Please check the examination details below before entering your candidate information

| Candidate surname | Other names |
|---|---|
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Pearson Edexcel International GCSE

| Centre Number | Candidate Number |
|---|---|
| | |

# Tuesday 7 January 2020

Morning (Time: 2 hours) | Paper Reference **4MA1/1HR**

# Mathematics A
## Paper 1HR
## Higher Tier

**You must have:**
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
  Anything you write on the formulae page will gain NO credit.

## Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

## Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

*Turn over*

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Pearson

## International GCSE Mathematics

## Formulae sheet – Higher Tier

**Arithmetic series**

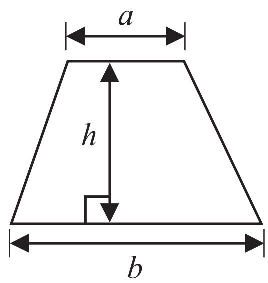
Sum to $n$ terms, $S_n = \frac{n}{2}[2a + (n - 1)d]$

**The quadratic equation**

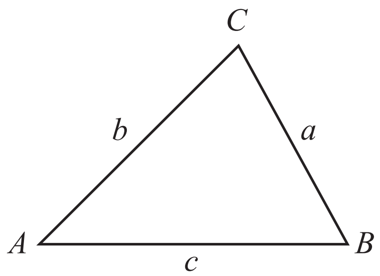
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**Area of trapezium** $= \frac{1}{2}(a + b)h$




**Trigonometry**




**In any triangle** $ABC$

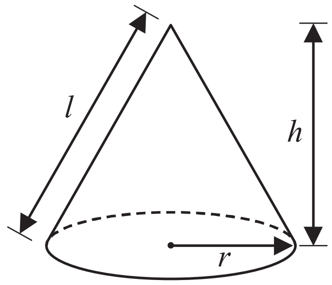
**Sine Rule** $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

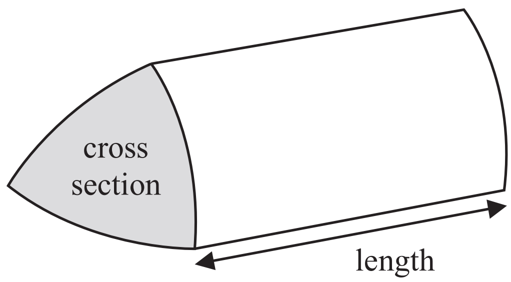
**Area of triangle** $= \frac{1}{2}ab\sin C$

**Volume of cone** $= \frac{1}{3}\pi r^2 h$

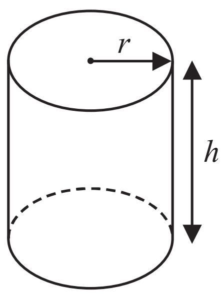
**Curved surface area of cone** $= \pi rl$




**Volume of prism**
= area of cross section × length

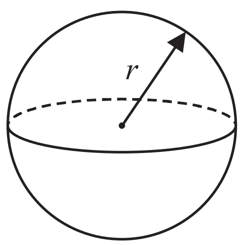



**Volume of cylinder** $= \pi r^2 h$
**Curved surface area of cylinder** $= 2\pi rh$




**Volume of sphere** $= \frac{4}{3}\pi r^3$

**Surface area of sphere** $= 4\pi r^2$



**Answer ALL TWENTY THREE questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

**1** Brendon, Asha and Julie share some money in the ratios 3 : 2 : 6
The **total** amount of money that Asha and Julie receive is \$36

Work out the amount of money that Brendon receives.

\$.......................................................

**(Total for Question 1 is 3 marks)**

---

**2** Show that $3\frac{1}{5} \times 2\frac{5}{8} = 8\frac{2}{5}$

**(Total for Question 2 is 3 marks)**

**3** (a) Make $a$ the subject of $d = g + 2ac$

..............................................................
**(2)**

(b) Factorise fully $9ef - 12f$

..............................................................
**(2)**

(c) Expand and simplify $(x + 2)(x - 5)$

..............................................................
**(2)**

(d) Simplify fully $\dfrac{n^4 \times n^7}{n^5}$

..............................................................
**(2)**

**(Total for Question 3 is 8 marks)**

**4** $B = \{b, l, u, e\}$

$G = \{g, r, e, y\}$

$W = \{w, h, i, t, e\}$

(a) List all the members of the set

(i) $B \cup G$

..........................................

(ii) $W \cap G'$

..........................................

**(2)**

Serena writes down the statement $B \cap G \cap W = \varnothing$

(b) Is Serena's statement correct?
You must give a reason for your answer.

..........................................

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..........................................

**(1)**

**(Total for Question 4 is 3 marks)**

**5** The diagram shows Yuen's garden.

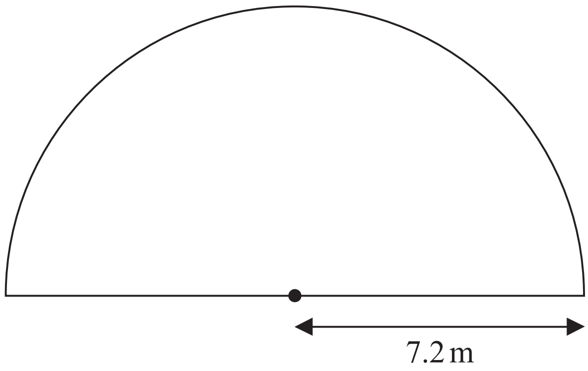



Diagram **NOT** accurately drawn

The garden is in the shape of a semicircle of radius 7.2 m.
Yuen is going to cover his garden with grass seed.

Yuen has 12 boxes of grass seed.
Each box of grass seed contains enough seed to cover $6\,m^2$ of the garden.

Has Yuen enough grass seed for his garden?
Show your working clearly.

**(Total for Question 5 is 3 marks)**

**6** Solve $x^2 - 5x - 36 = 0$
Show clear algebraic working.

..........................................................

**(Total for Question 6 is 3 marks)**

**7** In a sale, the normal price of a hat is reduced by 15%
The sale price of the hat is 20.40 euros.

Work out the normal price of the hat.

.......................................................... euros

**(Total for Question 7 is 3 marks)**

**8** 5 children are playing on a trampoline.
The mean weight of the 5 children is 28 kg.

2 of the children get off the trampoline.
The mean weight of these 2 children is 26.5 kg.

Work out the mean weight of the 3 children who remain on the trampoline.

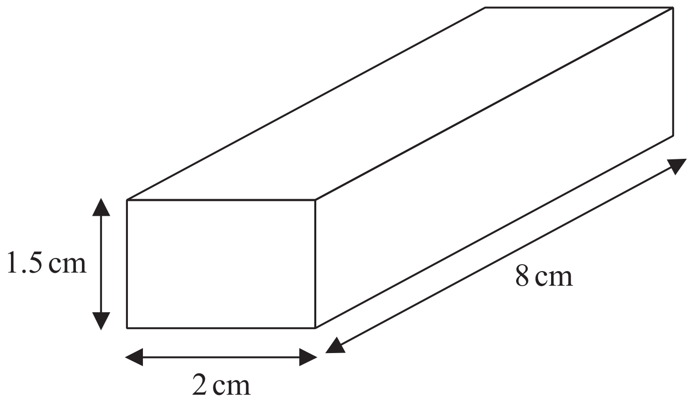
.......................................................... kg

**(Total for Question 8 is 3 marks)**

**9** Pablo made a solid gold statue.

He melted down some gold blocks and used the gold to make the statue.
Each block of gold was a cuboid, as shown below.

Diagram **NOT** accurately drawn




The mass of the statue is 5.73 kg.
The density of gold is 19.32 g/cm$^3$

Work out the least number of gold blocks Pablo melted down in order to make the statue.
Show your working clearly.

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**(Total for Question 9 is 5 marks)**

**10** The diagram shows a regular hexagon, $ABCDEF$, and an isosceles triangle, $GHJ$.

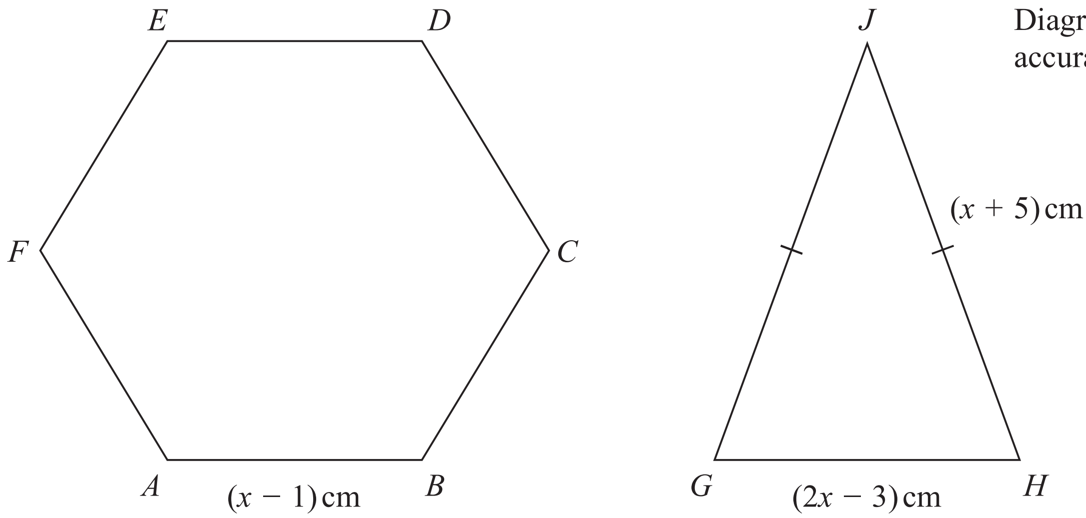



Diagram **NOT** accurately drawn

The perimeter of the hexagon is equal to the perimeter of the triangle.

Find the length of each side of the hexagon.
Show clear algebraic working.

.......................................................... cm

**(Total for Question 10 is 5 marks)**

**11** The weight of a cat is 4.3 kg correct to 2 significant figures.

(a) Write down the upper bound of the weight of the cat.

........................................................ kg
**(1)**

(b) Write down the lower bound of the weight of the cat.

........................................................ kg
**(1)**

$G = e - f$

$e$ = 17 correct to the nearest integer
$f$ = 9.4 correct to one decimal place

(c) Work out the upper bound for the value of $G$.

........................................................
**(2)**

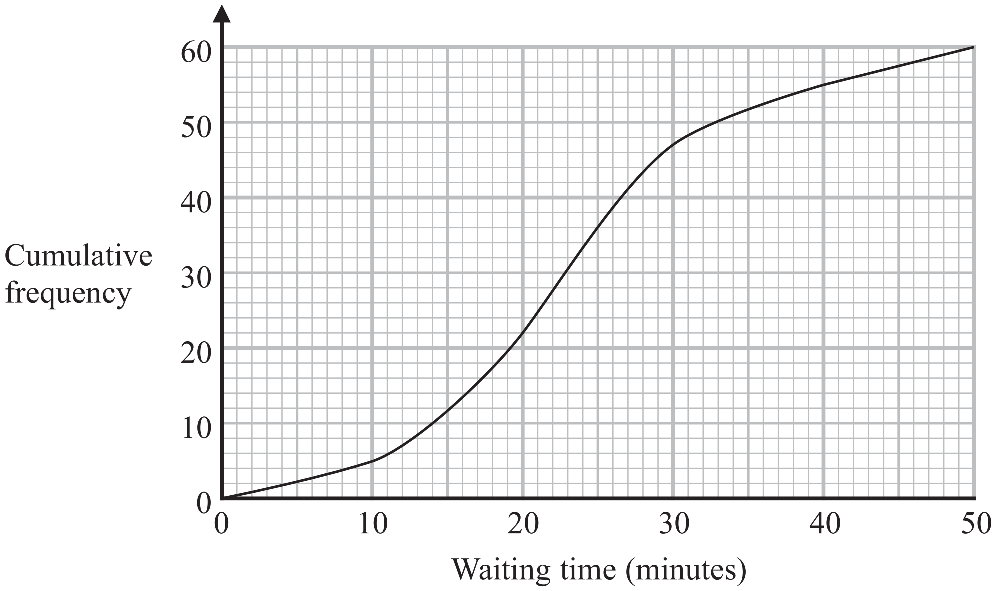
**(Total for Question 11 is 4 marks)**



P 5 8 4 4 3 A 0 1 1 2 4

*Turn over*

**12** The cumulative frequency graph gives information about the waiting times, in minutes, of people with appointments at Hospital A.




(a) Use the graph to find an estimate of the median waiting time at Hospital A.

.......................................... minutes
**(1)**

(b) Use the graph to find an estimate of the interquartile range of the waiting times at Hospital A.

.......................................... minutes
**(2)**

At a different hospital, Hospital B, the median waiting time is 28 minutes and the interquartile range of the waiting times is 19 minutes.

(c) Compare the waiting times at Hospital A with the waiting times at Hospital B.

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**(2)**

**(Total for Question 12 is 5 marks)**





P 5 8 4 4 3 A 0 1 2 2 4

**13** (a) Use algebra to show that $0.5\dot{7}\dot{2} = \dfrac{63}{110}$

**(2)**

Given that $y$ is a prime number,

(b) express $\dfrac{3}{2 - \sqrt{y}}$ in the form $\dfrac{a + b\sqrt{y}}{c - y}$ where $a$, $b$ and $c$ are integers.

..........................................................

**(2)**

**(Total for Question 13 is 4 marks)**

**14**

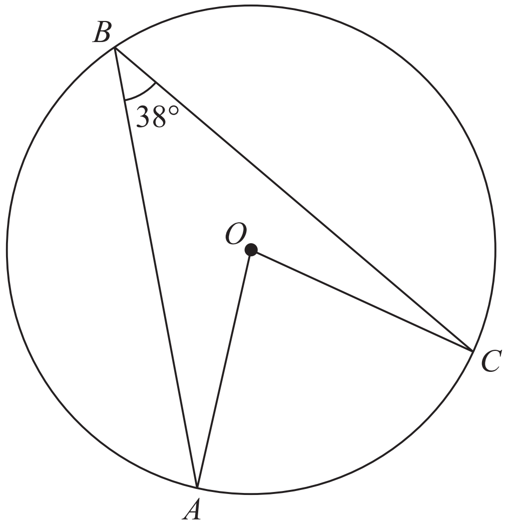



Diagram **NOT** accurately drawn

*A*, *B* and *C* are points on a circle, centre *O*.
Angle *ABC* = 38°

Work out the size of angle *OAC*.
Give a reason for each stage of your working.

........................................................ °

**(Total for Question 14 is 4 marks)**

**15** The diagram shows two right-angled triangles, *DEF* and *EFG*.

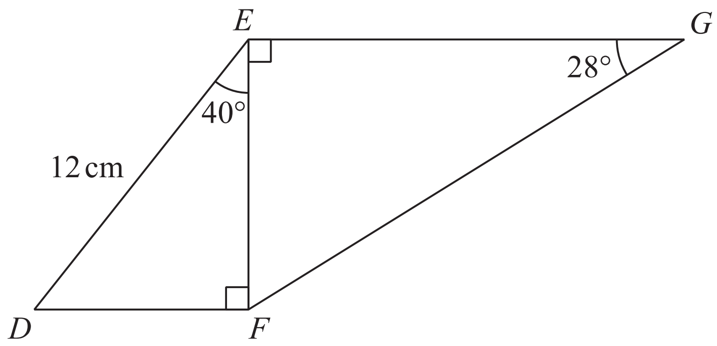



Diagram **NOT** accurately drawn

Work out the length of *EG*.
Give your answer correct to 3 significant figures.

.......................................................... cm

**(Total for Question 15 is 4 marks)**

**16** Steffi is going to play one game of tennis and one game of chess.

The probability that she will win the game of tennis is 0.6
The probability that she will win **both** games is 0.42

Work out the probability that she will **not** win either game.

.......................................................

**(Total for Question 16 is 4 marks)**

**17** The function f is such that $f(x) = (x - 4)^2$ for all values of $x$.

(a) Find f(1)

..........................................................

**(1)**

(b) State the range of the function f.

..........................................................

**(1)**

The function g is such that $g(x) = \dfrac{4}{x+3} \qquad x \neq -3$

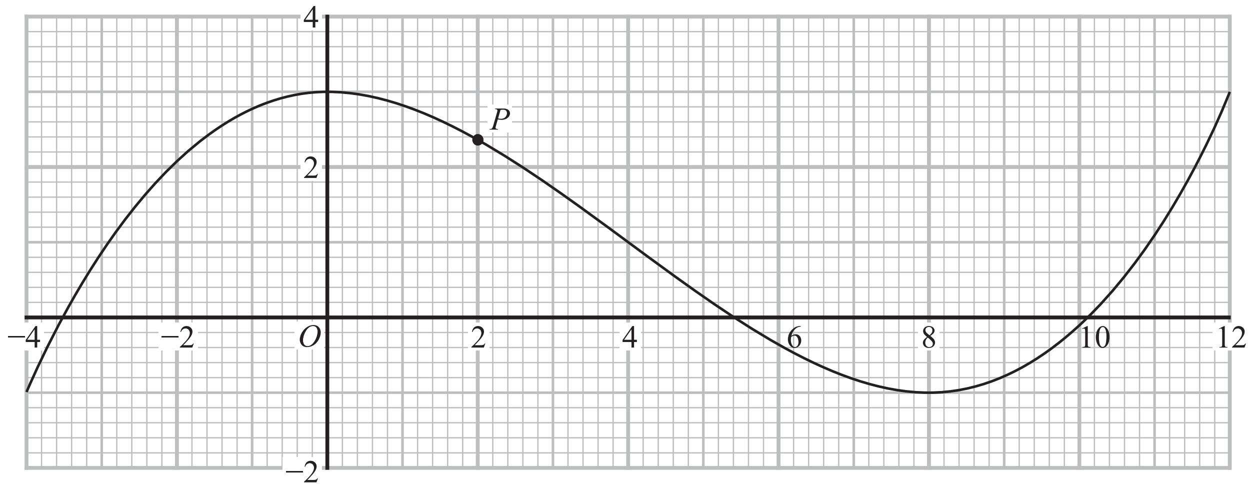
(c) Work out fg(2)

..........................................................

**(2)**

**(Total for Question 17 is 4 marks)**

**18** The diagram shows the graph of $y = f(x)$ for $-4 \leqslant x \leqslant 12$




The point $P$ on the curve has $x$ coordinate 2

(a) (i) Use the graph to find an estimate for the gradient of the curve at $P$.

..............................................................
**(3)**

(ii) Hence find an equation of the tangent to the curve at $P$.
Give your answer in the form $y = mx + c$

..............................................................
**(2)**

The equation $f(x) = k$ has exactly two different solutions for $-4 \leqslant x \leqslant 12$

(b) Use the graph to find the two possible values of $k$.

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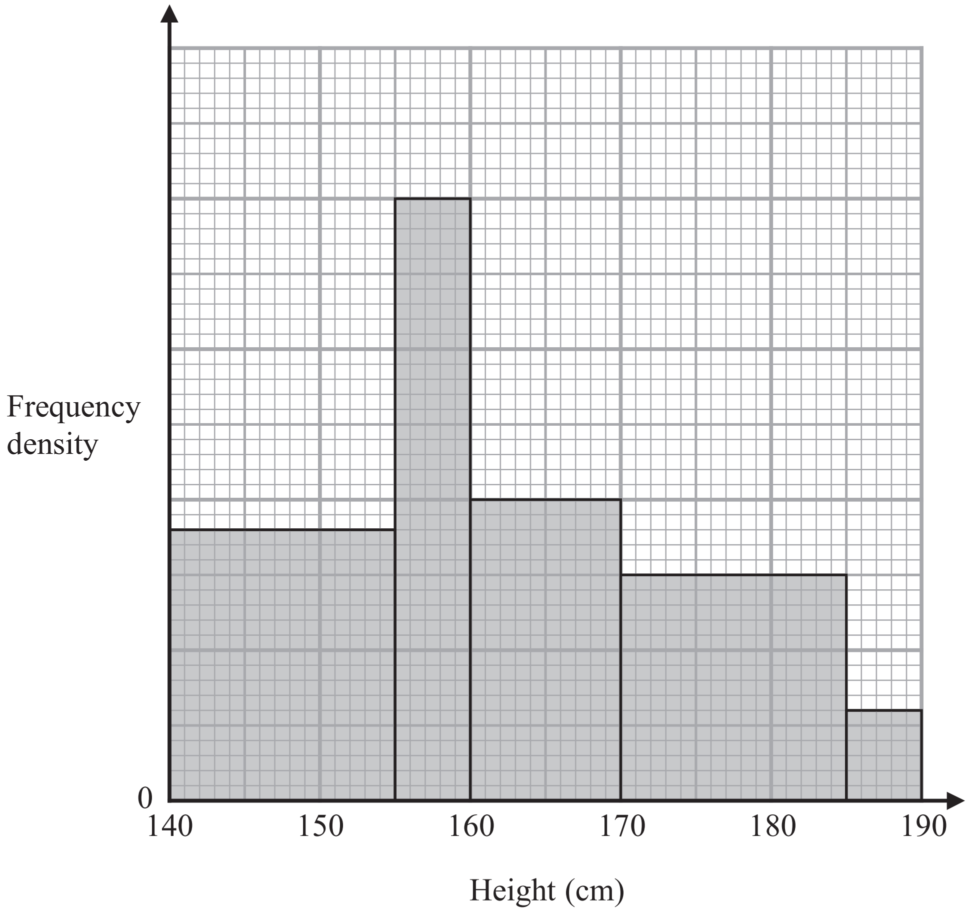
**(2)**

**(Total for Question 18 is 7 marks)**

**19**




The histogram gives information about the heights of all the Year 11 students at a school.

There are 160 students in Year 11 with a height between 155 cm and 170 cm.

Work out the total number of students in Year 11 at the school.

.......................................................

**(Total for Question 19 is 4 marks)**

**20** The diagram shows a frustum of a cone and a sphere.

The frustum is made by removing a small cone from a large cone.
The cones are similar.

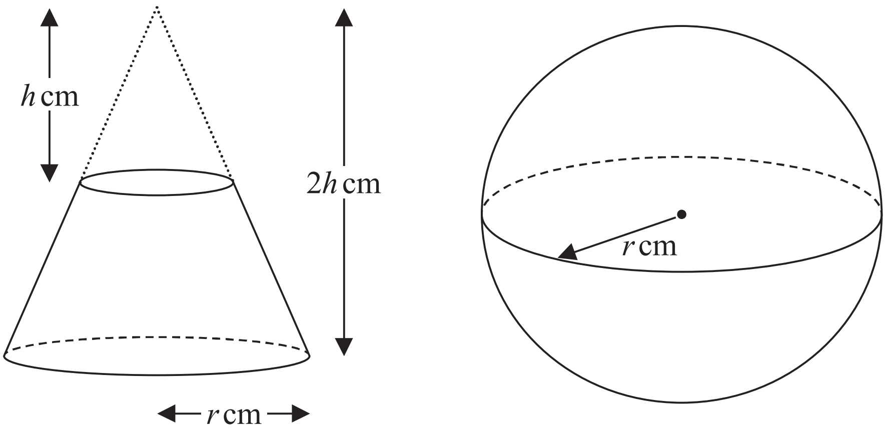



Diagram **NOT** accurately drawn

The height of the small cone is $h$ cm.
The height of the large cone is $2h$ cm.
The radius of the base of the large cone is $r$ cm.

The radius of the sphere is $r$ cm.

Given that the volume of the frustum is equal to the volume of the sphere,

find an expression for $r$ in terms of $h$.
Give your expression in its simplest form.

$r =$ ..........................................................

**(Total for Question 20 is 5 marks)**

**21** The diagram shows the prism $ABCDEF$ with cross section triangle $ABC$.

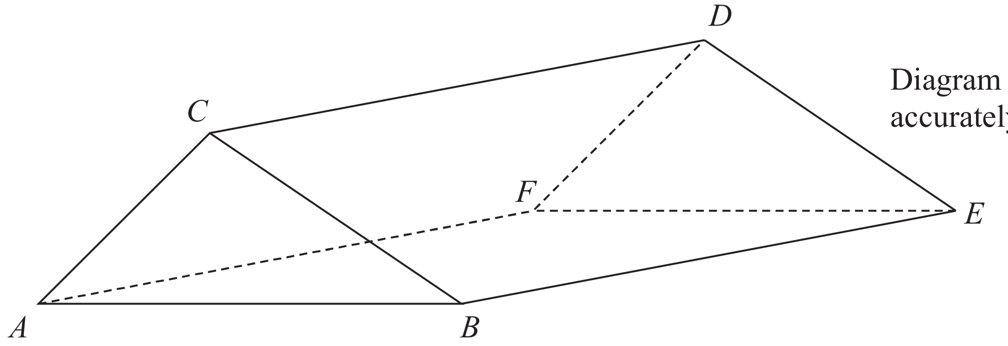



Diagram **NOT** accurately drawn

Angle $BEC = 40°$ and angle $ACB$ is obtuse.
$AC = 6$ cm and $CE = 13$ cm

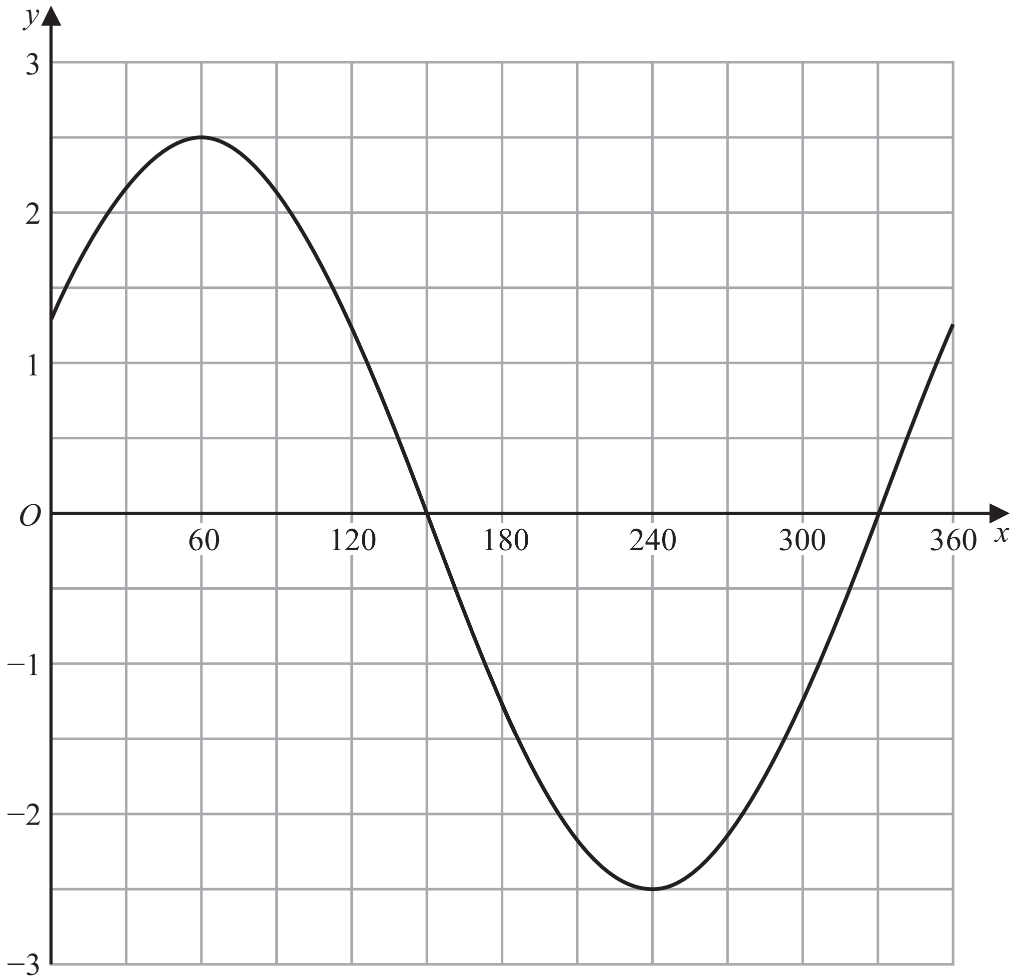
The area of triangle $ABC$ is $22\text{ cm}^2$

Calculate the length of $AB$.
Give your answer correct to one decimal place.

.......................................................... cm

**(Total for Question 21 is 6 marks)**

**22** The graph of $y = a\cos(x + b)°$ for $0 \leqslant x \leqslant 360$ is drawn on the grid.




(a) Find the value of $a$ and the value of $b$.

$a$ = ........................................................

$b$ = ........................................................

**(2)**

Another curve $C$ has equation $y = \mathrm{f}(x)$
The coordinates of the minimum point of $C$ are (4, 5)

(b) Write down the coordinates of the minimum point of the curve with equation

(i) $y = \mathrm{f}(2x)$

(.......................... , ..........................)

(ii) $y = \mathrm{f}(x) - 7$

(.......................... , ..........................)

**(2)**

**(Total for Question 22 is 4 marks)**





P 5 8 4 4 3 A 0 2 3 2 4

**23** A particle moves along a straight line.
The fixed point $O$ lies on this line.
The displacement of the particle from $O$ at time $t$ seconds, $t \geqslant 0$, is $s$ metres where

$$s = t^3 + 4t^2 - 5t + 7$$

At time $T$ seconds the velocity of $P$ is $V$ m/s where $V \geqslant -5$

Find an expression for $T$ in terms of $V$.

Give your expression in the form $\dfrac{-4 + \sqrt{k + mV}}{3}$ where $k$ and $m$ are integers to be found.

$T =$ ..............................................................

**(Total for Question 23 is 6 marks)**

**TOTAL FOR PAPER IS 100 MARKS**