Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0756949765

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/42**

Paper 4 (Extended) **May/June 2017**

2 hours 15 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical Instruments
Graphics Calculator

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.
Do not use staples, paper clips, glue or correction fluid.
You may use an HB pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Unless instructed otherwise, give your answers exactly or correct to three significant figures as appropriate.
Answers in degrees should be given to one decimal place.
For π, use your calculator value.
You must show all the relevant working to gain full marks and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 120.

This document consists of **19** printed pages and **1** blank page.

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Formula List

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

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

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

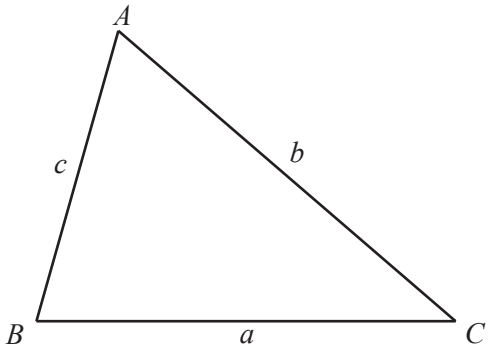
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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

Volume, V, of cylinder of radius r, height h. $\quad V = \pi r^2 h$

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. $\quad V = \frac{4}{3}\pi r^3$



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

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

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

Answer **all** the questions.

1 In 2016, Carla's salary was $23 970 per year.

(a) From her salary she pays tax at a rate of 20%.
She is paid monthly in equal amounts.

Calculate the amount Carla receives each **month** after tax has been paid.

$ ..... [3]

(b) Carla's salary of $23 970 was 2% more than her salary in 2015.

(i) Calculate her yearly salary in 2015.

$ ..... [3]

(ii) From 2016, Carla's employer agrees to pay her an increase of 3% each year.

Calculate the year in which her salary is first greater than $30 000.

..... [3]

2 **(a)** **(i)** Reflection in the line $y = x$ maps triangle A onto triangle B.

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

.....

..... [1]

(ii) Enlargement, with centre (2, 1) and scale factor 4, maps triangle C onto triangle D.

Describe fully the **single** transformation that maps triangle D onto triangle C.

.....

..... [2]

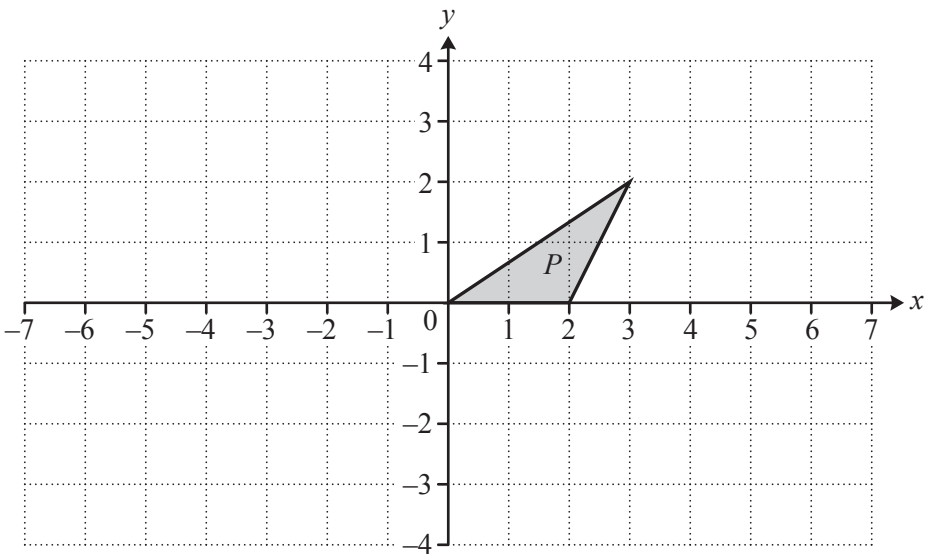
(iii) Translation by the vector $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$ maps triangle E onto triangle F.

Describe fully the **single** transformation that maps triangle F onto triangle E.

.....

..... [2]

(b)



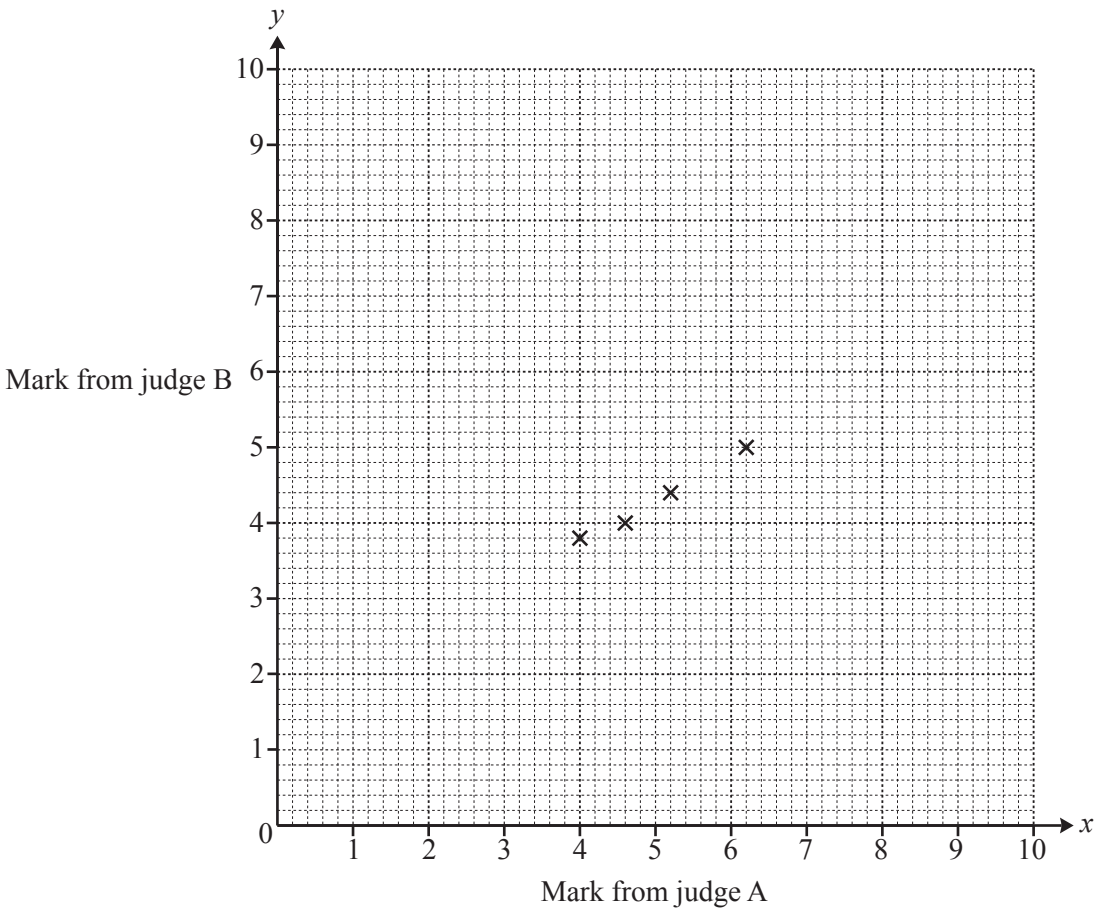
(i) Rotate triangle P through 90° anticlockwise about (0, 0).
Label the image Q. [2]

(ii) Stretch triangle P with stretch factor 2 and the y-axis invariant.
Label the image R. [2]

3 Two judges each give a mark out of ten for each dancer in a competition.
Their marks for ten dancers are shown in the table.

Mark from judge A (x)	4.0	4.6	5.2	6.2	8.8	6.8	7.0	7.4	8.0	8.6
Mark from judge B (y)	3.8	4.0	4.4	5.0	7.6	5.2	5.6	6.8	6.6	7.0

(a) Complete the scatter diagram.
The first four points have been plotted for you.



[3]

(b) What type of correlation is shown on your scatter diagram?

..... [1]

(c) **(i)** Find the equation of the regression line, in the form $y = mx + c$.

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

(ii) Judge A gives another dancer a mark of 6.4 .

Use your equation to estimate the mark judge B gives this dancer.

..... [1]

4 $\mathbf{p} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$

(a) Find

(i) the column vector $\frac{1}{2}\mathbf{p}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) the column vector $\mathbf{q} - 2\mathbf{p}$,

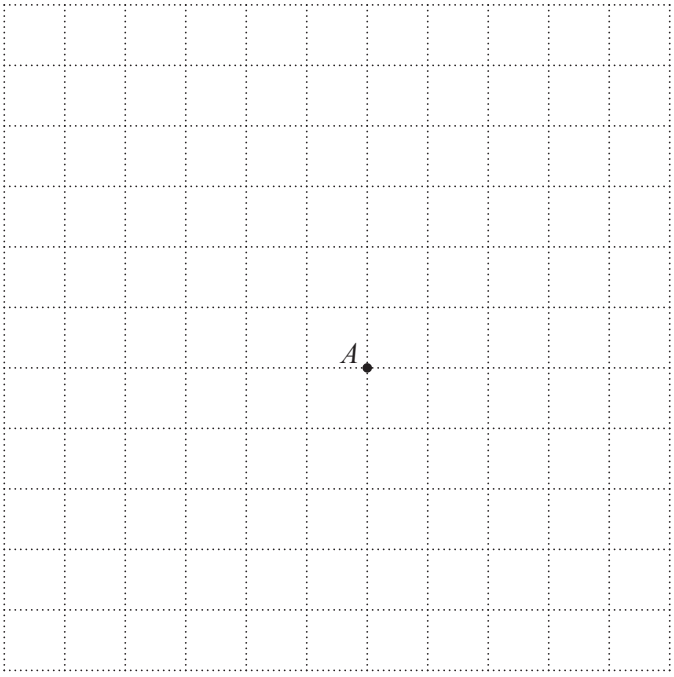
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(iii) $|\mathbf{p}|$, leaving your answer in surd form.

..... [2]

(b) $\overrightarrow{AB} = \mathbf{p} + \mathbf{q}$

Mark and label point B on the grid.



[2]

5 Nitini flies from New Delhi to Singapore for a holiday.

(a) Nitini changes 119 050 Indian rupees (INR) to Singapore dollars (SGD).
The exchange rate is 1 SGD = 47.62 INR.

Find how many Singapore dollars he receives.

..... SGD [2]

(b) The flight from New Delhi to Singapore takes 5 hours and 45 minutes.
The distance of the flight is 4150 km.

(i) The time in New Delhi when the flight leaves is 21 55.
The time in Singapore is $2\frac{1}{2}$ hours ahead of the time in New Delhi.

Find the time in Singapore when the flight arrives.

..... [2]

(ii) Find the average speed of the aircraft.

..... km/h [3]

(iii) On the return flight the average speed is 750 km/h.

Find the time of this flight in hours and minutes.

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

6 **(a)** **(i)** x is proportional to v.

Write down an expression for x in terms of v and a constant c.

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

(ii) y is proportional to v^2.

Write down an expression for y in terms of v and a constant k.

$y =$ ..... [1]

(iii) $d = x + y$

Write down an expression for d in terms of v, c and k.

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

(b) The table shows two values of v and the corresponding values of d.

v	d
12	750
20	2050

Using your answer to **part (a)(iii)**,

(i) show that $125 = 2c + 24k$,

[1]

(ii) write down a second equation connecting c and k.

..... [1]

(c) Solve the simultaneous equations in **part (b)** to find the value of c and the value of k.

c = ...

k = ... [3]

(d) Find the value of d when $v = 40$.

d = ... [2]

7 A ship sails 65 km on a bearing of 310° from A to B.
It then changes course and sails 40 km on a bearing of 250° from B to C.
The ship then returns to A.

(a) On the diagram, sketch the path of the ship from A.
On your diagram show the bearings and distances.

[3]

(b) Find angle ABC.

..... [1]

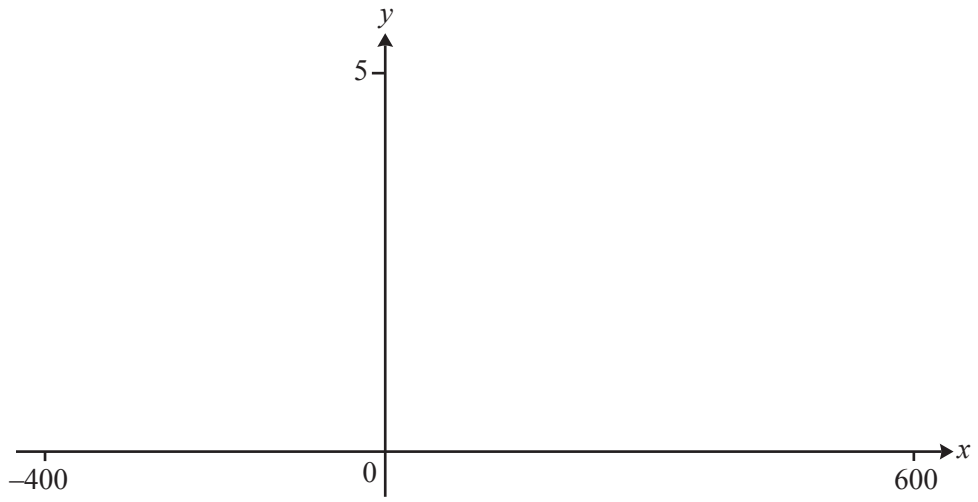
(c) Calculate AC and show that it rounds to 91.8 km, correct to the nearest tenth of a kilometre.

[3]

(d) Find the bearing of C from A.

..... [4]

8



$f(x) = 3^{\sin x}$

(a) Sketch the graph of $y = f(x)$ for $-400° \leqslant x \leqslant 600°$. [3]

(b) Find the x co-ordinates of the local maximum points of $f(x)$ for $-400° \leqslant x \leqslant 600°$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(c) The point $(30, \sqrt{3})$ is on the graph.
The point $(a, \sqrt{3})$ is also on the graph where $600° < a < 900°$.

Find the two possible values of a.

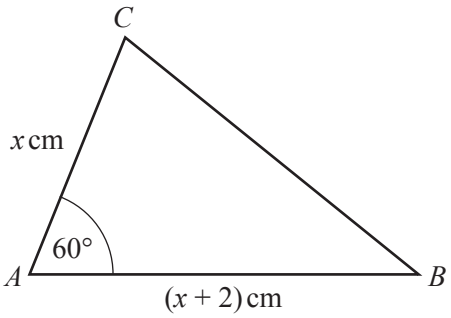
$a =$ ..... or $a =$ ..... [2]

(d) $g(x) = 3 - \frac{x}{100}$

Solve the inequality $g(x) > f(x)$.

..... [3]

9



NOT TO SCALE

In the diagram $AC = x$ cm, $AB = (x + 2)$ cm and angle $A = 60°$.

(a) (i) Find an expression, in terms of x, for the area of triangle ABC.
Give your answer in surd form.

.....cm^2 [2]

(ii) The area of triangle $ABC = 18\sqrt{3}$ cm^2.

Show that $x^2 + 2x - 72 = 0$.

[2]

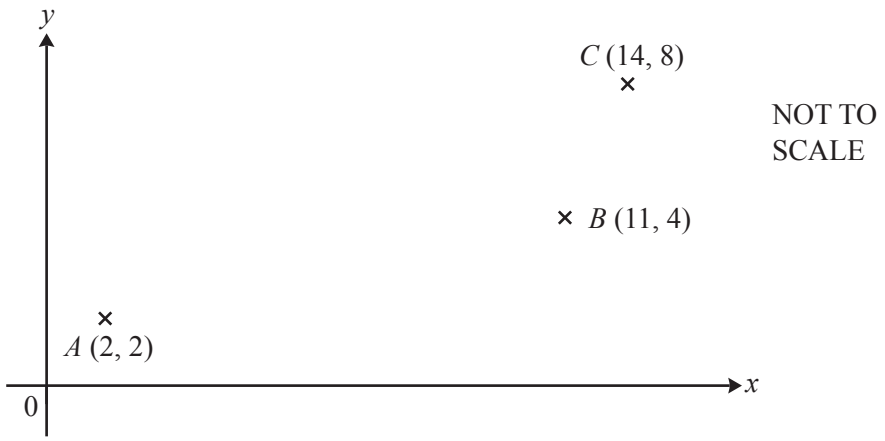
(b) (i) Solve the equation $x^2 + 2x - 72 = 0$.

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

(ii) Find the shortest distance between the line AB and the point C.

..... cm [2]

10



A is the point (2, 2), B is the point (11, 4) and C is the point (14, 8).

(a) Find the equation, in the form $y = mx + c$, of

(i) the line AC,

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

(ii) the line through B that is perpendicular to AC.

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

(b) Show that the point (10, 6) is on both the lines you found in **part (a)**.

[2]

(c) AC is the perpendicular bisector of BD.

Find the co-ordinates of D.

(..... , ...) [1]

(d) Find the **exact** area of the quadrilateral $ABCD$.

..... [4]

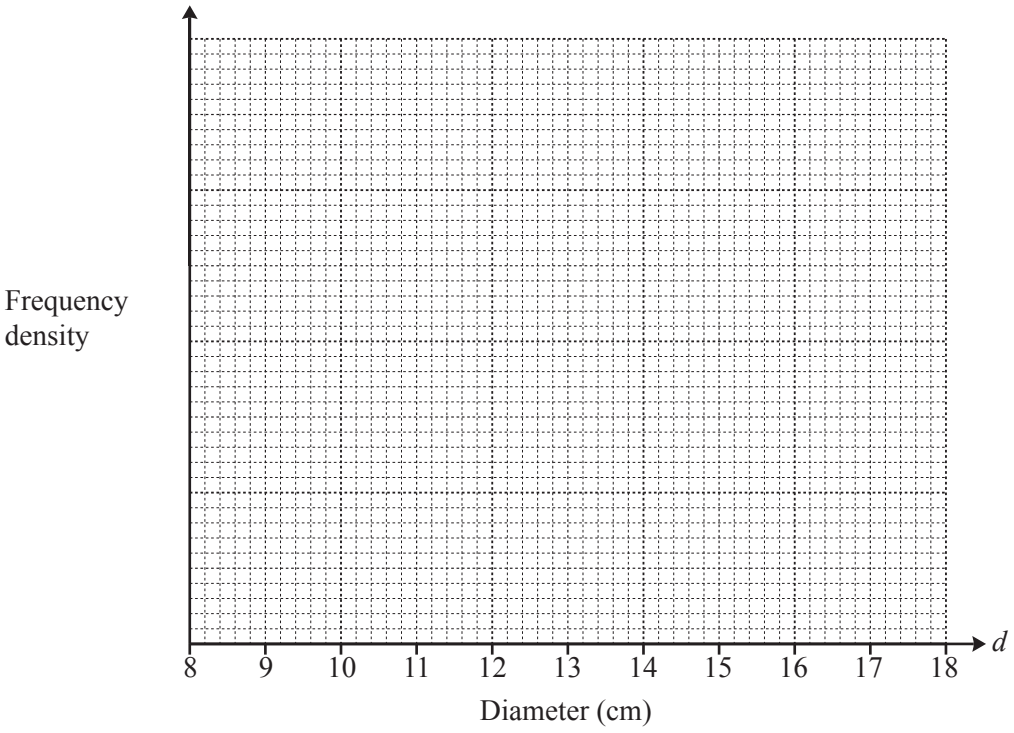
11 A farmer sorts the grapefruit he grows into sizes, according to their diameter.
The diameters, d cm, of 170 grapefruit are shown in the table.

Size	Small	Medium	Large	Very Large
Diameter (d cm)	$9 < d \leqslant 10$	$10 < d \leqslant 12$	$12 < d \leqslant 14$	$14 < d \leqslant 17$
Frequency	10	50	65	45

(a) Calculate an estimate of the mean diameter of the grapefruit.

..... cm [2]

(b) On the grid, draw a histogram to represent this information.
Complete the scale on the frequency density axis.



[4]

(c) Two of the 170 grapefruit are chosen at random.

Calculate the probability that

(i) they are both Very Large,

..... [2]

(ii) one is Small and the other is Medium.

..... [3]

12 $f(x) = 4x + 2$ $g(x) = 5 - 2x$ $h(x) = x^2 - 3$

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

..... [1]

(b) Find $f(h(2))$.

..... [2]

(c) Find x when $f(x) = -10$.

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

(d) Write down the range of $h(x)$.

..... [1]

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

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

(f) $k(x) = 10 - 4x$

Describe fully the **single** transformation that maps the graph of $y = g(x)$ onto the graph of $y = k(x)$.

.....

..... [3]

(g) The graph of $y = h(x)$ is translated by the vector $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$.

Find the equation of the graph of the image.
Write your answer in the form $y = ax^2 + bx + c$.

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

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