Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTER NUMBER	
CANDIDATE NUMBER	

MATHEMATICS (US) **0444/43**

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

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments
Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Center 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 work is needed for any question it must be shown in the space provided.
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 digits.
Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

The number of points is given in parentheses [ ] at the end of each question or part question.
The total of the points for this paper is 130.

Write your calculator model in the box below.

Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

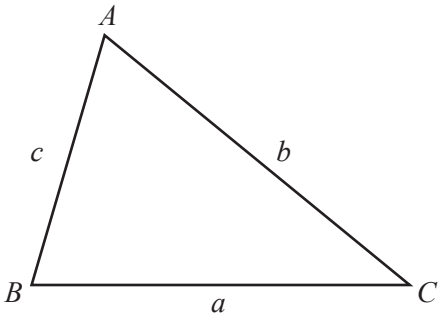
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

Surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \frac{1}{3}Ah$

Volume, V, of cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$



$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

$a^2 = b^2 + c^2 - 2bc \cos A$

Area $= \frac{1}{2}bc \sin A$

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)** Factor.

$$2x^2 - 18$$

..... [2]

(ii) Simplify.

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

..... [3]

3 **(a)** In a sale, the price of a laptop is reduced by 5%.
The sale price is \$456.

Calculate the original price.

\$ ..... [3]

(b) Kate invests \$200 at a rate of 1.5% per year compound interest.

Calculate the amount Kate has after 18 years.

\$ ..... [2]

(c) Larry buys a watch for \$2000.
The value of the watch increases exponentially by x% per year.
After 17 years the value of the watch is \$2449.62 .

Calculate the value of x.

x = ... [3]

(d) Maggie buys a car for \$$c$.
She sells it at a loss of p%

Find an expression, in terms of c and p, for the selling price of the car.

\$ ..... [2]

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]

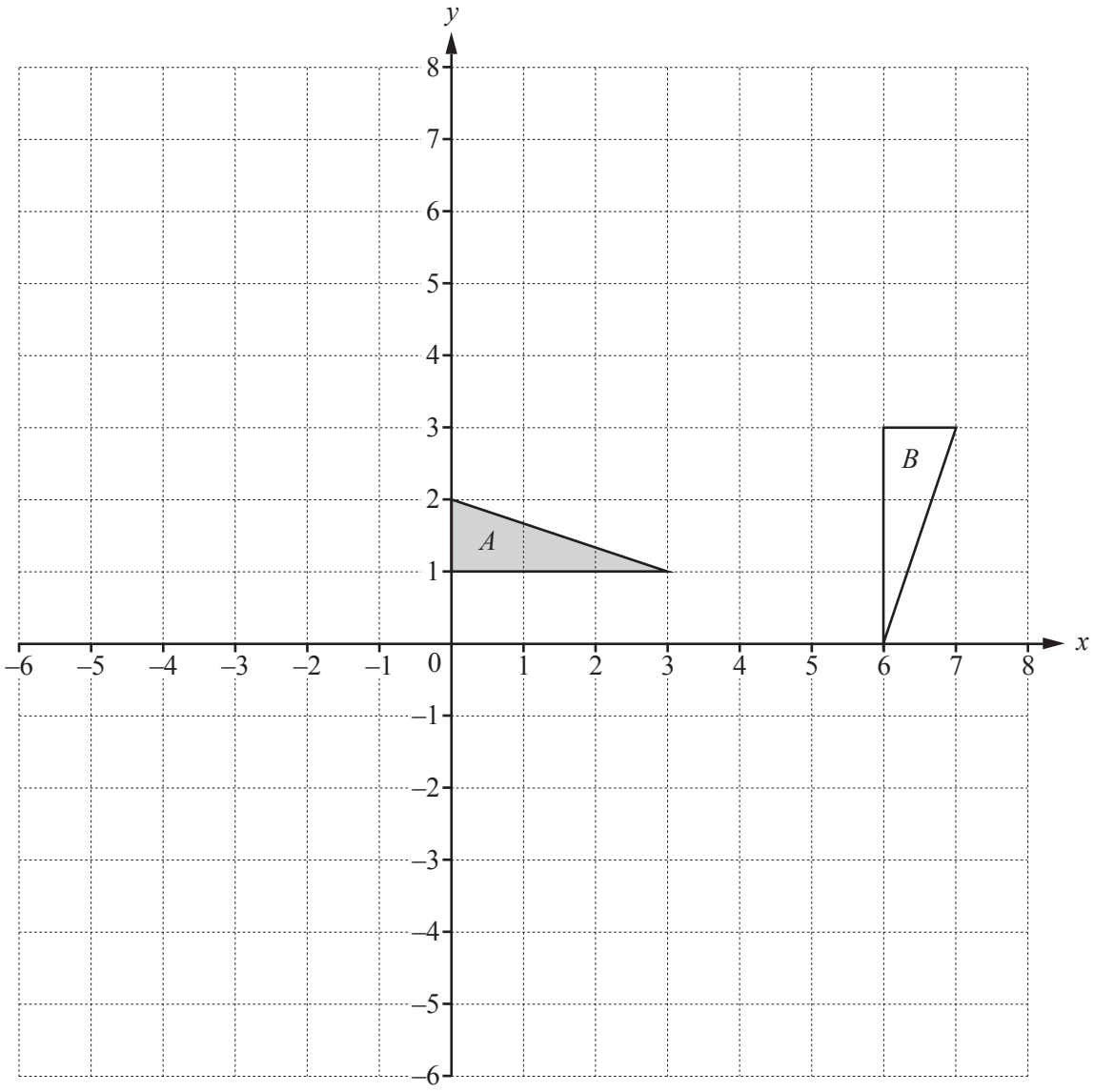
(f) The information in the frequency table is shown in a histogram.
The height of the block for the $60 < t \leqslant 65$ interval is 5 cm.

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, center (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]

6 $f(x) = 2x - 1$ $g(x) = 3 - x$ $h(x) = 2^x$

(a) Find $f(-3)$.

..... [1]

(b) Find $f(g(x))$ in its simplest form.

..... [2]

(c) Find x when

(i) $f(x) = g(x)$,

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

(ii) $h(x) = 0.125$.

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

(d) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(e) Find $g\left(\frac{2}{x}\right)$.

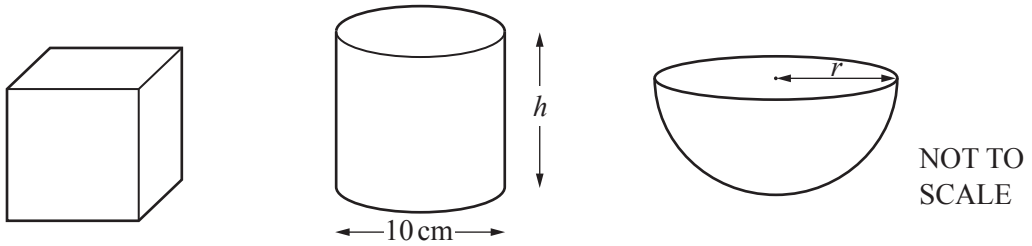
Give your answer as a single fraction in its simplest form.

..... [2]

(f) Find x when $h^{-1}(x) = 4$.

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

7 (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]

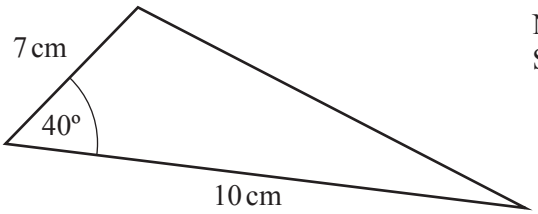
(ii) Work out the radius, r, of the hemisphere.

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

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

.....cm^2 [3]

(b)



NOT TO SCALE

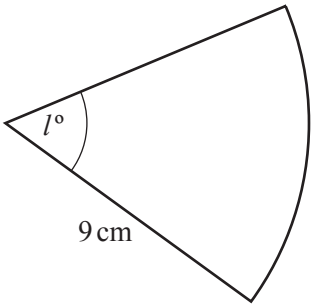
(i) Calculate the area of the triangle.

.....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 l.

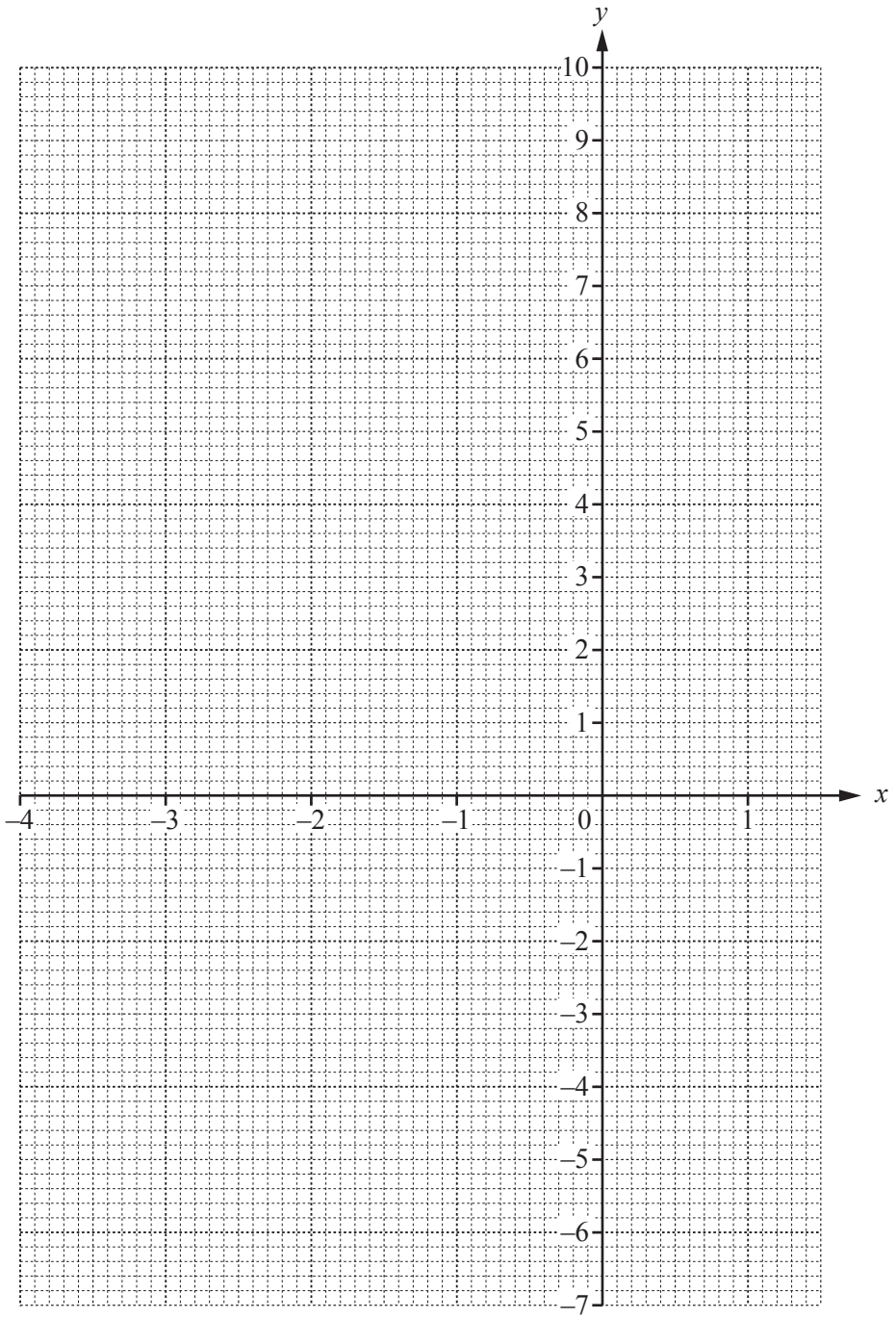
l = ... [3]

8 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]

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

(a) Find the slope 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 $y = mx + b$.

$y =$ ..... [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]

10 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 11 is printed on the next page.

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

..... [2]

(ii) Find the least 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 greatest common factor (GCF) of X and Y is 1225.
The least common multiple (LCM) of X and Y is 42 875.

Find the value of X and the value of Y.

$X =$ .....

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