1.

Diagram **NOT** accurately drawn

7.8 cm
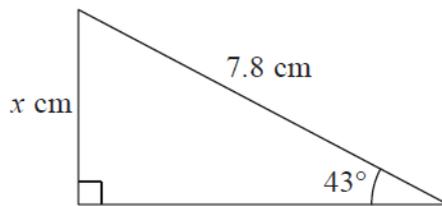
x cm

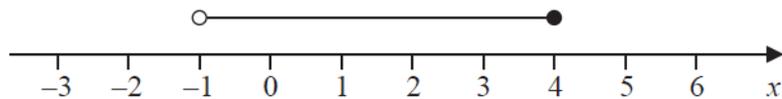43°

Work out the value of x.
Give your answer correct to 3 significant figures.

2 (*a*) Write $2^3 \times 2^4$ as a single power of 2.

(*b*) $280 = 2^n \times 5 \times 7$

Find the value of n.

3.

An inequality is shown on the number line.

Write down this inequality.

(*b*) (i) Solve the inequality $2(y - 3) \geq 1$

(ii) Write down the lowest **integer** which satisfies this inequality.

(*c*) Work out the value of $\dfrac{451.4}{14.1 + 10.3}$

Eloy's height was 125 cm when his age was 7 years.
His height was 153 cm when his age was 12 years.

(d) Work out the percentage increase in Eloy's height between the ages of 7 and 12 years.

Eloy's height at the age of 12 years was 85% of his height at the age of 20 years.

(*e*) Work out Eloy's height when his age was 20 years.

4. A box contains 80 tea bags.
The table shows information about the weight of each tea bag.

Weight (w grams)	Number of tea bags
$2.8 < w \leq 2.9$	2
$2.9 < w \leq 3.0$	4
$3.0 < w \leq 3.1$	22
$3.1 < w \leq 3.2$	32
$3.2 < w \leq 3.3$	14
$3.3 < w \leq 3.4$	6

(*a*) Work out the percentage of the 80 tea bags that weigh more than 3.1 grams.

(*b*) Work out an estimate for the total weight of the 80 tea bags.
Use halfway values of 2.85 grams, 2.95 grams, …

Here is a cumulative frequency graph for the weights of the 80 tea bags.
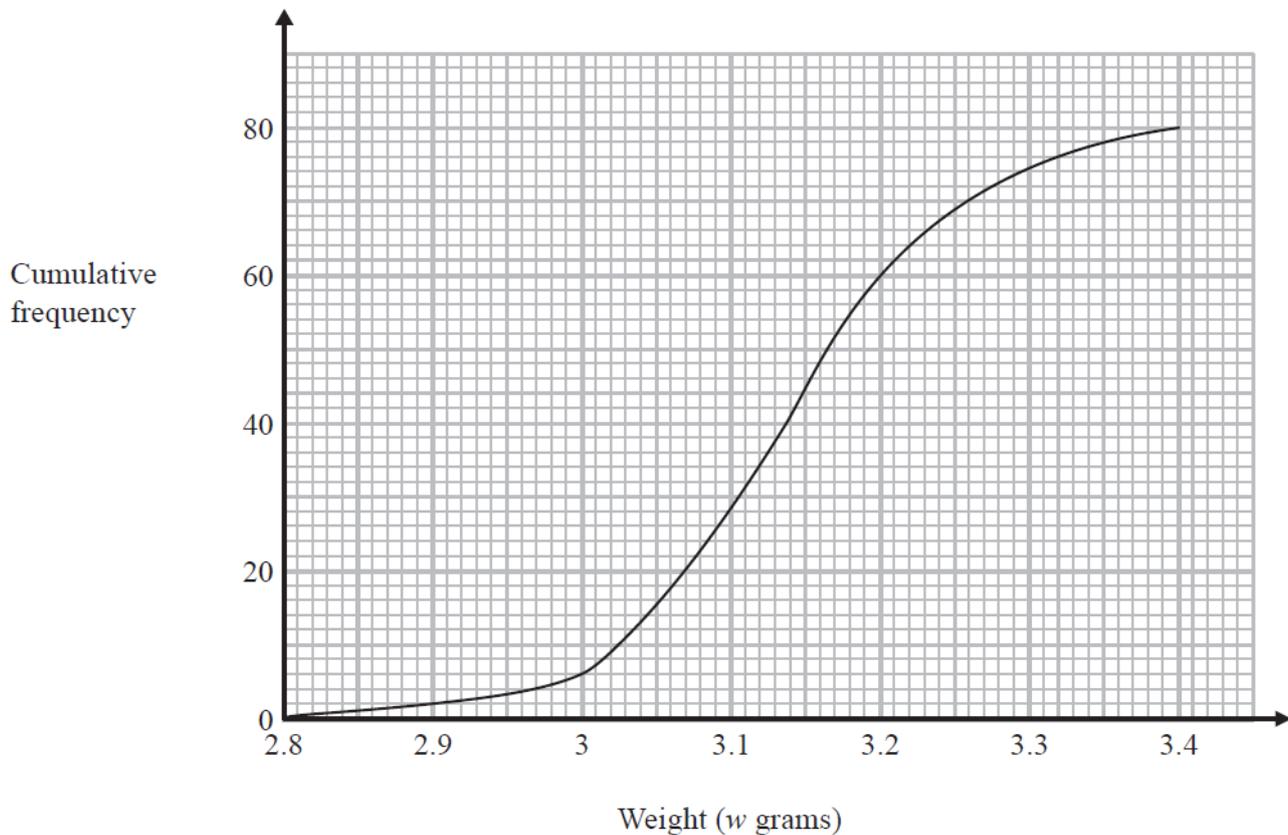
(*c*) Use the graph to find an estimate for the number of tea bags which weighed more than 3.25 grams.

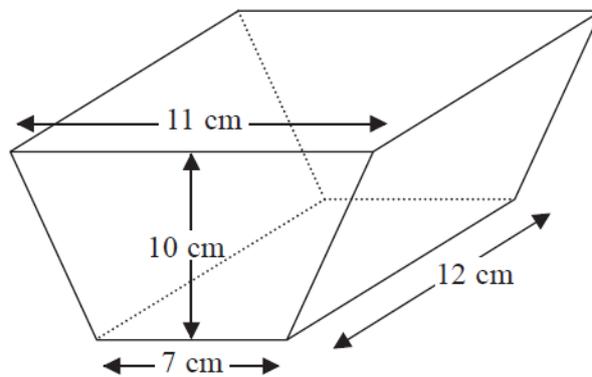(*d*) Use the graph to find an estimate for the interquartile range of the weights of the tea bags.

5.

Diagram **NOT** accurately drawn

11 cm

10 cm

7 cm

12 cm

The diagram shows a solid prism.
The cross section of the prism is a trapezium.
The lengths of the parallel sides of the trapezium are 11 cm and 7 cm.
The perpendicular distance between the parallel sides of the trapezium is 10 cm.
The length of the prism is 12 cm.

(*a*) Work out the area of the trapezium.

(*b*) Work out the volume of the prism.

4. The table gives information about the numbers of goals scored by a football team in 30 matches.

Number of goals scored	Frequency
0	2
1	10

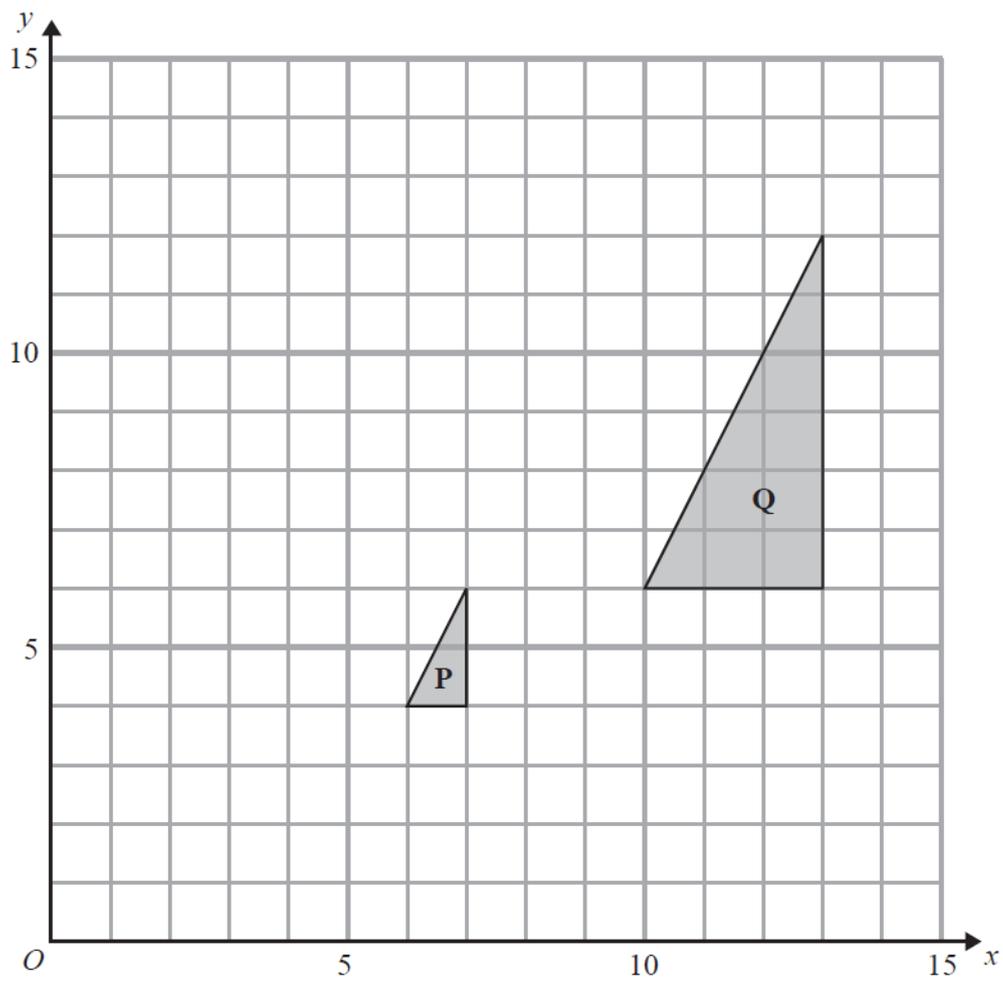|	
2	7
3	6
4	3
5	2

Find the a) mean and b) median number of goals scored.

5.   (*a*) Simplify $k \times k \times k \times k \times k$

(*b*) Expand $2(7t - 3)$

(*c*) Expand and simplify fully
$4(2y + 6) - 3(2y - 7)$

6.

(*a*) Describe fully the single transformation which maps triangle **P** onto triangle **Q**.

(*b*) On the grid, translate triangle **Q** by the vector $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$.

Label the new triangle **R**.

(1)

(*c*) Describe fully the single transformation which maps triangle **R** onto triangle **P**.

7. Expand and simplify fully

    (i) $(x-6)(x-4)$

    ii) $(x-6)(x-4)(2x+4)$

iii) Simplify fully $\dfrac{v^4 \times v^7}{v^5}$

8.   Serena bought a car that had a value of $16 000.
At the end of each year, the value of her car had depreciated by 15%.

Calculate the value of her car at the end of 3 years.

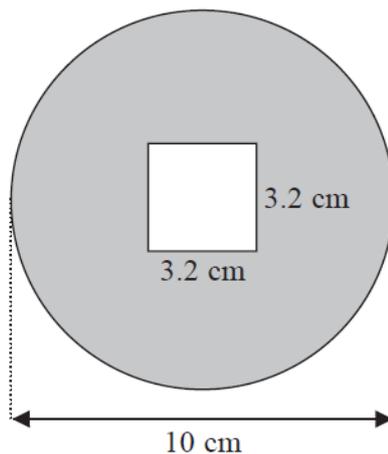**9.**   A square hole is cut from a circular piece of card.

Diagram **NOT**
accurately drawn

3.2 cm

3.2 cm

10 cm

The square has sides of length 3.2 cm.
The diameter of the circular piece of card is 10 cm.

Work out the area of the shaded region.
Give your answer correct to 3 significant figures.

10.   Express 825 as a product of its prime factors.

11. $\mathscr{E}$ = {positive whole numbers **less than** 13}
A = {even numbers}
B = {multiples of 3}
C = {prime numbers}

(*a*) List the members of the set.

(i) $A \cap B$
(ii) $B \cup C$

(*b*) Is it true that $14 \in A$?

Tick (√) the appropriate box.

Yes   No

Explain your answer.

10.   The mean of four numbers is 2.6.
One of the four numbers is 5.

Find the mean of the other three numbers.

13.   Factorise fully $4(x-5)^2 + 3(x-5)$

14.   Peter wants to pass his driving test.
The probability that he passes at his first attempt is 0.7.
When Peter passes his driving test, he does not take it again.
If he fails, the probability that he passes at the next attempt is 0.8.

(*a*) Complete the probability tree diagram for Peter's first two attempts.

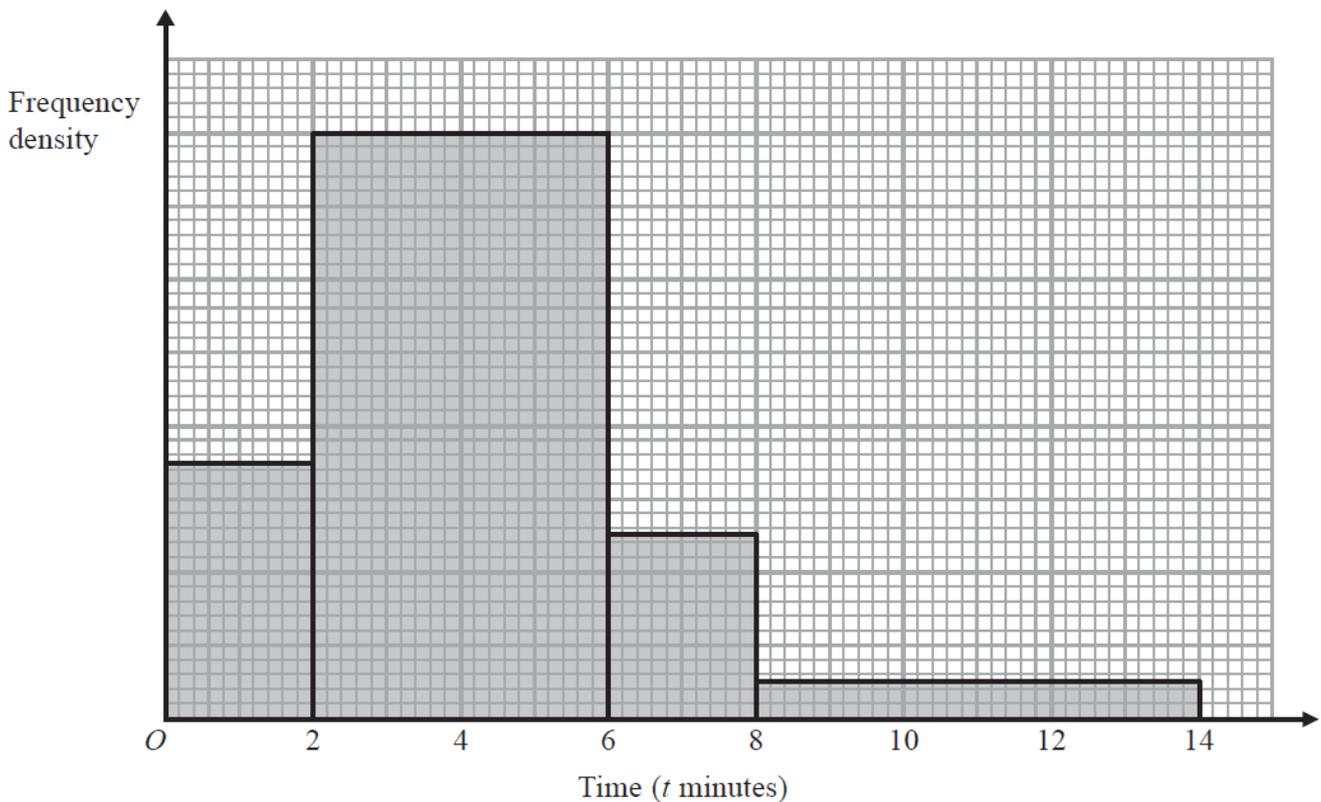First attempt   Second attempt

Pass

0.7

....

Fail
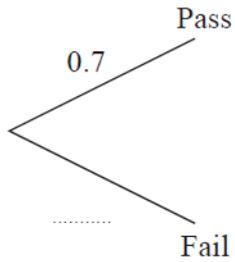
(2)

(*b*) Calculate the probability that Peter needs exactly two attempts to pass his driving test.

(*c*) Calculate the probability that Peter passes his driving test at his third or fourth attempt.

15.   The histogram shows information about the times, t minutes, customers spent in a post office.

Frequency density

Time (t minutes)

28 customers spent 2 minutes or less in the post office.
Calculate an estimate for the number of customers who spent between 5 and 14 minutes in the post office.

16. A circular clock face, centre O, has a minute hand OA and an hour hand OB.

$OA = 10$ cm.

$OB = 7$ cm.

Calculate the length of AB when the hands show 5 o'clock.
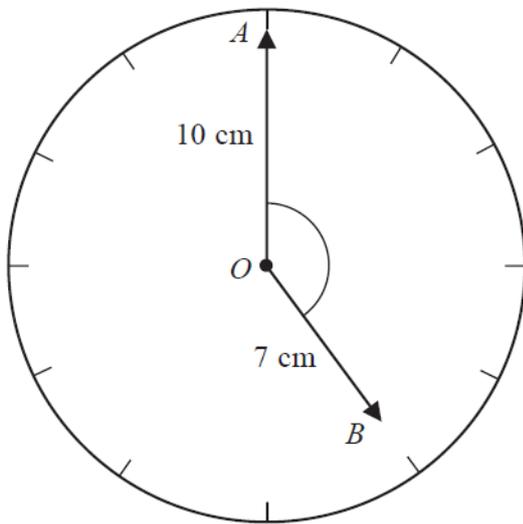
Give your answer correct to 3 significant fig

Diagram **NOT** accurately drawn

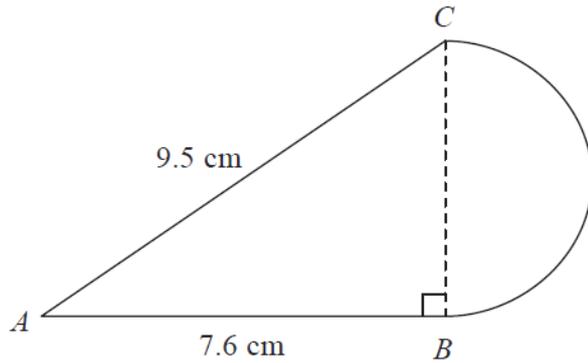**17.** Solve $\dfrac{6x-1}{4} - \dfrac{5-2x}{2} = 1$

Show clear algebraic working.

18.

Diagram **NOT** accurately drawn

The diagram shows a shape made from triangle *ABC* and a semicircle with diameter *BC*.
Triangle *ABC* is right-angled at *B*.
AB = 7.6 cm and *AC* = 9.5 cm.

Calculate the area of the shape.
Give your answer correct to 3 significant figures.

19. A box contains 20 nails.
The table shows information about the length of each nail.

Length of nail (mm)	25	30	40	50	60
Number of nails	1	8	4	5	2

(*a*) Viraj takes at random one nail from the box.

Find the probability that the length of the nail he takes is

(i) 50 mm or 60 mm,

(ii) less than 35 mm.

(*b*) Jamila puts all 20 nails into a bag.
She takes at random one of the nails and records its length.
She replaces the nail in the bag.
She then takes at random a second nail from the bag and records its length.

Calculate the probability that the two nails she takes

(i) each have a length of 60 mm,
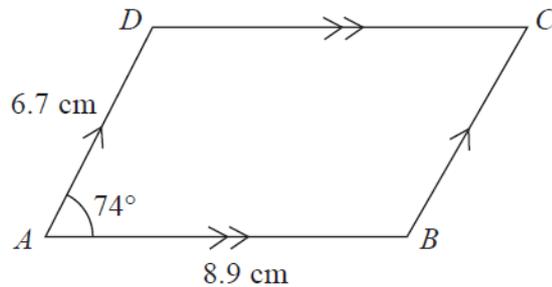
(ii) have a total length of 80 mm.

20.

Diagram **NOT** accurately drawn

ABCD is a parallelogram.
AB = 8.9 cm.
AD = 6.7 cm.
Angle *BAD* = 74°.

Calculate the area of parallelogram *ABCD*.
Give your answer correct to 3 significant figures.

21. Given that *y* is positive, make *y* the subject of $y = \sqrt{ay^2 + n}$.

Show clear algebraic working.

22. Given that $\left(5 - \sqrt{x}\right)^2 = y - 20\sqrt{2}$ where *x* and *y* are positive integers, find the value of *x* and the value of *y*.

23. f is the function f(*x*) = 2*x* + 5.

(*a*) Find f(3).

(*b*) Express the inverse function f^{-1} in the form f^{-1}(*x*) =

g is the function $g(x) = x^2 - 25$.

(*c*) Find g(–3).

(*d*) (i) Find gf(*x*).
  Give your answer as simply as possible.
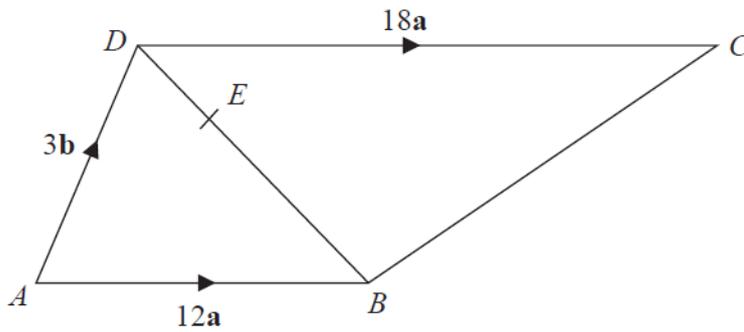
(ii) Solve gf(x) = 0.

24.

Diagram **NOT** accurately drawn

ABCD is a trapezium.
AB is parallel to *DC*.

$\overrightarrow{AB}$ = 12**a**

$\overrightarrow{AD}$ = 3**b**

$\overrightarrow{DC}$ = 18**a**

E is the point on the diagonal *DB* such that $DE = \dfrac{1}{3} DB$.

(*a*) Find, in terms of **a** and **b**,

    (i) $\overrightarrow{DB}$

    (ii) $\overrightarrow{DE}$

    (iii) $\overrightarrow{AE}$

(*b*)   Show by a vector method that *BC* is parallel to *AE*.

25. A rectangular lawn has a length of 3*x* metres and a width of 2*x* metres.
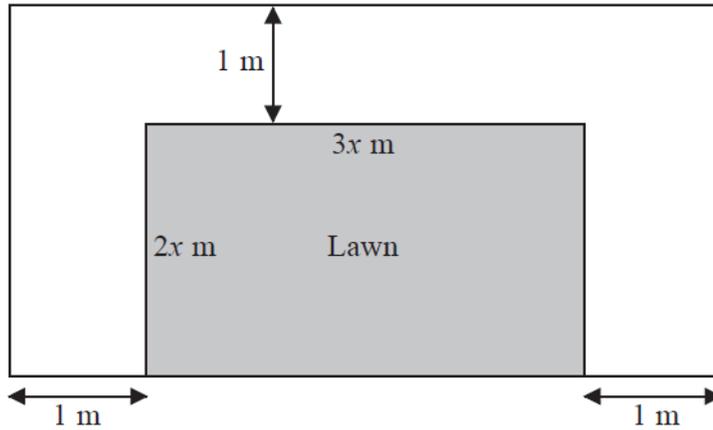The lawn has a path of width 1 metre on three of its sides.

Diagram **NOT**
accurately drawn

The total area of the lawn and the path is 100 m^2

(a) Show that $6x^2 + 7x - 98 = 0$

(b) Calculate the area of the lawn.
   Show clear algebraic working.

26.

Diagram **NOT**
accurately drawn

The diagram shows part of a regular polygon.
The interior angle and the exterior angle at a vertex are marked.
The size of the interior angle is 7 times the size of the exterior angle.

Work out the number of sides of the polygon.

27. Show that the recurring decimal $0.0\dot{1}\dot{5} = \dfrac{1}{66}$

28. There are 1300 sheets of paper, correct to the nearest 100 sheets, in a pile.
Each sheet is of equal thickness.
The height of the pile is 160 mm, correct to the nearest 10 mm.

Calculate the upper bound, in millimetres, for the thickness of one sheet of paper.

29. Solve the simultaneous equations

$$2x - y = 7$$

$$x^2 + y^2 = 34$$

Show clear algebraic working.

30. A pyramid has a horizontal square base *ABCD* with sides of length 230 metres.
M is the midpoint of *AC*.
The vertex, *T*, is vertically above *M*.
The slant edges of the pyramid are of length 218 metres.

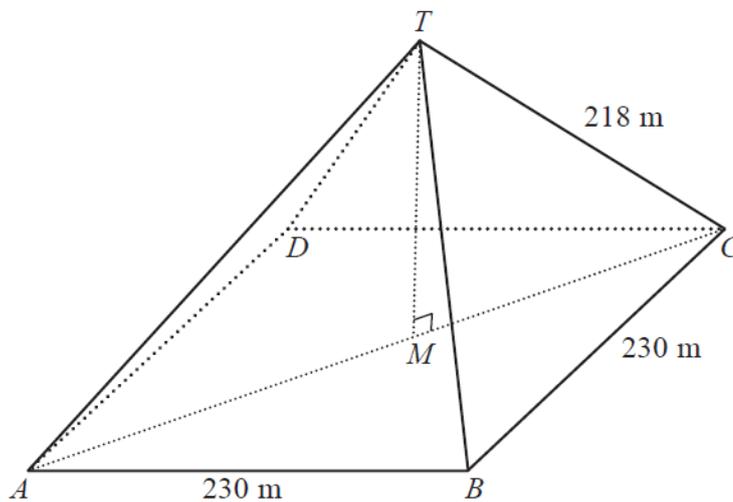Calculate the height, *MT*, of the pyramid.
Give your answer correct to 3 significant figures.

Diagram **NOT**
accurately drawn

218 m

230 m

230 m