Cambridge IGCSE

**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

**MATHEMATICS** **0580/43**

Paper 4 (Extended) **October/November 2017**

**2 hours 30 minutes**

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
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 an HB 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 below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For $\pi$, use either your calculator value or 3.142.

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 130.

This document consists of **16** printed pages.

© UCLES 2017

CAMBRIDGE International Examinations

**1** **(a)** The angles of a triangle are in the ratio 2 : 3 : 5.

View solution

**(i)** Show that the triangle is right-angled.

[1]

View solution

**(ii)** The length of the hypotenuse of the triangle is 12 cm.

Use trigonometry to calculate the length of the shortest side of this triangle.

..... cm [3]

**(b)** The sides of a different right-angled triangle are in the ratio 3 : 4 : 5.

View solution

**(i)** The length of the shortest side is 7.8 cm.

Calculate the length of the longest side.

..... cm [2]

View solution

**(ii)** Calculate the smallest angle in this triangle.

..... [3]

© UCLES 2017

**2** **(a)** Solve.

$$\frac{x}{7} = 49$$

View solution

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

**(b)** Simplify.

**(i)** $x^0$

View solution

..... [1]

**(ii)** $x^7 \times x^3$

View solution

..... [1]

**(iii)** $\dfrac{(3x^6)^2}{x^{-4}}$

View solution

..... [2]

**(c)** **(i)** Factorise completely.

$$2x^2 - 18$$

View solution

..... [2]

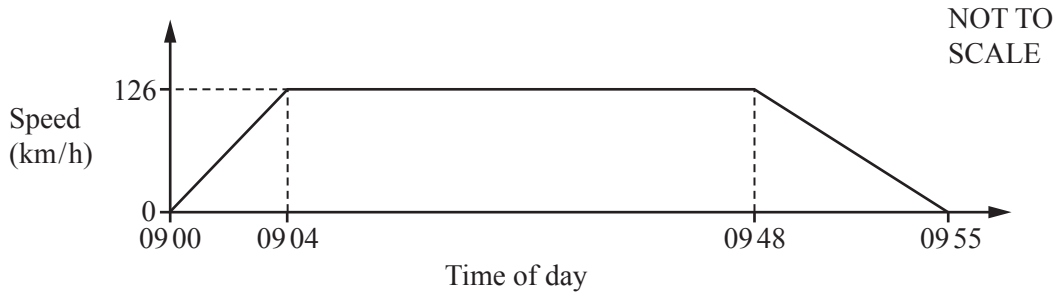
**(ii)** Simplify.

$$\frac{2x^2 - 18}{x^2 + 7x - 30}$$

View solution

..... [3]

**3** The graph shows information about the journey of a train between two stations.




**(a)** **(i)** Work out the acceleration of the train during the first 4 minutes of this journey. Give your answer in km/h$^2$.

View solution

..... km/h$^2$ [2]

**(ii)** Calculate the distance, in kilometres, between the two stations.

View solution

..... km [4]

**(b)** **(i)** Show that 126 km/h is the same speed as 35 m/s.

View solution

[1]

**(ii)** The train has a total length of 220 m.
At 09 30, the train crossed a bridge of length 1400 m.

View solution

Calculate the time, in seconds, that the train took to completely cross the bridge.

.....s [3]

**(c)** On a different journey, the train took 73 minutes, correct to the nearest minute, to travel 215 km, correct to the nearest 5 km.

View solution

Calculate the upper bound of the average speed of the train for this journey.
Give your answer in km/h.

..... km/h [4]

© UCLES 2017

**4** The table shows information about the time, $t$ minutes, taken for each of 150 girls to complete an essay.

| Time ($t$ minutes) | $60 < t \leqslant 65$ | $65 < t \leqslant 70$ | $70 < t \leqslant 80$ | $80 < t \leqslant 100$ | $100 < t \leqslant 150$ |
|---|---|---|---|---|---|
| Frequency | 10 | 26 | 34 | 58 | 22 |

**(a)** Write down the interval that contains the median time.

View solution

..... $< t \leqslant$ ..... [1]

**(b)** Calculate an estimate of the mean time.

View solution

.....min [4]

**(c)** Rafay looks at the frequency table.

View solution

**(i)** He says that it is not possible to work out the range of the times.

Explain why he is correct.

.....

..... [1]

**(ii)** He draws a pie chart to show this information.

View solution

Calculate the sector angle for the interval $65 < t \leqslant 70$ minutes.

..... [2]

**(d)** A girl is chosen at random.

View solution

Work out the probability that she took more than 100 minutes to complete the essay.

..... [1]

© UCLES 2017

**(e)** Two girls are chosen at random.

View solution

Work out the probability that, to complete the essay,

**(i)** they both took 65 minutes or less,

..... [2]

**(ii)** one took 65 minutes or less and the other took more than 100 minutes.

View solution

..... [3]

**(f)** The information in the frequency table is shown in a histogram.
The height of the block for the $60 < t \leqslant 65$ interval is 5 cm.

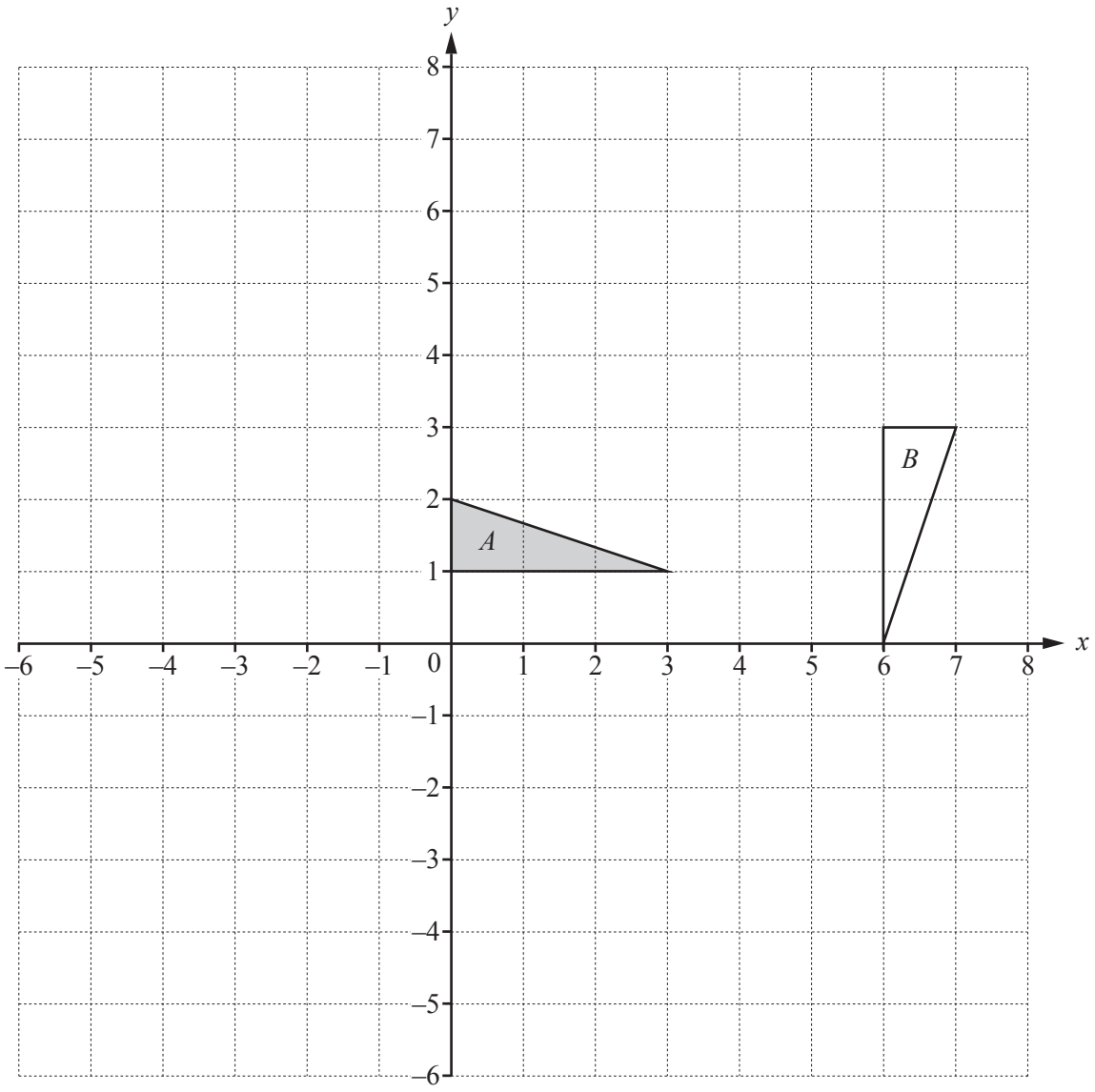
View solution

Complete the table.

| Time ($t$ minutes) | $60 < t \leqslant 65$ | $65 < t \leqslant 70$ | $70 < t \leqslant 80$ | $80 < t \leqslant 100$ | $100 < t \leqslant 150$ |
|---|---|---|---|---|---|
| Height of block (cm) | 5 | | | | |

[3]

**5**




View solution

**(a)** Draw the image of

**(i)** triangle $A$ after a reflection in the line $x = 0$, [2]

**(ii)** triangle $A$ after an enlargement, scale factor 2, centre (0, 4), [2]

**(iii)** triangle $A$ after a translation by the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$. [2]

View solution

**(b)** Describe fully the **single** transformation that maps triangle $A$ onto triangle $B$.

.....

..... [3]

© UCLES 2017

**(c)** $\mathbf{T} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ $\mathbf{U} = \begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$

View solution

Point $P$ has co-ordinates $(1, -4)$.

**(i)** Find $\mathbf{T}(P)$.

(....., .....) [2]

**(ii)** Find $\mathbf{TU}(P)$.

View solution

(....., .....) [2]

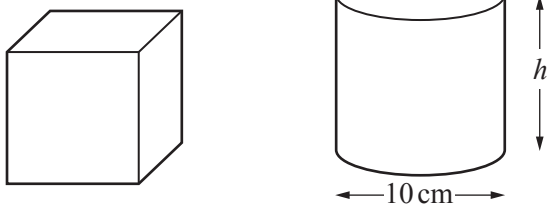
**(iii)** Describe the **single** transformation represented by the matrix **T**.

View solution

.....

..... [3]

**6 (a)**




NOT TO SCALE

The diagrams show a cube, a cylinder and a hemisphere.
The volume of each of these solids is $2000\,cm^3$.

**(i)** Work out the height, $h$, of the cylinder.

$h =$ ..... cm [2]

**(ii)** Work out the radius, $r$, of the hemisphere.

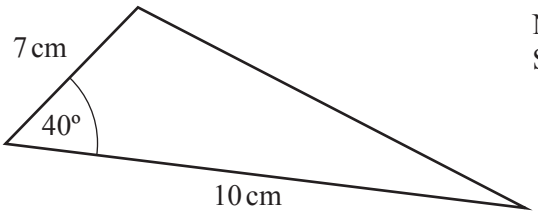
[The volume, $V$, of a sphere with radius $r$ is $V = \frac{4}{3}\pi r^3$.]

$r =$ ..... cm [3]

**(iii)** Work out the surface area of the cube.

..... $cm^2$ [3]

**(b)**




NOT TO SCALE

View solution

**(i)** Calculate the area of the triangle.

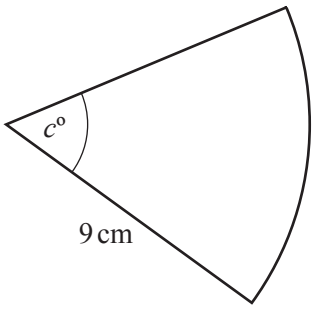
.....cm$^2$ [2]

**(ii)** Calculate the perimeter of the triangle and show that it is 23.5 cm, correct to 1 decimal place. Show all your working.

View solution

[5]

**(c)**




NOT TO SCALE

View solution

The perimeter of this sector of a circle is 28.2 cm.

Calculate the value of $c$.

$c$ = ..... [3]

**7** The table shows some values of $y = 2x^2 + 5x - 3$ for $-4 \leqslant x \leqslant 1.5$.

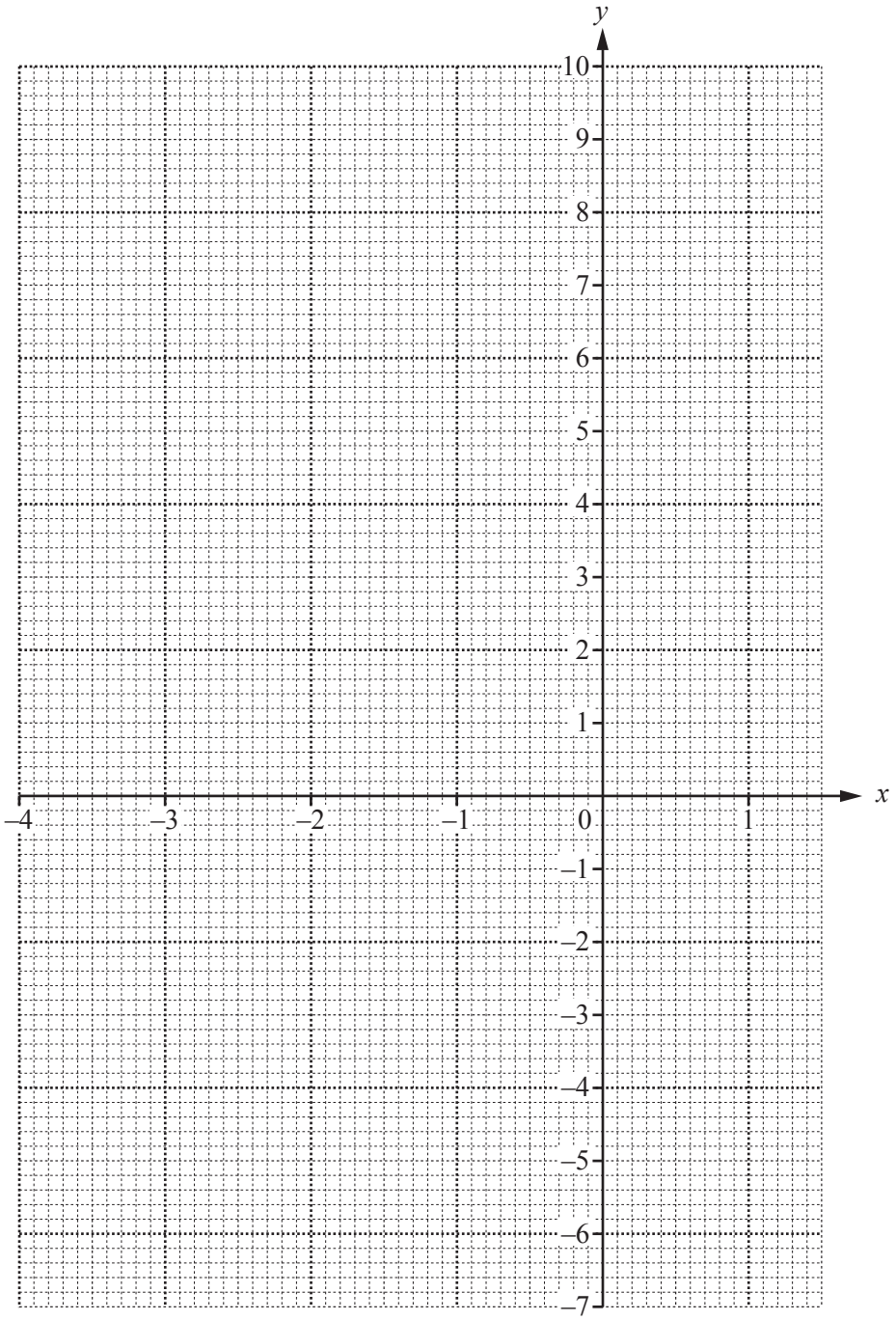
| $x$ | $-4$ | $-3$ | $-2$ | $-1$ | 0 | 1 | 1.5 |
|---|---|---|---|---|---|---|---|
| $y$ | | 0 | $-5$ | | $-3$ | 4 | |

View solution

**(a)** Complete the table. [3]

View solution

**(b)** On the grid, draw the graph of $y = 2x^2 + 5x - 3$ for $-4 \leqslant x \leqslant 1.5$.




[4]

**(c)** Use your graph to solve the equation $2x^2 + 5x - 3 = 3$.

View solution

$x =$ ..... or $x =$ ..... [2]

**(d)** $y = 2x^2 + 5x - 3$ can be written in the form $y = 2(x + a)^2 + b$.

View solution

Find the value of $a$ and the value of $b$.

$a =$ .....

$b =$ ..... [3]

**8** Line $A$ has equation $y = 5x - 4$.
Line $B$ has equation $3x + 2y = 18$.

**(a)** Find the gradient of

View solution

**(i)** line $A$,

..... [1]

**(ii)** line $B$.

View solution

..... [1]

**(b)** Write down the co-ordinates of the point where line $A$ crosses the $x$-axis.

View solution

(....., .....) [2]

**(c)** Find the equation of the line perpendicular to line $A$ which passes through the point (10, 9).
Give your answer in the form $y = mx + c$.

View solution

$y =$ ..... [4]

**(d)** Work out the co-ordinates of the point of intersection of line $A$ and line $B$.

View solution

(....., .....) [3]

**(e)** Work out the area enclosed by line $A$, line $B$ and the $y$-axis.

View solution

..... [3]

© UCLES 2017

**9** Luigi and Alfredo run in a 10 km race.
Luigi's average speed was $x$ km/h.
Alfredo's average speed was 0.5 km/h slower than Luigi's average speed.

**(a)** Luigi took $\frac{10}{x}$ hours to run the race.

View solution

Write down an expression, in terms of $x$, for the time that Alfredo took to run the race.

..... h [1]

**(b)** Alfredo took 0.25 hours longer than Luigi to run the race.

View solution

**(i)** Show that $2x^2 - x - 40 = 0$.

[4]

**(ii)** Use the quadratic formula to solve $2x^2 - x - 40 = 0$.
Show all your working and give your answers correct to 2 decimal places.

View solution

$x =$ ..... or $x =$ ..... [4]

**(iii)** Work out the time that Luigi took to run the 10 km race.
Give your answer in hours and minutes, correct to the nearest minute.

View solution

..... h ..... min [3]

**Question 10 is printed on the next page.**

© UCLES 2017

**10 (a) (i)** Write 180 as a product of its prime factors.

View solution

..... [2]

**(ii)** Find the lowest common multiple (LCM) of 180 and 54.

View solution

..... [2]

**(b)** An integer, $X$, written as a product of its prime factors is $a^2 \times 7^{b+2}$.
An integer, $Y$, written as a product of its prime factors is $a^3 \times 7^2$.

View solution

The highest common factor (HCF) of $X$ and $Y$ is 1225.
The lowest common multiple (LCM) of $X$ and $Y$ is 42 875.

Find the value of $X$ and the value of $Y$.

$X =$ .....

$Y =$ ..... [4]

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.