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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/42**

Paper 4 (Extended) **October/November 2023**

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. Any blank pages are indicated.

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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. $\quad A = \pi rl$

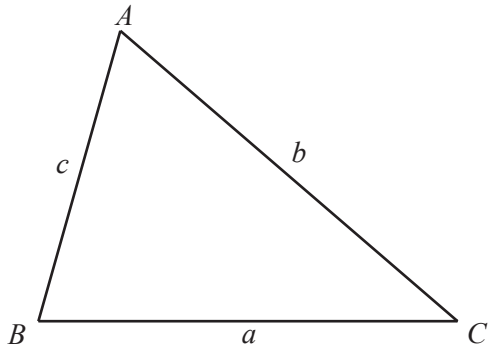
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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



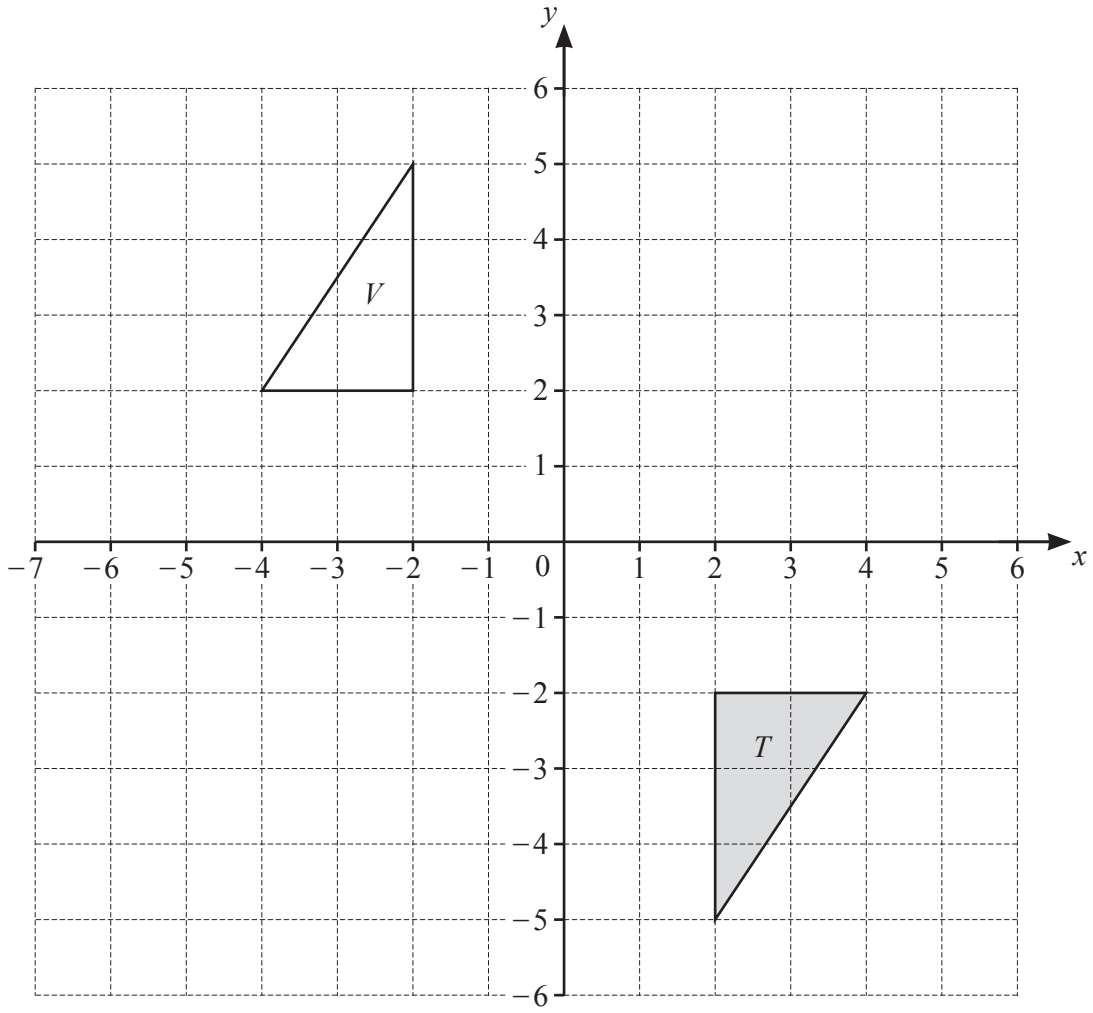
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1



(a) Reflect triangle T in the line $x = -1$. Label the image A. [2]

(b) Translate triangle T using the vector $\begin{pmatrix} 1 \\ 4 \end{pmatrix}$. Label the image B. [2]

(c) Describe fully the **single** transformation that maps triangle T onto triangle V.

.....

..... [3]

(d) Stretch **triangle V** with factor $\frac{1}{2}$ and invariant line $x = 2$. Label the image C. [2]

2 $f(x) = 2x + 4$ $g(x) = x - 1$ $h(x) = x^2 - 3x$

(a) Find

(i) $f(3)$

..... [1]

(ii) $h(7)$.

..... [1]

(b) Find the value of x when $g(x) = -6$.

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

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

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

(d) Simplify $f(x) \times g(x) + 1$.

..... [2]

(e) Solve $h(g(x)) = 0$.

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

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3 y is inversely proportional to the square of $(x+1)$.

(a) When $x = 5,\ y = 1$.

Find y in terms of x.

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

(b) Find y when $x = 3$.

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

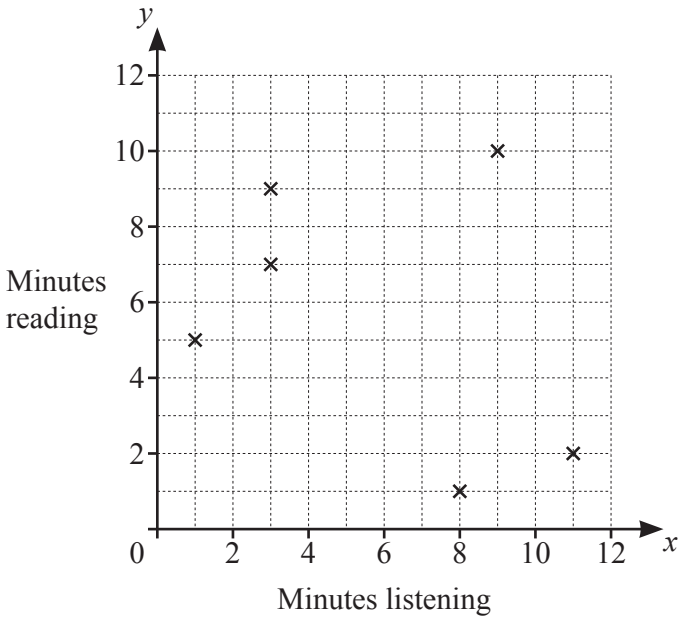
(c) Find the value of x when $y = (x+1)$.

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

4 **(a)** A group of 10 people were asked the time, correct to the nearest minute, they each spent listening to the news and reading the news on Monday.
The results are shown in the table.

Minutes listening (x)	1	9	3	3	11	8	2	7	1	4
Minutes reading (y)	5	10	9	7	2	1	3	6	11	5

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



[2]

(ii) Find the median time spent reading the news on Monday.

..... min [1]

(iii) Find the equation of the line of regression.
Give your answer in the form $y = mx + c$.

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

(iv) On Tuesday, each person spends the same time listening to the news as they did on Monday.
They each spend 5 minutes longer reading the news than they did on Monday.

Write down the equation of the line of regression for Tuesday.

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

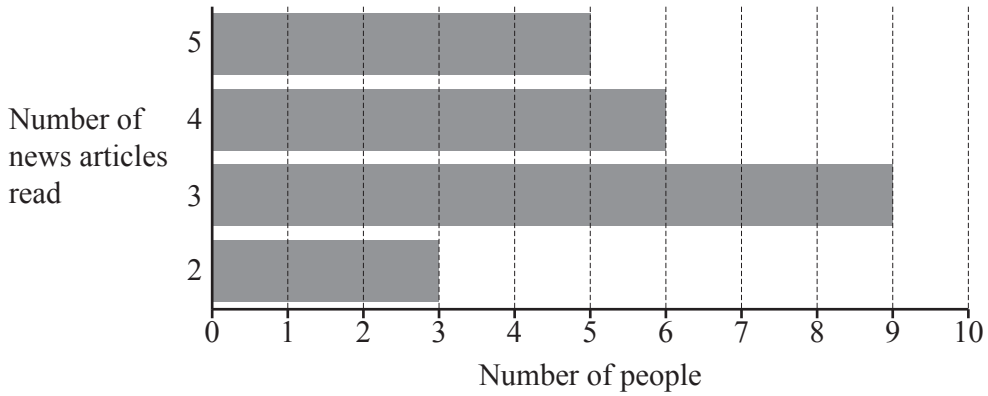
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(b) In February Sancho read the news for a total of 8 hours.
This was a reduction of 36% from January.

Work out how long Sancho read the news in January.

..... hours [2]

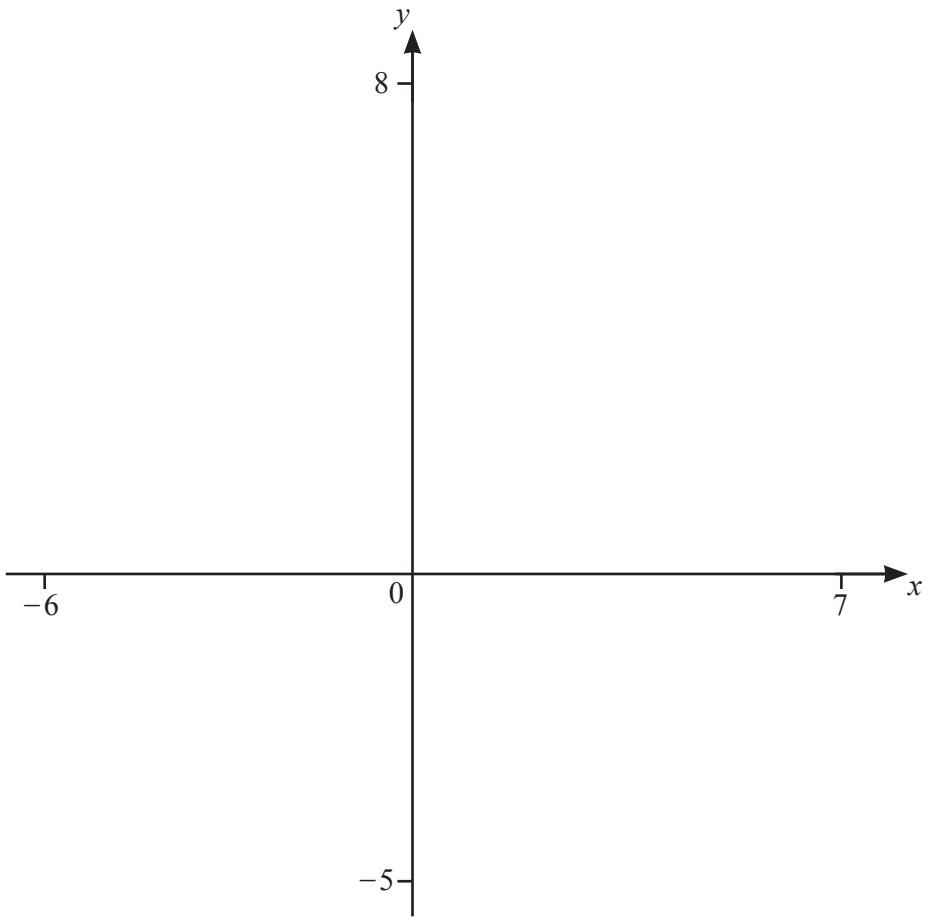
(c) The bar chart shows the number of news articles read one day by each of 23 people.



Calculate the mean number of articles read.

..... [2]

5 (a)



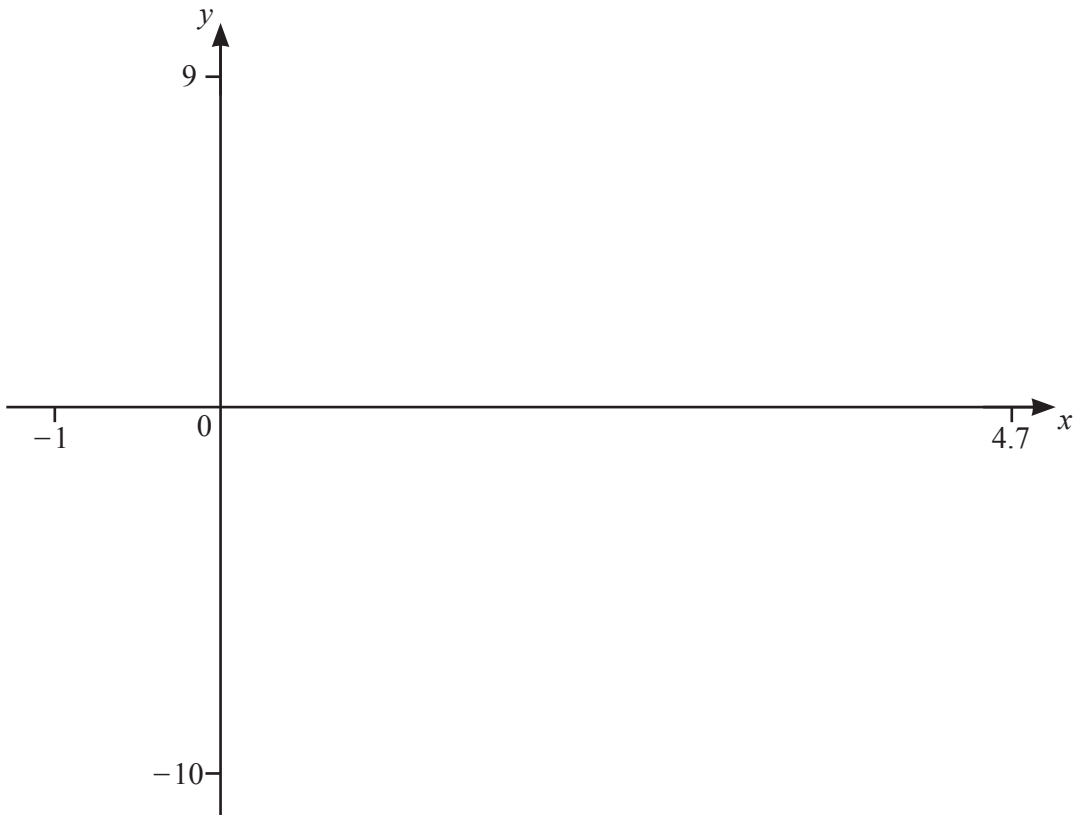
(i) On the diagram sketch the lines $y = -\frac{1}{2}x + 3$, $2y = x + 5$ and $y = x$ for $-6 \leqslant x \leqslant 7$. [4]

(ii) Show, by shading, the region that satisfies these inequalities.

$y > -\frac{1}{2}x + 3$ $\quad 2y < x + 5$ $\quad y > x$ [2]

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(b)



$f(x) = (x-2)^3 - 5x + 12$ for $-1 \leqslant x \leqslant 4.7$

(i) On the diagram, sketch the graph of $y = f(x)$. [2]

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

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

(iii) The equation $(x-2)^3 - 5x + 12 = k$ has exactly 2 solutions.

Find the values of k.

$k =$ ..... or $k =$ ..... [2]

(iv) $g(x) = -(x-1)^2$ for $-1 \leqslant x \leqslant 4.7$

On the diagram, sketch the graph of $y = g(x)$. [2]

(v) Solve $f(x) = g(x)$.

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

6 **(a)** **(i)** Kayla walks from A to B on a bearing of 105°.
She then walks back to A.

Calculate the bearing Kayla walks from B to A.

..... [2]

(ii) The distance from A to B is 1.5 km.

(a) It takes Kayla 24 minutes to walk from A to B.

Calculate her average speed in km/h.

..... km/h [2]

(b) Kayla has a map with a scale of 1 : 25 000 showing A and B.

Work out the length of AB on the map.
Give your answer in centimetres.

..... cm [2]

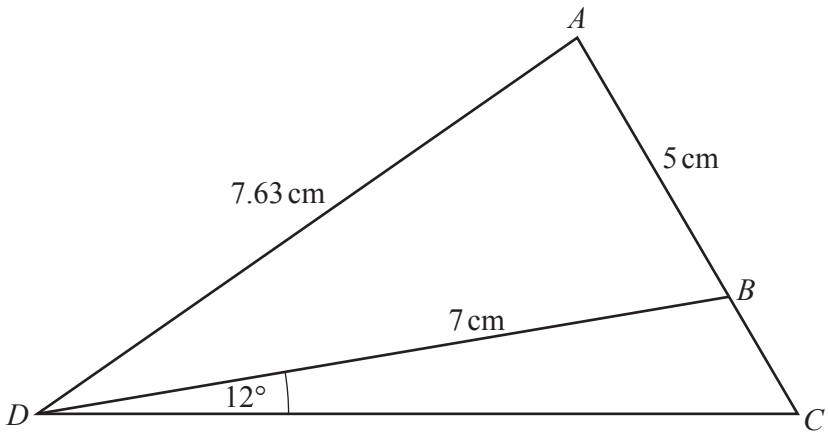
(b) A train is 770 m long.
The train takes 2 minutes and 36 seconds to travel completely through a tunnel.
Its speed through the tunnel is 120 km/h.

Work out the length of the tunnel.
Give your answer in metres.

..... m [4]

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7



NOT TO SCALE

In triangle ACD, $AB = 5\,\text{cm}$, $AD = 7.63\,\text{cm}$ and $BD = 7\,\text{cm}$.
Angle $BDC = 12°$.

(a) Show that angle $ABD = 77.0°$ correct to 1 decimal place.

[3]

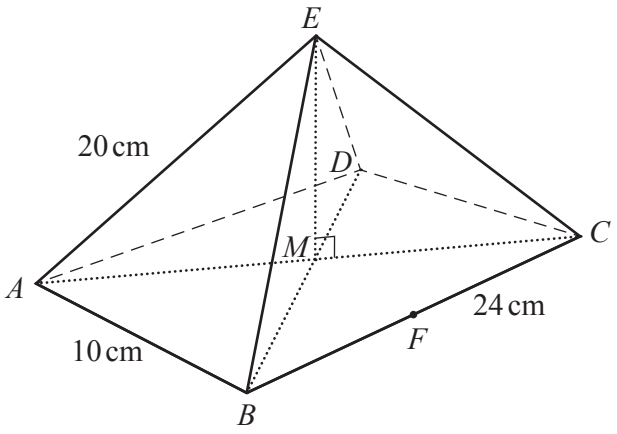
(b) Calculate the area of triangle ABD.

..... cm^2 [2]

(c) Calculate BC.

..... cm [4]

8 (a)



NOT TO SCALE

ABCDE is a pyramid with a rectangular base.
$AB = 10$ cm and $BC = 24$ cm.
The length of each sloping edge is 20 cm.
Vertex E is vertically above the centre of the base, M.

(i) Calculate the length AC.

..... cm [2]

(ii) Calculate EM, the height of the pyramid.

..... cm [3]

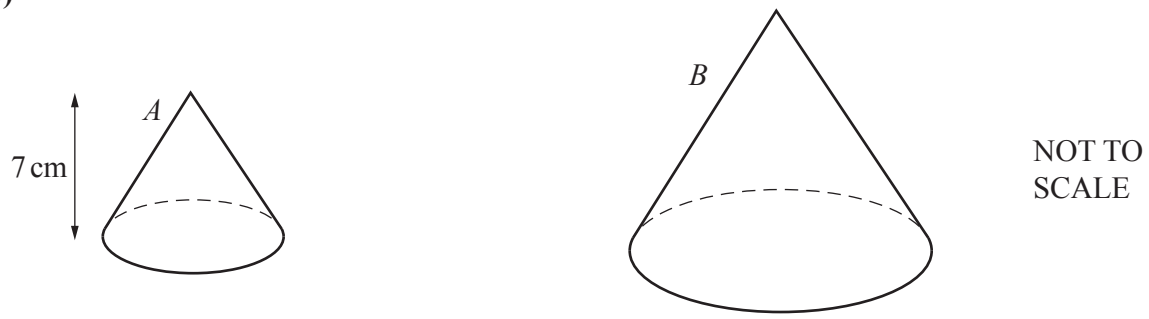
(iii) F is the mid-point of BC.

Find the angle between EF and the base of the pyramid.

..... [3]

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(b)



NOT TO SCALE

Cone A is mathematically similar to cone B.
The height of cone A is 7 cm and its volume is $66\,cm^3$.
The volume of cone B is $222.75\,cm^3$.

(i) Find the height of cone B.

..... cm [3]

(ii) A sphere also has volume $66\,cm^3$.

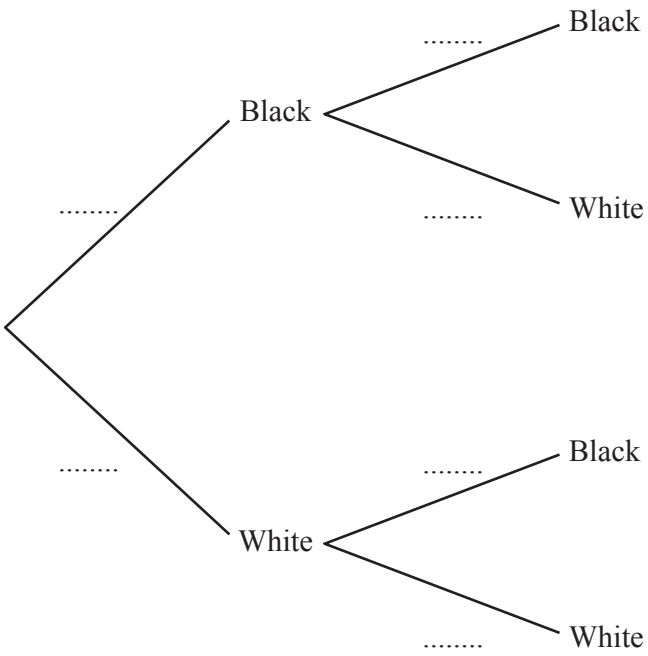
Calculate the radius of the sphere.

..... cm [2]

9 **(a)** A bag contains 3 black discs and 5 white discs.

Jani takes a disc from the bag at random.
When the disc is black, he does not replace it.
When the disc is white, he replaces it in the bag.
Jani then takes a second disc at random.

(i) Complete the tree diagram for the first and second discs.



[3]

(ii) Jani takes a third disc from the bag at random.

Find the probability that he takes 2 black discs and 1 white disc.

..... [4]

(b) Another bag contains 10 discs.
x are red and the rest are green.

(i) Write down an expression for the number of green discs.

..... [1]

(ii) y blue discs are added to the bag.
A disc is taken from the bag at random.

(a) The probability of taking a red disc from the bag is $\frac{1}{3}$.

Show that $3x = 10 + y$.

[1]

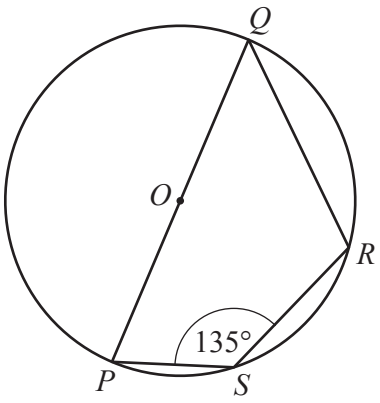
(b) The probability of taking a green disc is $\frac{2}{9}$.

Write another equation in x and y and find the number of red discs and the number of blue discs.

number of red discs, $x =$ .....

number of blue discs, $y =$ ..... [5]

10 (a)



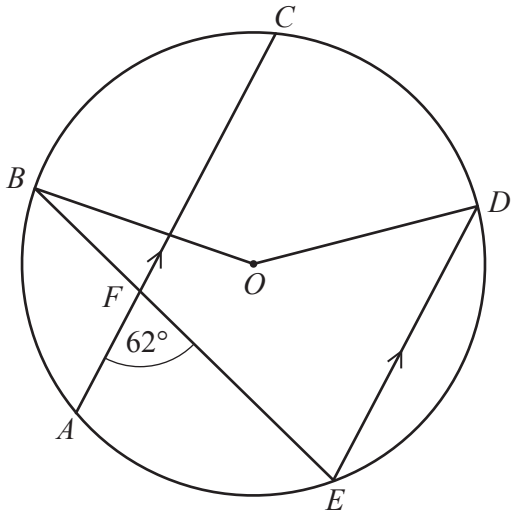
NOT TO SCALE

P, *Q*, *R* and *S* are points on the circle centre *O*.

Find angle *PQR*.

Angle *PQR* = ... [1]

(b)



NOT TO SCALE

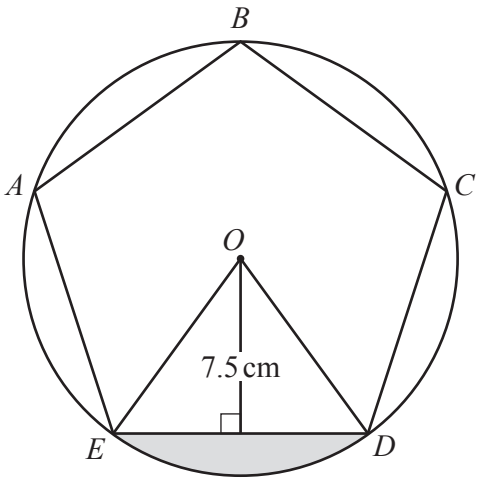
A, *B*, *C*, *D* and *E* are points on the circle centre *O*.
AC is parallel to *ED*.

Find the obtuse angle *BOD*.

Angle *BOD* = ... [2]

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(c)



NOT TO SCALE

ABCDE is a regular pentagon.
A, *B*, *C*, *D* and *E* are points on the circle centre *O*.
The length of the perpendicular from *O* to *ED* is 7.5 cm.

(i) Show that the length of one side of the pentagon is 10.9 cm correct to 3 significant figures.

[4]

(ii) Calculate the shaded area.

..... cm^2 [4]

11 **(a)** Simplify fully $(64x^6y^3)^{\frac{2}{3}}$.

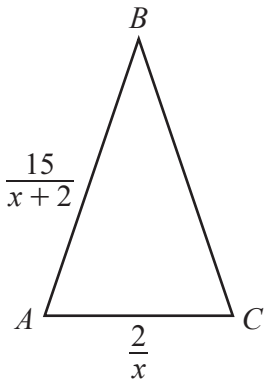
..... [3]

(b) $3^x \times 2^x = 279\,936$

Find the value of x.

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

(c)



NOT TO SCALE

In triangle ABC, $AB = BC$.
The perimeter of triangle ABC is 16 cm.

(i) Show that $4x^2 - 1 = 0$.

[5]

(ii) Find the length of AB.

$AB =$ ..... cm [2]

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