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 π, 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.

CAMBRIDGE International Examinations

[Turn over

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

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

[1]

(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.

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

Calculate the length of the longest side.

..... cm [2]

(ii) Calculate the smallest angle in this triangle.

..... [3]

2 **(a)** Solve.

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

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

(b) Simplify.

(i) x^0

..... [1]

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

..... [1]

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

..... [2]

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

$$2x^2 - 18$$

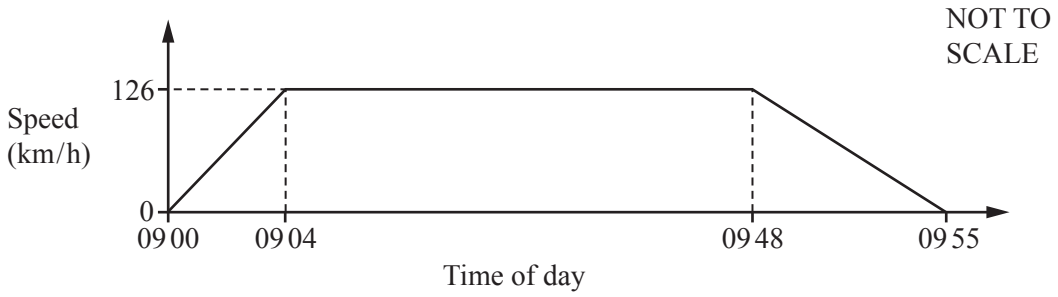
..... [2]

(ii) Simplify.

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

..... [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.

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

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

..... km [4]

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

[1]

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

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.

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

.....km/h [4]

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.

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

(b) Calculate an estimate of the mean time.

.....min [4]

(c) Rafay looks at the frequency table.

(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.

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

..... [2]

(d) A girl is chosen at random.

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

..... [1]

(e) Two girls are chosen at random.

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.

..... [3]

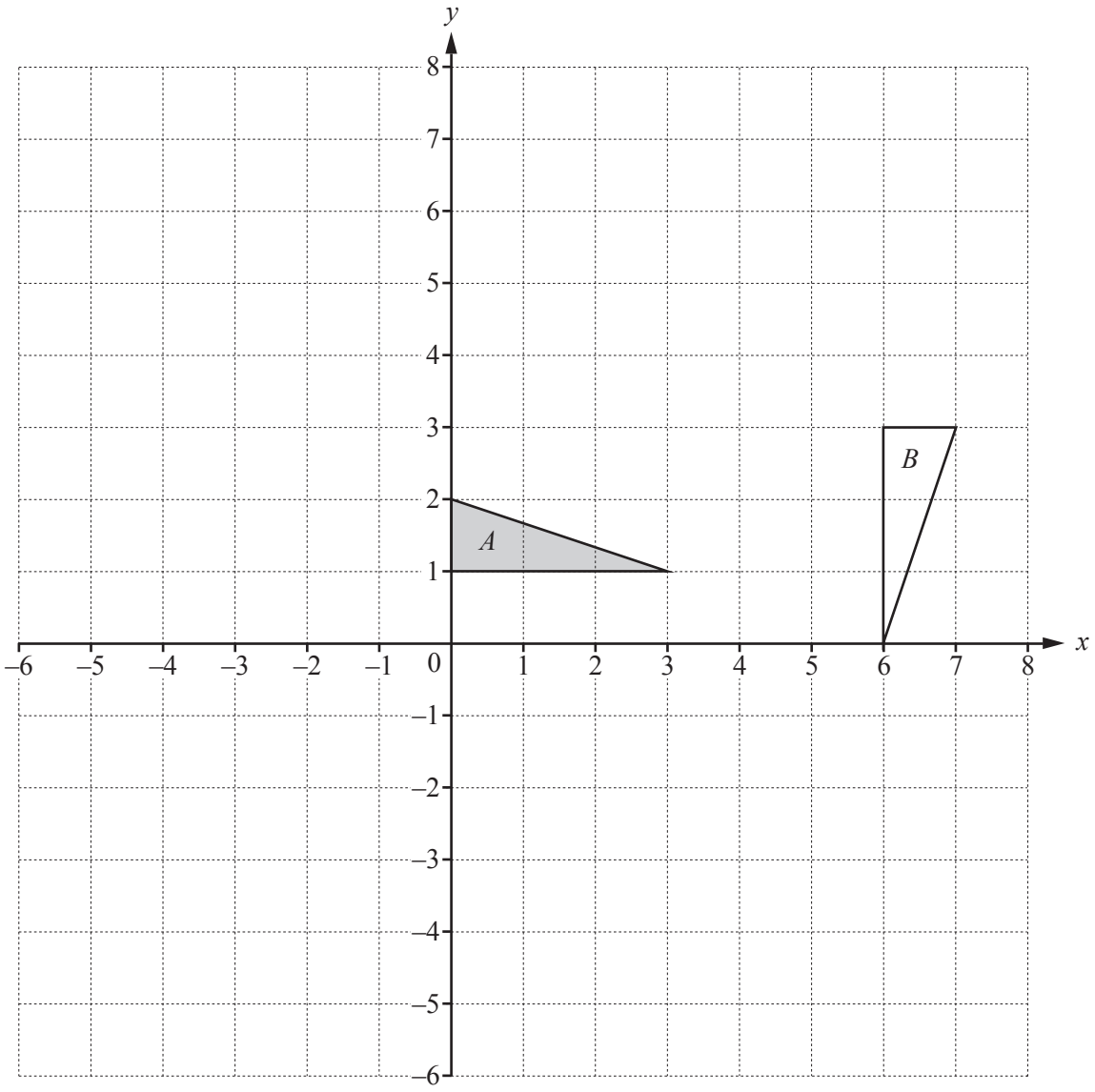
(f) The information in the frequency table is shown in a histogram.
The height of the block for the $60 < t \leqslant 65$ interval is 5 cm.

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



(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]

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

.....

..... [3]

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

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

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

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

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

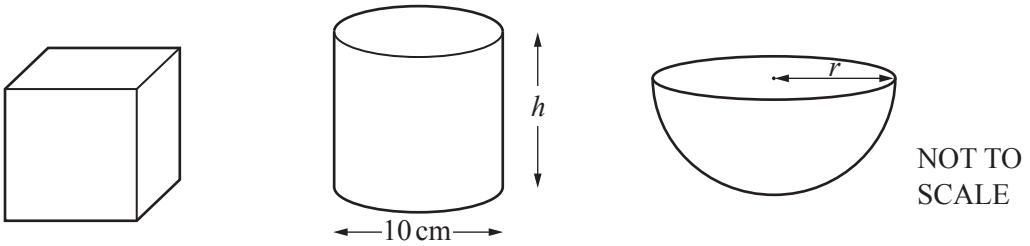
(....., ...) [2]

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

.....

..... [3]

6 (a)



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.

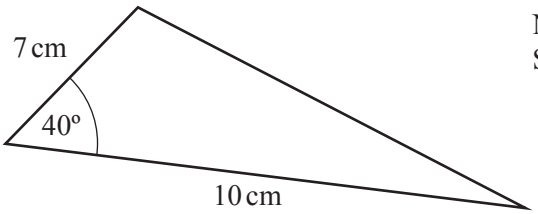
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

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

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

..... cm^2 [3]

(b)



NOT TO SCALE

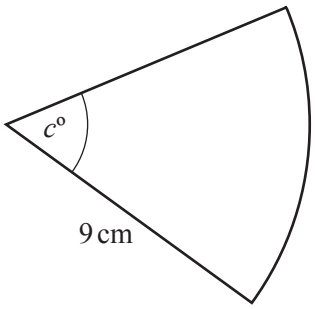
(i) Calculate the area of the triangle.

.....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.

[5]

(c)



NOT TO SCALE

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

Calculate the value of c.

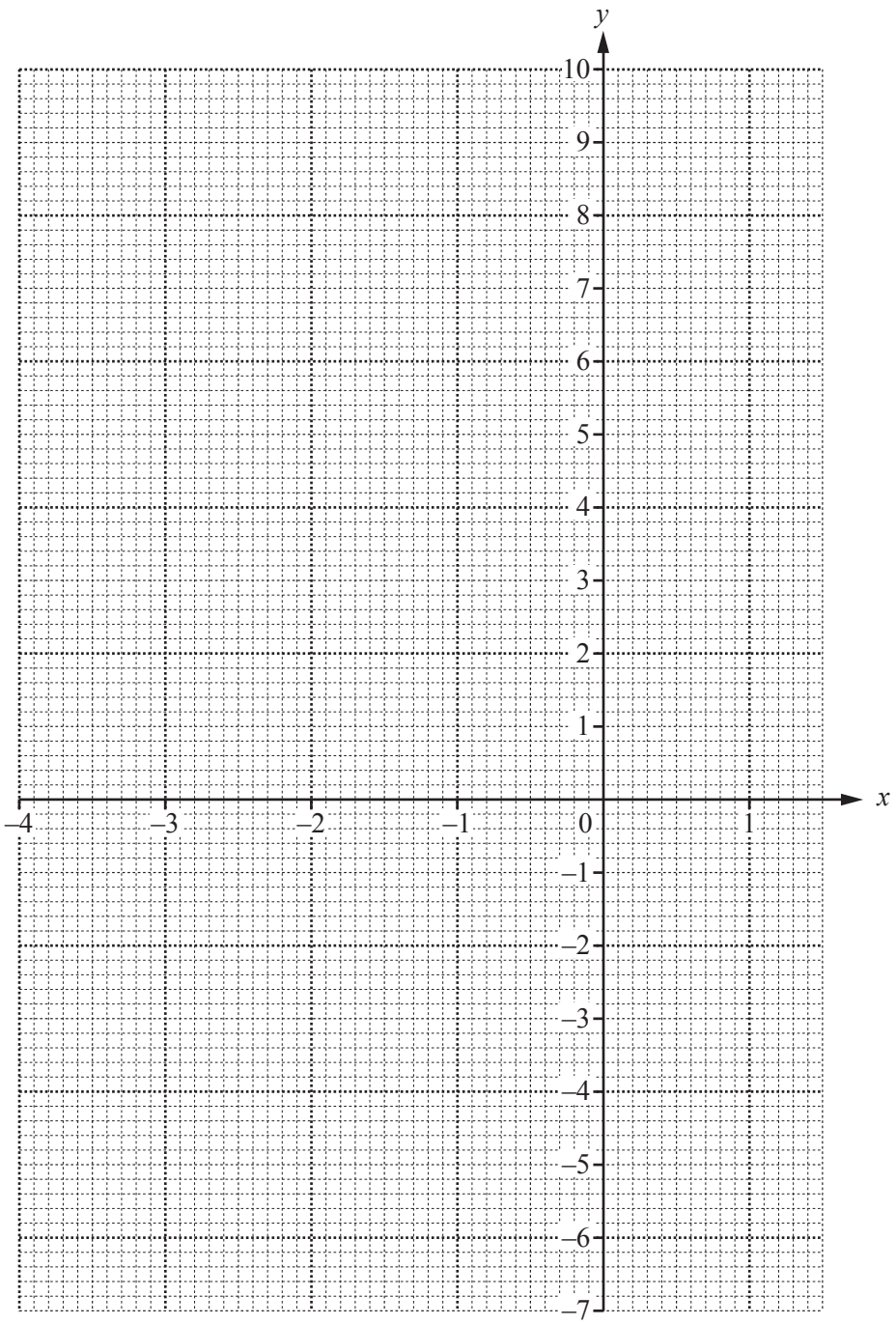
c = ... [3]

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	

(a) Complete the table. [3]

(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 $2x^2 + 5x - 3 = 3$.

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

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

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

(i) line A,

..... [1]

(ii) line B.

..... [1]

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

(....., ...) [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 $y = mx + c$.

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

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

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

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

..... [3]

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.

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.

(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.

$x =$ ..... 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.

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

Question 10 is printed on the next page.

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

..... [2]

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

..... [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 $a^3 \times 7^2$.

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]