Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

* 4 4 6 4 8 3 0 8 9 1 *

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **May/June 2015**

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, 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 **19** printed pages and **1** blank page.

© UCLES 2015

CAMBRIDGE International Examinations

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

1 **(a)** Evaluate $\frac{1.3 + 2.9}{0.2}$.

Answer ..... [1]

(b) Evaluate $2\frac{1}{4} \times \frac{1}{5}$.

Answer ..... [1]

---

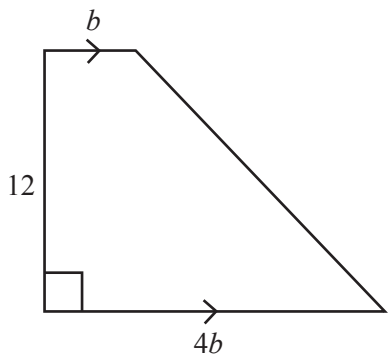
2 Write these numbers in order of size, starting with the smallest.

$$\frac{13}{20} \quad 0.7 \quad \frac{7}{12} \quad 0.64 \quad \frac{5}{8}$$

Answer ..... , ... , ... , ... , ... [2]
smallest

© UCLES 2015

3



The diagram shows a trapezium with lengths in centimetres.
The area of the trapezium is $120\,\text{cm}^2$.

Find the value of b.

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

---

4 A bag contains red counters, blue counters and yellow counters.
There are 60 counters in the bag.

The probability that a counter taken at random from the bag is red is $\frac{2}{5}$.

The probability that a counter taken at random from the bag is blue is $\frac{5}{12}$.

How many yellow counters are in the bag?

Answer ..... [2]

---

5 Fariza travels from London to Astana.
The time in Astana is 5 hours ahead of the time in London, so when it is 10 00 in London the local time in Astana is 15 00 .

She flies from London to Moscow and then from Moscow to Astana.
The flight leaves London at 12 25 and takes 4 hours to reach Moscow.

Fariza waits $4\frac{1}{2}$ hours in Moscow for the flight to Astana.

She arrives in Astana at 05 25 local time.

How long did the flight from Moscow to Astana take?

Answer ..... hours ..... minutes [2]

---

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

$$\frac{29.3^2}{2.04 \times 0.874}.$$

Answer ..... [2]

© UCLES 2015

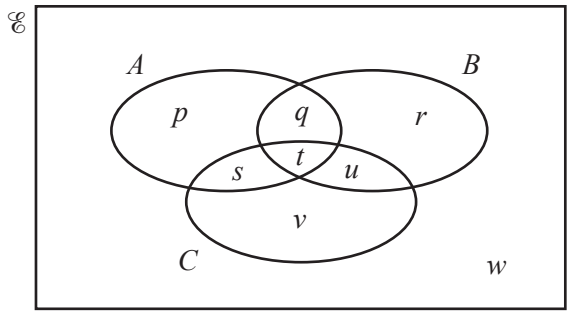
7 y is inversely proportional to the square of x.

Given that $y = 24$ when $x = 2$, find y when $x = 8$.

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

---

8 The Venn diagram shows the sets A, B and C.



List the elements of

(a) $A \cup B$,

Answer ..... [1]

(b) $B' \cap C$.

Answer ..... [1]

---

9 **(a)** Write 0.000 005 21 in standard form.

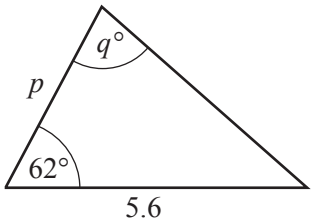
Answer ..... [1]

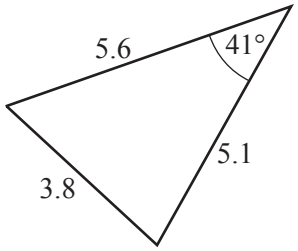
(b) Giving your answer in standard form, evaluate $(6 \times 10^7) \times (5 \times 10^{-3})$.

Answer ..... [1]

---

10 These two triangles are congruent.
The lengths are in centimetres, correct to the nearest 0.1 cm.



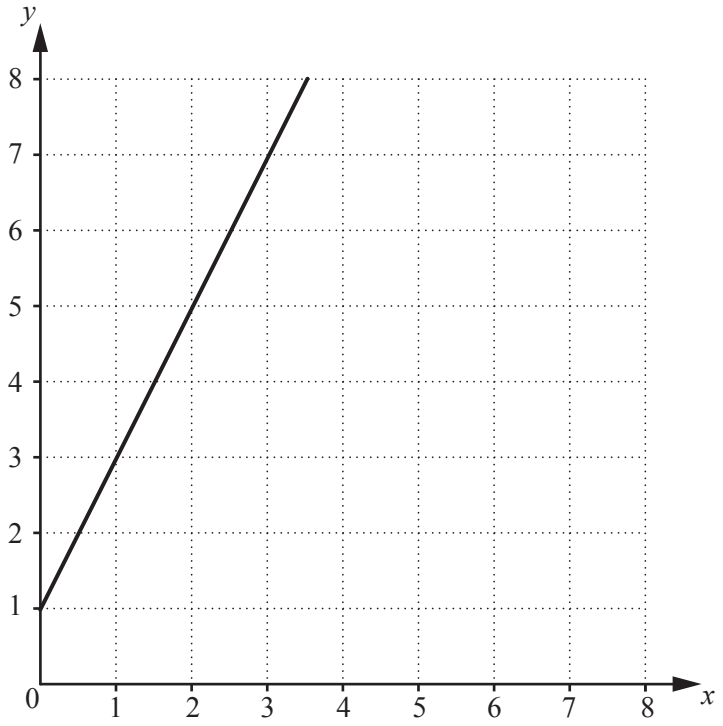


Find p and q.

Answer p = ...

q = ... [2]

11



The diagram shows the line $y = 2x + 1$.

The point P has coordinates (a, b) where a and b are both positive integers.
The values of a and b satisfy the inequalities $a < 2$, $b < 7$ and $b > 2a + 1$.

Write down all the possible coordinates of P.

Answer ..... [2]

12 Omar has a pack of number cards.
He picks these five cards.

–2	–4	–2	4	1

(a) Write down the mode of the five numbers.

Answer ..... [1]

(b) He takes another card from the pack.

(i) If the mean of the six numbers is -1, what number did he pick?

Answer ..... [1]

(ii) If the difference between the highest and lowest of the six numbers is 12, what are the **two** possible numbers he could have picked?

Answer ..... or ..... [1]

---

13 **(a)** Express 60 as a product of its prime factors.

Answer ..... [1]

(b) Find the smallest possible integer m such that $60m$ is a square number.

Answer $m =$ ..... [1]

(c) The lowest number that is a multiple of both 60 and the integer n is 180 .

Find the smallest possible value of n.

Answer $n =$ ..... [1]

© UCLES 2015

14 In triangle ABC, $AB = 5\,\text{cm}$ and $AC = 6\,\text{cm}$.

(a) Construct triangle ABC.
Line BC is drawn for you.

[2]

(b) Measure $B\hat{A}C$ in your triangle.

Answer ..... [1]

15 $c = \sqrt{8a - 3b}$

(a) Find c when $a = 3$ and $b = -4$.

Answer $c =$ ..... [1]

(b) Rearrange the formula to make b the subject.

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

---

16 **(a)** Evaluate

(i) $2^0 + 2^3$,

Answer ..... [1]

(ii) $\left(\frac{1}{9}\right)^{\frac{1}{2}}$.

Answer ..... [1]

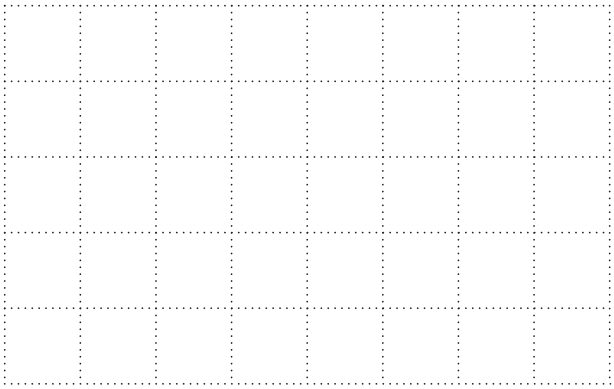
(b) Simplify $(4x^2)^{-2}$.

Answer ..... [1]

© UCLES 2015

17 The matrix $\begin{pmatrix} 4 & 0 \\ 0 & 1 \end{pmatrix}$ represents the transformation T.

(a) Describe fully the transformation T.
You may use the grid below to help you answer this question.



Answer .....

..... [2]

(b) The transformation T maps triangle A onto triangle B.
The area of triangle B is x cm^2.

Find, in terms of x, the area of triangle A.

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

18 **(a)** Factorise completely $p^2q - pq$.

Answer ..... [1]

(b) **(i)** Factorise $5x^2 + x - 4$.

Answer ..... [1]

(ii) Hence solve $5x^2 + x - 4 = 0$.

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

---

19 **(a)** Luis works in an office.
For normal time he is paid \$8 per hour.
For overtime he is paid the same rate as normal time plus an extra 50%.
One month he works 140 hours normal time and 10 hours overtime.

Work out how much he is paid for that month's work.

Answer \$ ..... [2]

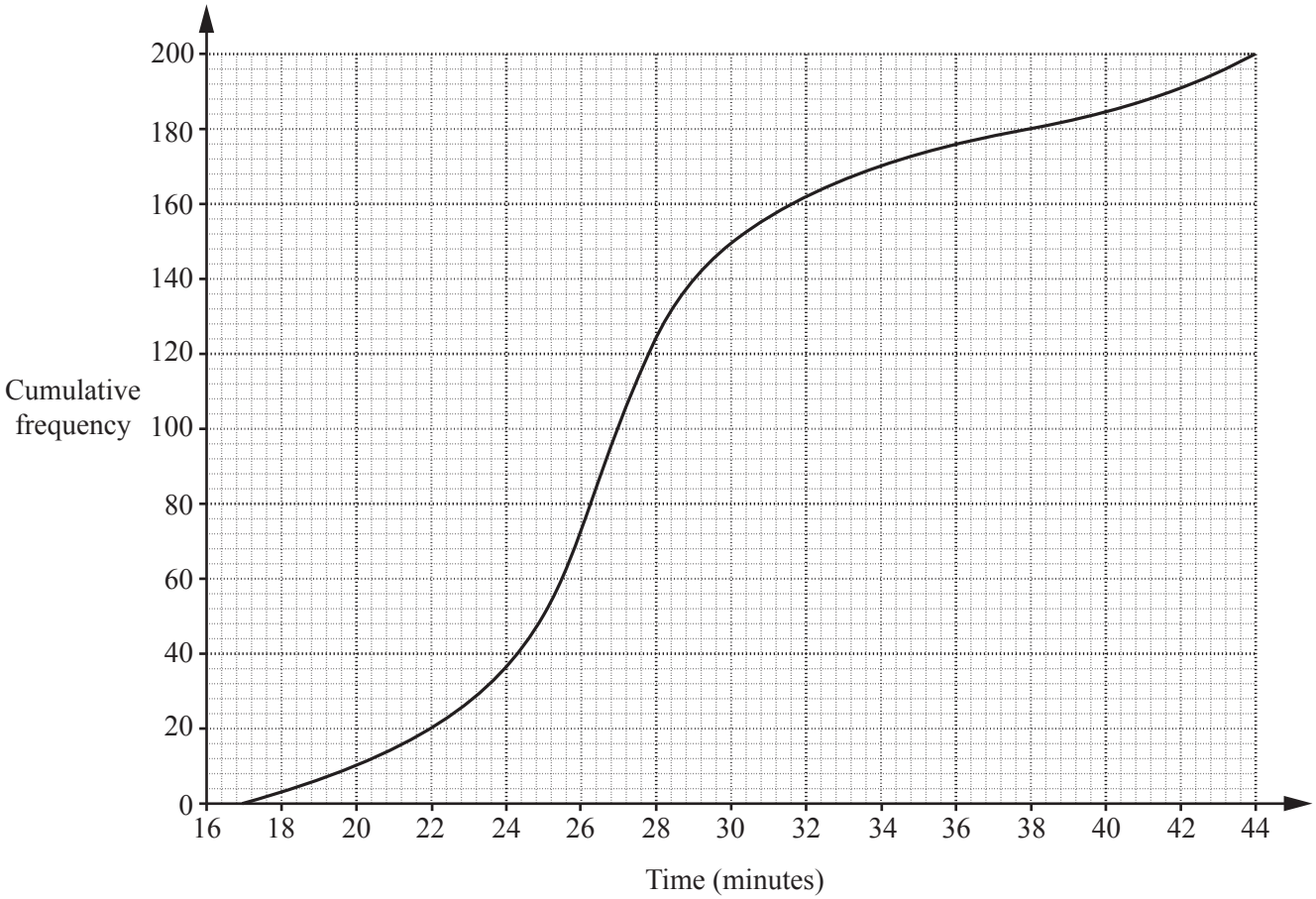
(b) Sara invests \$240 in an account that pays 3% per year simple interest.
She leaves the money in the account for 5 years.

Work out how much money Sara has at the end of 5 years.

Answer \$ ..... [2]

© UCLES 2015

20 The times taken for 200 people to complete a 5 km race were recorded.
The results are summarised in the cumulative frequency diagram.



(a) Use the diagram to estimate

(i) the median time,

Answer ..... minutes [1]

(ii) the interquartile range of the times.

Answer ..... minutes [2]

(b) It was found that the recording of the times was inaccurate.
The correct times were all one minute more than recorded.

Write down the median and interquartile range of the correct times.

Answer Median = ... minutes Interquartile range = ... minutes [1]

21 **(a)** Express as a single matrix $3\begin{pmatrix} 1 & 3 \\ -2 & 5 \end{pmatrix} - \begin{pmatrix} 4 & 0 \\ -1 & 2 \end{pmatrix}$.

Answer [2]

(b) $\mathbf{A} = \begin{pmatrix} 3 & -2 \\ p & -1 \end{pmatrix}$

The determinant of **A** is 2 .

(i) Find p.

Answer $p =$ ..... [1]

(ii) Find $\mathbf{A}^{-1}$.

Answer [1]

22 The scale of a map is $1 : 25\,000$.

(a) The scale can be written as $1\,\text{cm} : d\,\text{km}$.

Find d.

Answer $d =$ ..... [1]

(b) The distance between two villages is 8 km.

Find the distance, in centimetres, between the two villages on the map.

Answer .....cm [1]

(c) The distance between the peaks of two mountains is measured on the map as 76 mm.

Calculate the distance, in kilometres, between the two peaks.

Answer ..... km [2]

23 **(a)** Solve the inequalities.

$$-4 \leqslant 2x - 5 < 7$$

Answer ..... [2]

(b) Solve the simultaneous equations.

$$\begin{aligned} 3x + 4y &= 3 \\ 2x - y &= 13 \end{aligned}$$

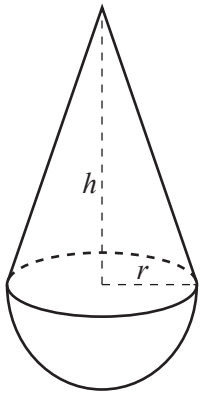
Answer $x =$ .....

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

© UCLES 2015

24 **[Volume of a cone $= \frac{1}{3}\pi r^2 h$, curved surface area of a cone $= \pi r l$]**

[Volume of a sphere $= \frac{4}{3}\pi r^3$, surface area of a sphere $= 4\pi r^2$]



The solid is formed from a hemisphere of radius r cm fixed to a cone of radius r cm and height h cm. The volume of the hemisphere is one third of the volume of the solid.

(a) Find h in terms of r.

Answer $h =$ ..... [2]

(b) The slant height of the cone can be written as $r\sqrt{k}$ cm, where k is an integer.

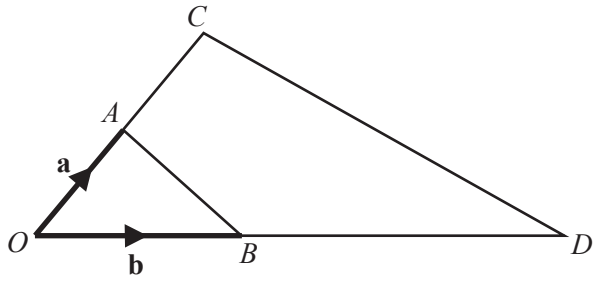
Find the value of k.

Answer $k =$ ..... [2]

(c) Find an expression, in terms of r and π, for the total surface area, in cm^2, of the solid.

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

25



In the diagram, A is the midpoint of OC and B is the point on OD where $OB = \frac{1}{3}\ OD$.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(a) Express, as simply as possible, in terms of **a** and **b**

(i) $\overrightarrow{AB}$,

Answer ..... [1]

(ii) $\overrightarrow{CD}$.

Answer ..... [1]

(b) E is the point on CD where $CE : ED = 1 : 2$.

(i) Express $\overrightarrow{BE}$, as simply as possible, in terms of **a** and/or **b**.

Answer ..... [2]

(ii) What special type of quadrilateral is $ABEC$?

Answer ..... [1]

© UCLES 2015

26 **(a)** The first four terms of a sequence, S, are 89, 83, 77, 71.

(i) Find an expression for S_n, the nth term of this sequence.

Answer $S_n =$ ..... [2]

(ii) Find the smallest value of n for which $S_n < 0$.

Answer $n =$ ..... [1]

(b) The nth term of a different sequence, T, is given by $T_n = n^2 - 4n$.

(i) Find and simplify an expression for $T_{n+1} - T_n$.

Answer ..... [2]

(ii) The difference between T_{p+1} and T_p is 75.

Find the value of p.

Answer $p =$ ..... [1]

© UCLES 2015

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2015