the height of the cuboid.

Answer (a) .....  $\text{cm}^2$  [1]

(b) ..... cm [2]

- 8 Evaluate

- (a)  $9^0$ ,  
(b)  $9^{-2}$ ,  
(c)  $9^{\frac{3}{2}}$ .

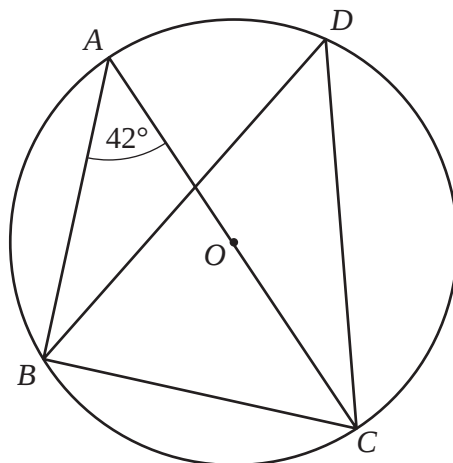
Answer (a) .....[1]

(b) .....[1]

(c) .....[1]

9

5



The diagram shows a circle, centre  $O$ , passing through  $A$ ,  $B$ ,  $C$  and  $D$ .  
 $AOC$  is a straight line and  $\hat{BAC} = 42^\circ$ .

Find

(a)  $\hat{BDC}$ ,

(b)  $\hat{ABC}$ ,

(c)  $\hat{ACB}$ .

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

(b)  $\hat{ABC} = \dots\dots\dots[1]$

(c)  $\hat{ACB} = \dots\dots\dots[1]$

**10** It is given that  $y$  is directly proportional to the square of  $x$  and that  $y = 1$  when  $x = \frac{1}{2}$ .

Find

(a) the formula for  $y$  in terms of  $x$ ,

(b) the values of  $x$  when  $y = 9$ .

Answer (a)  $y = \dots\dots\dots[2]$

(b)  $x = \dots\dots\dots[1]$

**11** The following list gives the names of six shapes.

Square

Rectangle

Equilateral triangle

Kite

Trapezium

Parallelogram

From this list, write down the name of the shape which always has

- (a) rotational symmetry of order 3,
- (b) rotational symmetry of order 2 and exactly 2 lines of symmetry,
- (c) one line of symmetry only.

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

(b) .....[1]

(c) .....[1]

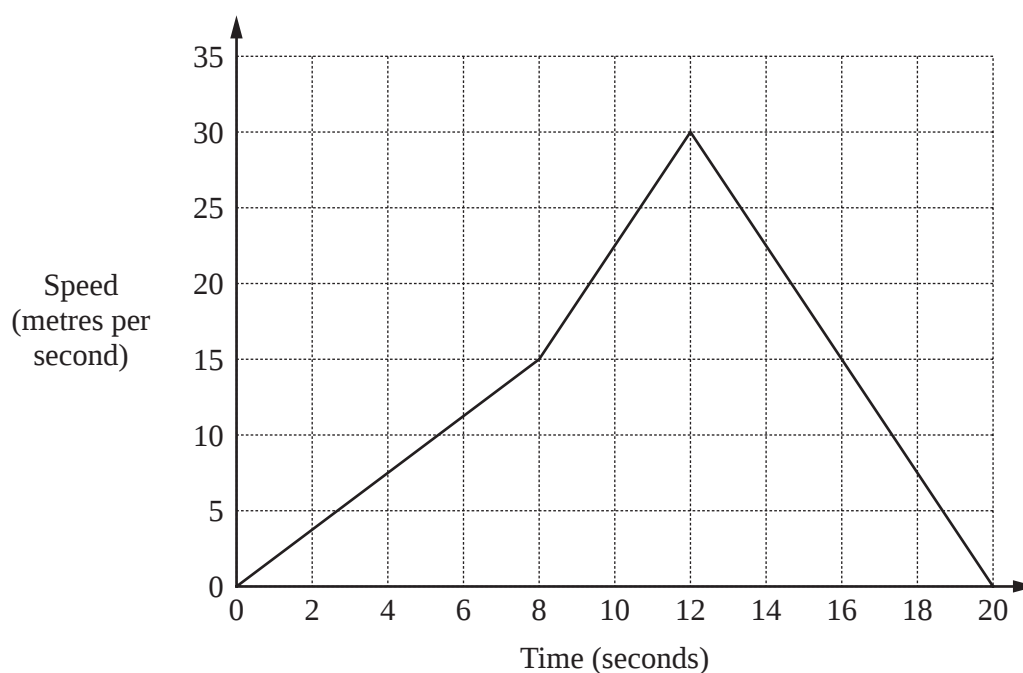
**12** Solve the simultaneous equations

$$\begin{aligned} 2x - 3y &= 13, \\ 3x + y &= 3. \end{aligned}$$

*Answer*  $x =$  .....

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

- 13 The diagram is the speed-time graph of the first 20 seconds of a motorcyclist's journey.



- (a) Calculate the motorcyclist's retardation during the final 8 seconds.
- (b) Calculate the distance travelled in the 20 seconds.

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

(b) ..... m [2]

- 14 (a)** A jar contained 370 g of jam.  
Usman ate 30% of the jam.

What mass of jam remained in the jar?

- (b)** In 2006 the population of a town was 30 000.  
This was 5000 more than the population in 1999.

Calculate the percentage increase in population.

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

(b) ..... % [2]

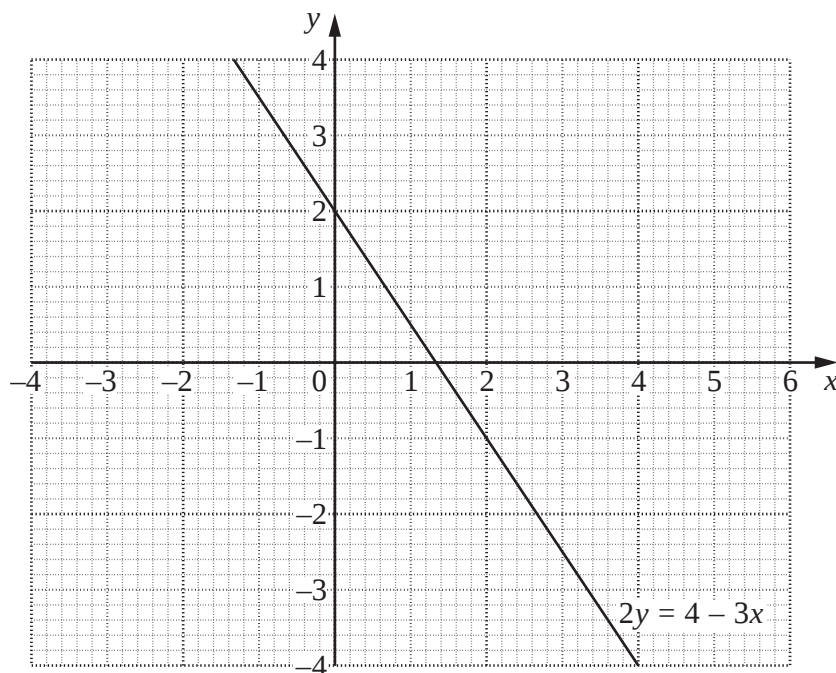
- 15** Express as a single fraction in its simplest form

$$\frac{3}{2t-1} - \frac{2}{t+2}.$$

Answer .....[3]

- 16** The diagram below shows the line  $2y = 4 - 3x$ .

Answer (a), (b)



On this diagram,

- (a)** draw the line  $y = \frac{1}{2}x - 2$ , [1]

- (b)** shade and label the region, R, defined by the following inequalities.

$$x \geq 0$$

$$2y \leq 4 - 3x$$

$$y \geq \frac{1}{2}x - 2$$

[2]

- 17** A straight line passes through the points  $P(1, 2)$  and  $Q(5, -14)$ .

Find

- (a)** the coordinates of the midpoint of  $PQ$ ,
- (b)** the gradient of  $PQ$ ,
- (c)** the equation of  $PQ$ .

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

(b) .....[1]

(c) .....[2]

- 18** The Earth is  $1.5 \times 10^8$  kilometres from the Sun.

- (a)** Mercury is  $5.81 \times 10^7$  kilometres from the Sun.

How much nearer is the Sun to Mercury than to the Earth?  
Give your answer in standard form.

- (b)** A terametre is  $10^{12}$  metres.

Find the distance of the Earth from the Sun in terametres.

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

(b) ..... terametres [2]

**19 (a)** Factorise completely

**(i)**  $15x^2 + 10x$ ,

**(ii)**  $t^2 - 2t - 15$ .

**(b)** Solve  $4(x - 0.3) = 3(x - 0.2)$ .

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

(ii) .....[1]

(b)  $x =$  .....[2]

**20** It is given that

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

Find

**(a)**  $\mathbf{A} - 2\mathbf{B}$ ,

**(b)**  $\mathbf{C}^{-1}$ .

Answer (a)  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

(b)  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

21 (a) Solve  $8 - 3t > 14 + t$ .

(b) Evaluate  $x^2 - 6xy + 2y^2$  when  $x = 2$  and  $y = -3$ .

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

(b) .....[2]

22 (a) The  $n$ th term of a sequence is  $7 - 2n$ .

Write down the 23rd term in this sequence.

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

(b) (i) The first five terms of another sequence are

4      7      10      13      16.

Write down an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

(ii) The first five terms of another sequence are

$\frac{4}{1}$        $\frac{7}{4}$        $\frac{10}{9}$        $\frac{13}{16}$        $\frac{16}{25}$ .

(a) Write down the next term in this sequence.

(b) Write down an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

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

(b)(ii)(a) .....[1]

(b)(ii)(b) .....[1]

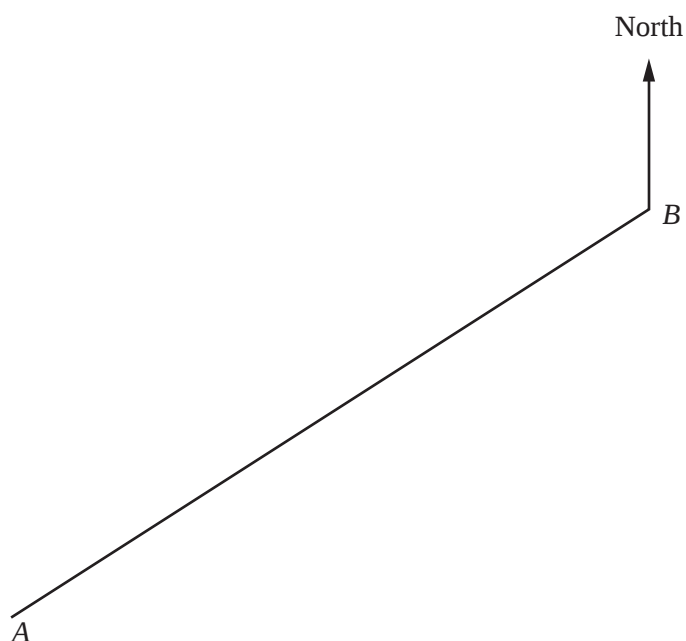
- 23** A map is drawn to a scale of 1 cm to 3 km.  
The diagram below shows the positions of two villages *A* and *B* on the map.

- (a)** **(i)** Write the scale in the form 1 :  $n$  .  
**(ii)** Find the actual distance, in kilometres, between the villages *A* and *B*.

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

(ii) ..... km [1]

Answer (b), (c), (d)



[4]

- (b)** A third village, *C*, lies north of the line *AB*.  
It is 21 km from *A* and 18 km from *B*.  
Using ruler and compasses only, construct triangle *ABC*.
- (c)** Construct the perpendicular bisector of *AB*.
- (d)** A petrol station is to be built so that it is equidistant from *A* and *B* and 9 km from *C*.  
Mark with letters *F* and *G* the two possible positions of the petrol station.

- 24 (a)** Fifty students were asked how many books they each took to school on Monday. The results are summarised in the table below.

|                 |    |    |   |   |   |   |   |   |
|-----------------|----|----|---|---|---|---|---|---|
| Number of books | 0  | 1  | 2 | 3 | 4 | 5 | 6 | 7 |
| Frequency       | 10 | 11 | 8 | 3 | 6 | 7 | 4 | 1 |

- (i) Write down the median.
- (ii) Calculate the mean number of books.
- (iii) What is the probability that two students, chosen at random, both took 5 books to school?  
Give your answer as a fraction in its simplest form.

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

(ii) .....[3]

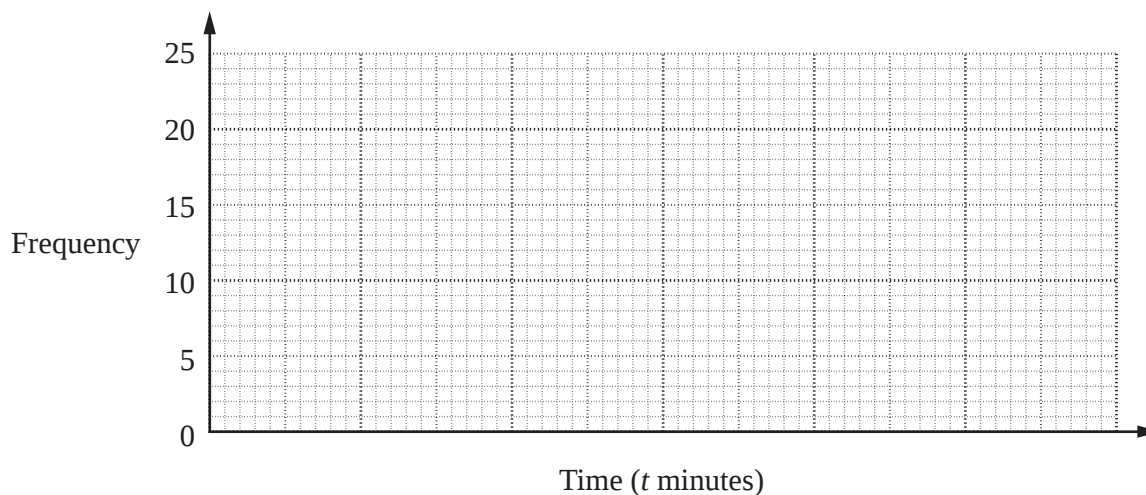
(iii) .....[2]

- (b)** The fifty students were also asked how long they each took to travel to school. The results are summarised in the table below.

|                               |                |                |                 |                  |
|-------------------------------|----------------|----------------|-----------------|------------------|
| Time of travel ( $t$ minutes) | $4 \leq t < 6$ | $6 \leq t < 8$ | $8 \leq t < 10$ | $10 \leq t < 12$ |
| Frequency                     | 21             | 11             | 13              | 5                |

Draw a frequency polygon on the grid below to illustrate this data.

Answer (b)



[2]

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