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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **October/November 2024**

2 hours 15 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use your calculator value.

INFORMATION

- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages.

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Formula List

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

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

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

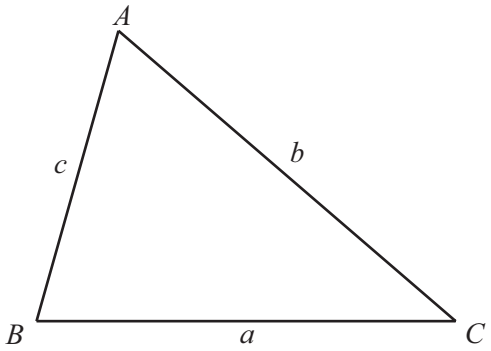
Curved surface area, A, of sphere of radius r. $A = 4\pi r^2$

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

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

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

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



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

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

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

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Answer **all** the questions.

1 **(a)** Solve the equations.

(i) $6x + 5 = -19$

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

(ii) $8x - 13 = 11 - 4x$

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

(iii) $\frac{8}{2x-3} = -5$

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

(b) Solve the equation $6x^2 - 2x - 1 = 0$.

Give your answers correct to 2 decimal places.
You must show all your working.

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

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2 **(a)** Younous wants to calculate $\frac{78.8}{2.46^2}+\frac{153+9.81^2}{\sqrt{9.47}}$.

(i) He finds an estimate for the answer by rounding each number correct to 1 significant figure.

Find this estimate.
You must show all your working.

..... [2]

(ii) Explain why his answer to **part (i)** is greater than the actual answer.

.....

..... [1]

(iii) Work out.

$$\frac{78.8}{2.46^2}+\frac{153+9.81^2}{\sqrt{9.47}}$$

..... [1]

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(b) Work out $3\frac{1}{4} \times \frac{8}{39}$.

..... [1]

(c) **(i)** Write 506 grams in kilograms.

..... kg [1]

(ii) Write 2000 m^2 in km^2.

..... km^2 [1]

(d) An athlete runs 20 km in 100 minutes and then walks at 8 km/h for 50 minutes.

Find the athlete's average speed in km/h.

..... km/h [3]

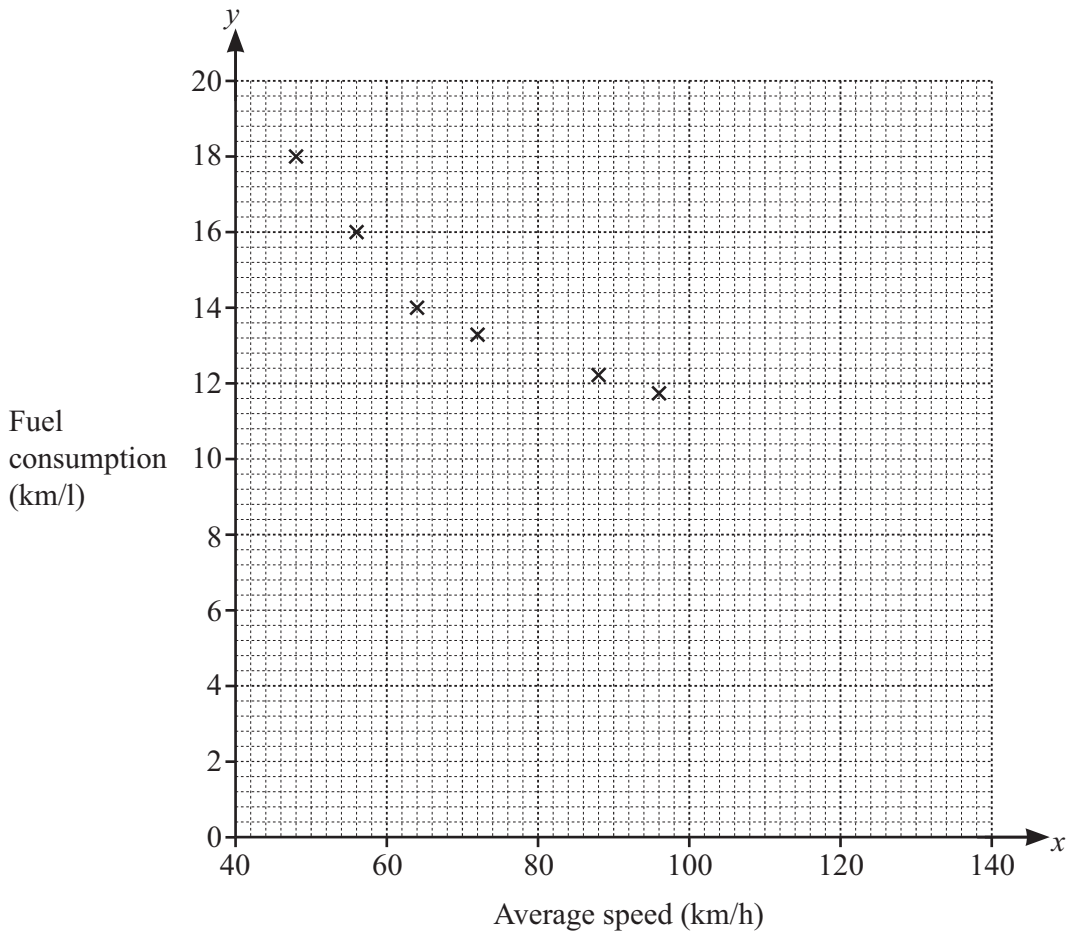
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3 Paulo compares the fuel consumption of his car and the average speed of his car for ten journeys.

The results are shown in the table.

Average speed (x kilometres per hour)	48	56	64	72	88	96	104	120	128	136
Fuel consumption (y kilometres per litre)	18	16	14	13.3	12.2	11.8	11.4	9.2	8	7

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



[2]

(ii) What type of correlation is shown by the scatter diagram?

..... [1]

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(b) Find the mean fuel consumption.

..... km/l [1]

(c) **(i)** Find the equation of the regression line for y in terms of x.

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

(ii) Use your regression line to estimate the fuel consumption when the average speed is 80 km/h.

..... km/l [1]

(iii) Paulo drives his next journey at an average speed of 30 km/h.

Give a reason why the regression line is unlikely to give a reliable estimate of the fuel consumption for this journey.

..... [1]

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4 **(a)** Alan, Beth and Imran share an amount of money in the ratio $3x : 2x : (x+1)$ where x is an integer.

(i) Find the amount Beth receives when $x = 4$ and they share \$400 in total.

\$ ..... [3]

(ii) Find the amount that Alan receives when Beth receives \$66.

\$ ..... [2]

(iii) Find the value of x when Alan receives 2.5 times the amount Imran receives.

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

(b) In a sale, a shop reduces the price of all furniture by 12%.

(i) Find the sale price of a chair that has an original price of \$90.

\$ ..... [2]

(ii) Find the original price of a table that has a sale price of \$440.

\$ ..... [2]

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(c) Kurt invests $\$X$ in a bank which pays simple interest at a rate of 4% each year.
The total amount of money that Kurt has in the bank at the end of 6 years is \$930.

Show that $X = 750$.

[2]

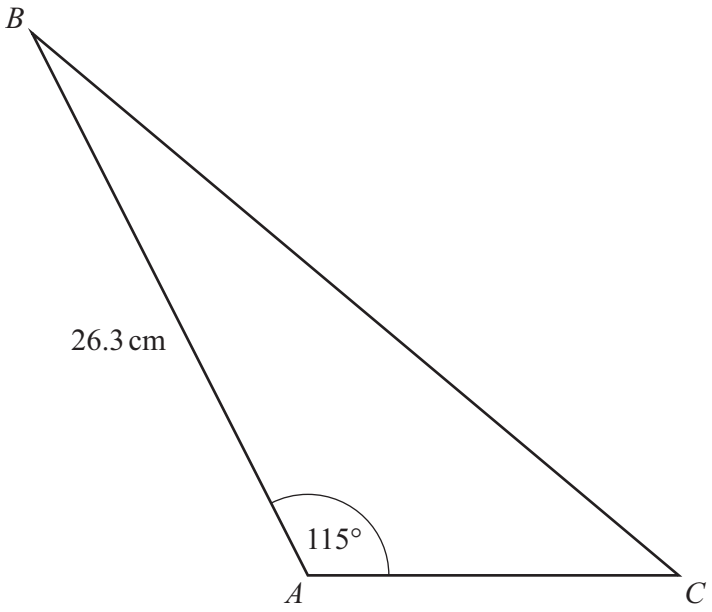
(d) Ivana invests \$750 in a bank which pays compound interest at a rate of y% each year.
The total amount of money that Ivana has in the bank at the end of 6 years is \$921.94 .

Find the value of y.

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

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The area of triangle ABC is $262\,\text{cm}^2$.

(a) Show that $AC = 22.0\,\text{cm}$, correct to 1 decimal place.

[2]

(b) Find BC.

$BC =$ ..... cm [3]

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(c) Use the sine rule to find angle ABC.

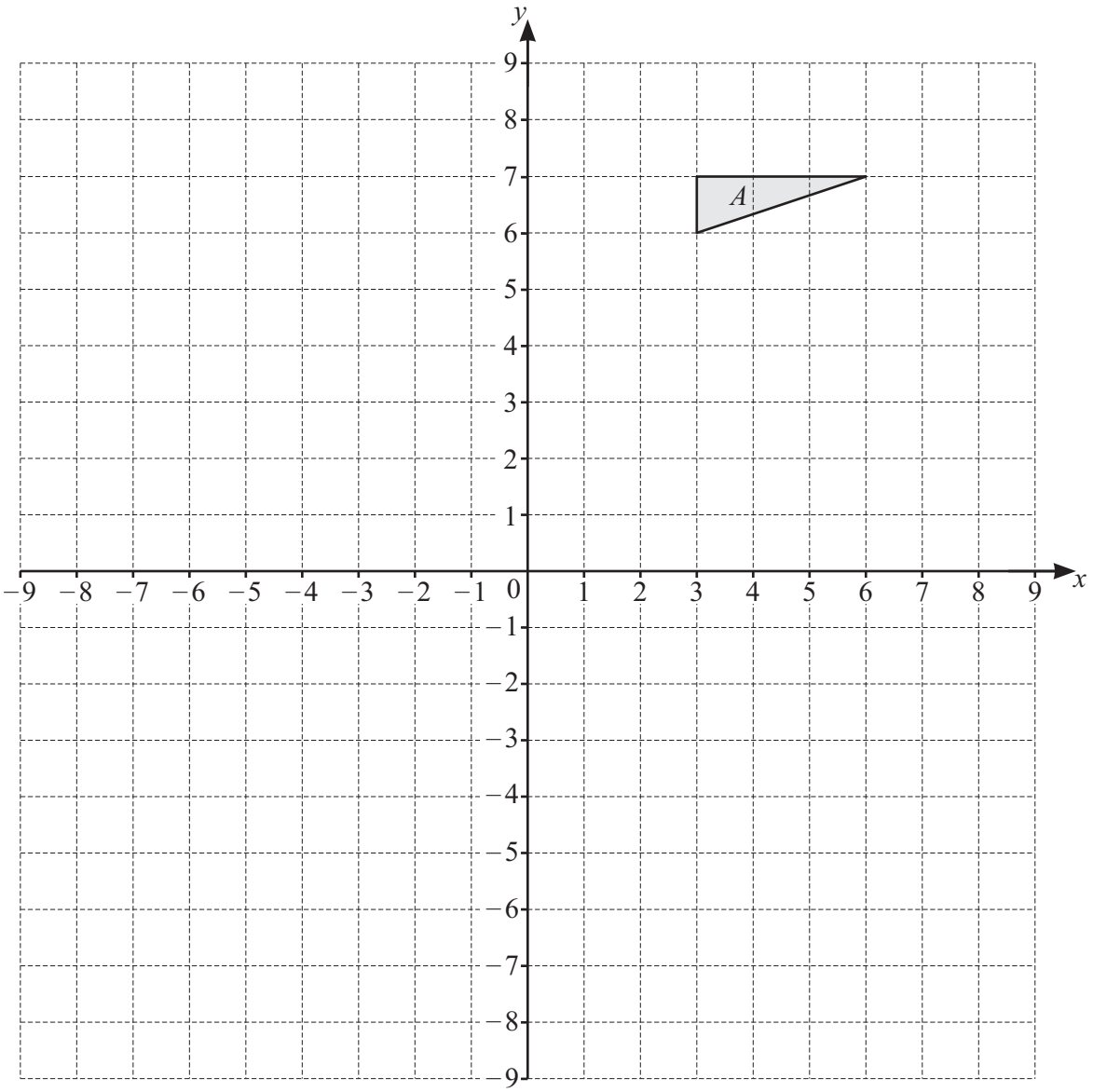
Angle ABC = ... [3]

(d) Find the length of the perpendicular line from A to the line BC.

..... cm [2]

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6 (a)



(i) Draw the image of triangle A after a reflection in the line $y = -x$.
Label the image B. [2]

(ii) Draw the image of **triangle *B*** after a reflection in the y-axis.
Label the image C. [1]

(iii) Describe fully the **single** transformation that maps **triangle *C*** onto **triangle *A***.

.....

..... [3]

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(b) The transformation P is a translation with vector $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

The transformation Q is a stretch, factor 3 with invariant line $y = 2$.

(i) Describe the transformation that is the inverse of P.

..... [2]

(ii) Describe the transformation that is the inverse of Q.

..... [2]

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7 **(a)** There are 49 students in a year group.

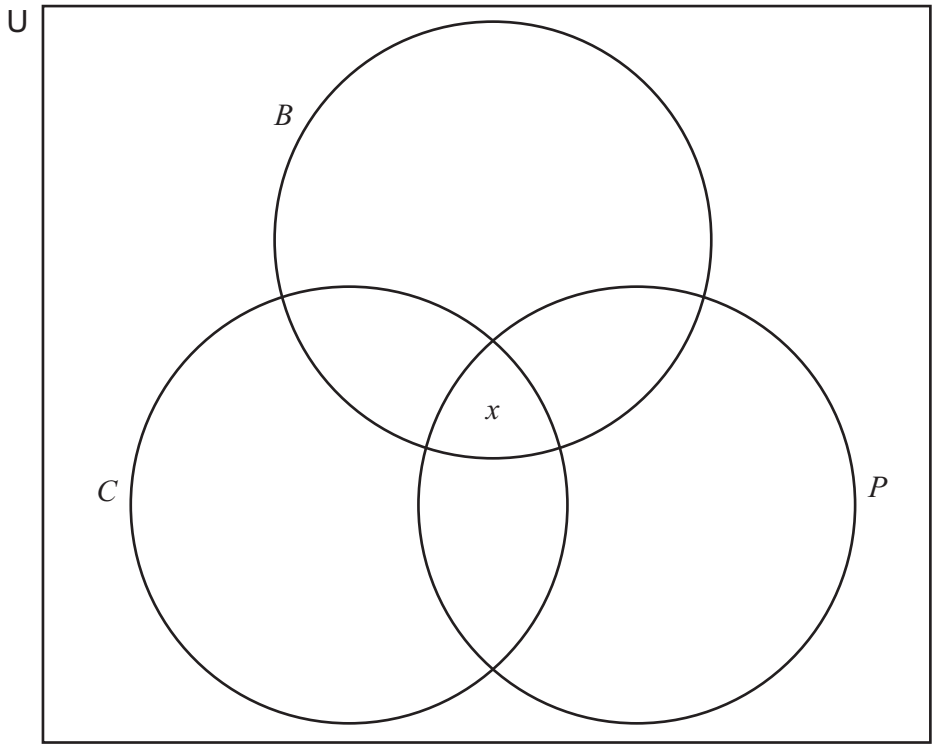
Each student studies at least one of the sciences, biology (B), chemistry (C) and physics (P).

x students study all 3 sciences.
y students study chemistry only.
12 students study physics only.

6 students study biology and chemistry but not physics.
11 students study biology and physics but not chemistry.
2 students study physics and chemistry but not biology.

25 students study only one science.

(i) Show this information on the Venn diagram.



[2]

(ii) Find the number of students who study all 3 sciences.

..... [2]

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(iii) The number of students that study biology is two times the number of students that study chemistry.

Find the number of students who study

(a) chemistry only

..... [2]

(b) biology only.

..... [1]

(b) A bag contains 7 red balls and 3 blue balls.
In an experiment, three balls are chosen at random without replacement.

Find the probability that at least two of the balls chosen are red.

..... [4]

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8 Find the next term and the nth term in each of the following sequences.

(a) 16, 9, 2, −5, −12, …

next term = ...

nth term = ... [3]

(b) 2, 8, 18, 32, 50, …

next term = ...

nth term = ... [3]

(c) 1, −3, 5, −7, 9, …

next term = ...

nth term = ... [3]

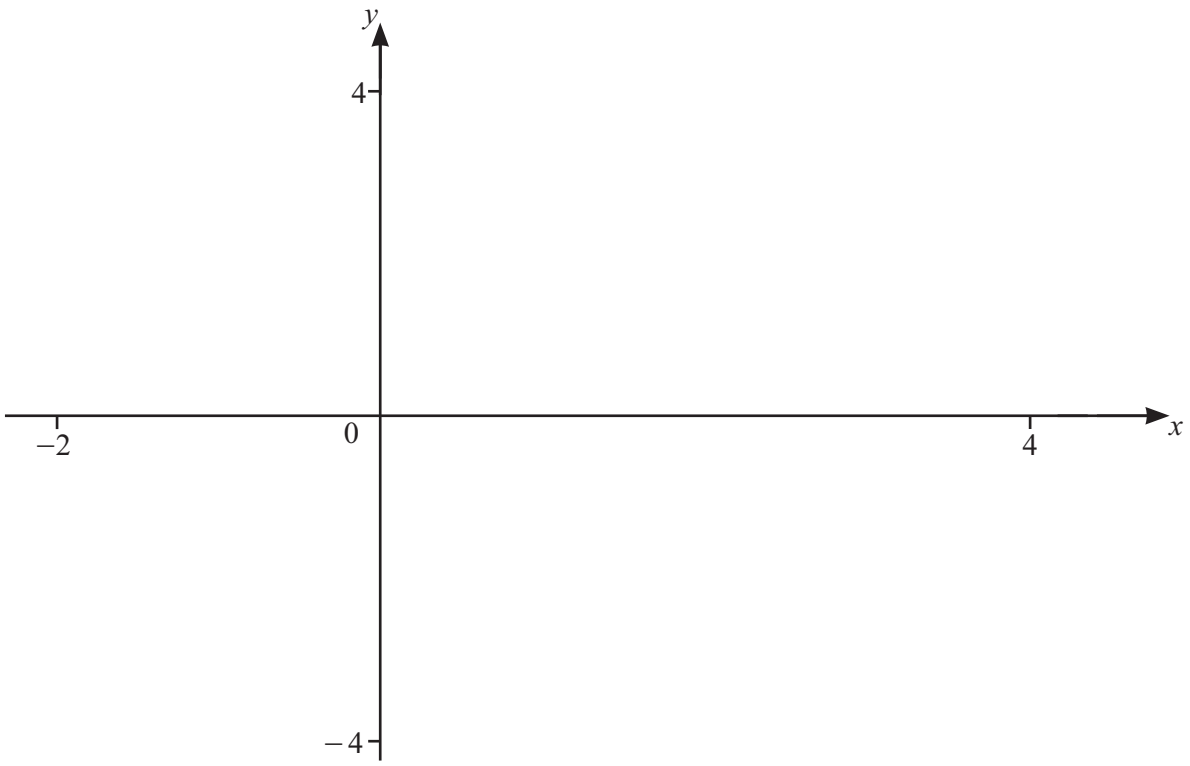
(d) 6, 9, 10, 9, 6, …

next term = ...

nth term = ... [3]

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$$f(x) = \frac{1}{(2x-3)(2x+1)}$$

(a) On the diagram, sketch the graph of $y = f(x)$ for values of x between -2 and 4. [3]

(b) Write down the equations of the asymptotes parallel to the y-axis.

..... [2]

(c) Write down the coordinates of the local maximum.

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

(d) The line $y = x - 2$ intersects the curve $y = f(x)$ three times.

Find the x-coordinate of each point of intersection.

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

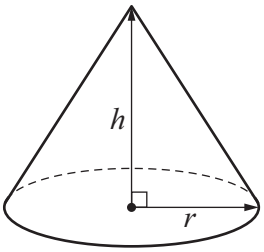
(e) Solve the inequality $f(x) \geqslant x - 2$.

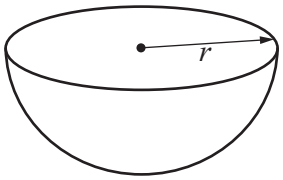
..... [3]

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10 In this question all lengths are in centimetres.

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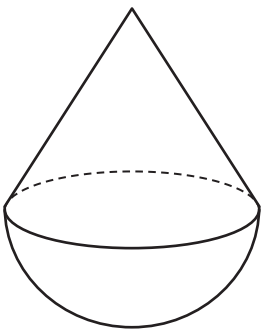
A solid cone has radius r and vertical height h.
A solid hemisphere also has radius r.
The curved surface area of the cone is the same as the curved surface area of the hemisphere.

(a) Show that $h = r\sqrt{3}$.

[4]

(b) The cone is placed directly on top of the hemisphere.

Show that the volume of this solid is $\frac{1}{3}\pi r^3(2+\sqrt{3})$.



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[2]

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(c) A larger solid is mathematically similar to the solid in **part (b)**.

The larger solid has volume $243\pi r^3(2+\sqrt{3})$.

(i) Find, in terms of r, the radius of the hemisphere of the larger solid.

..... [2]

(ii) The surface area of the larger solid is $5000\ \text{cm}^2$.

Find the volume of this solid.

..... cm^3 [4]

Question 11 is printed on the next page.

11 **(a)** Solve the equation.

$$2\log 5 - 5\log 2 = 3\log 4 - 2\log x$$

Give your answer in the form $\frac{a\sqrt{b}}{c}$, where a, b and c are integers.

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

(b) Make x the subject of the formula.

$$y = \sqrt{\frac{x}{2x+1}}$$

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

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