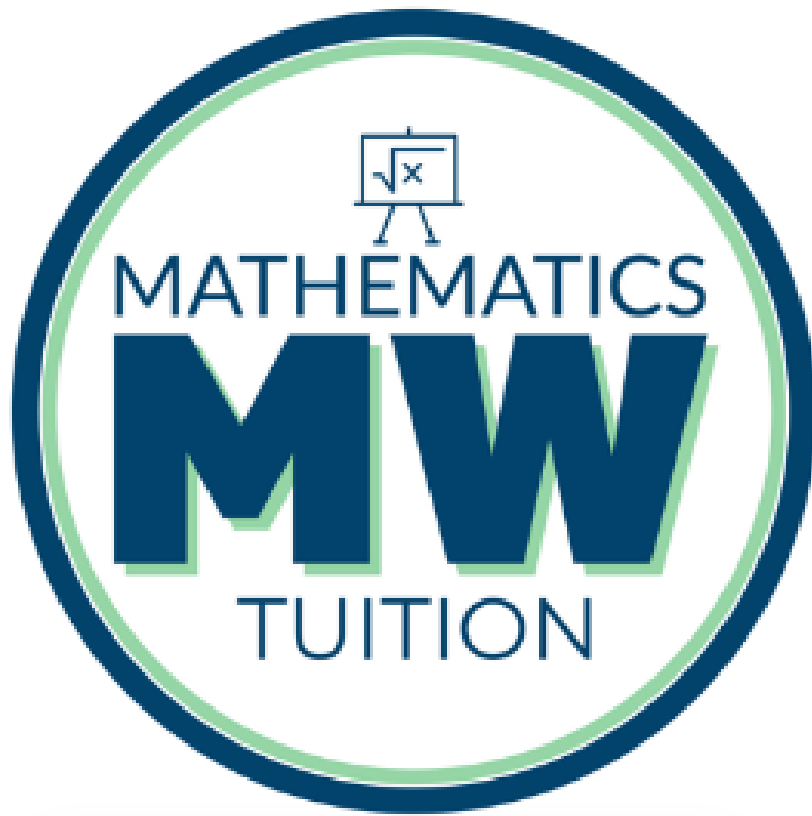


# Mathematics GCSE *Higher Tier*

## WTM – UNIT 2

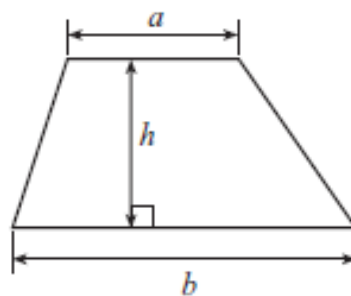


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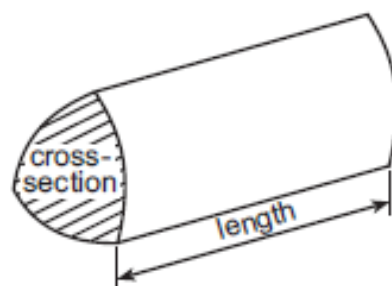
**You will need a calculator**

## Formula List

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



Volume of prism = area of cross-section  $\times$  length



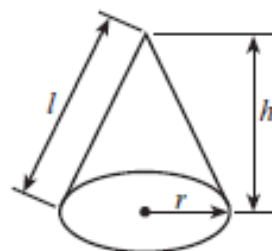
Volume of sphere =  $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone =  $\pi r l$

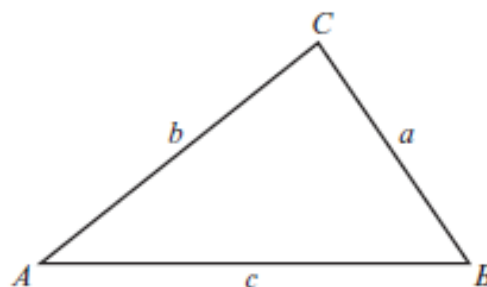


In any triangle  $ABC$

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 =  $\frac{1}{2}ab \sin C$



## The Quadratic Equation

The solutions of  $ax^2 + bx + c = 0$

where  $a \neq 0$  are given by

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

1

Evaluate the following.  
Give your answer in standard form, correct to 2 significant figures.

[2]

$$\frac{2.4 \times 10^5}{3.4^3 + \sqrt{5.6 \times 10^{-2}}}$$

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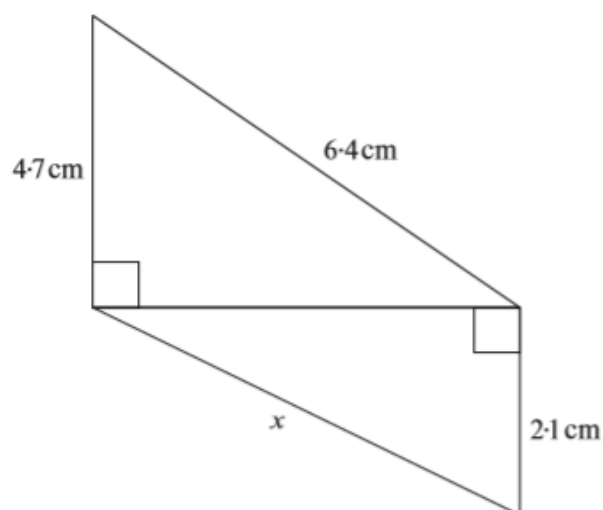
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2



*Diagram not drawn to scale*

Calculate the length of the side marked  $x$ .

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[4]

# 3

A solution to the equation

$$x^3 - 2x - 45 = 0$$

lies between 3 and 4.

Use the method of trial and improvement to find this solution correct to 1 decimal place.  
You must show all your working.

[4]

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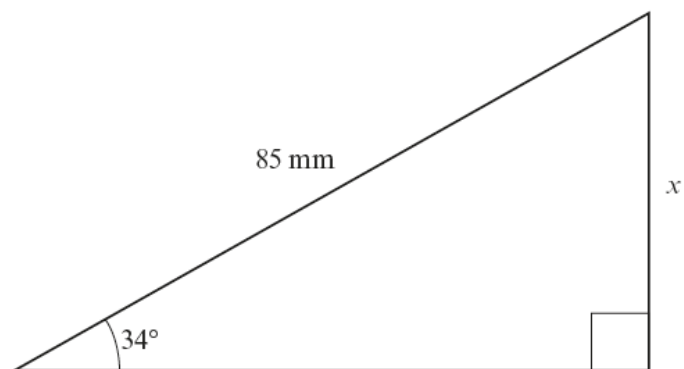
The same antique shop has a number of tables for sale.

Price, £ $x$	Number of tables
$50 \leq x < 100$	6
$100 \leq x < 150$	10
$150 \leq x < 200$	4

Calculate an estimate for the mean price of a table.

[4]

5



*Diagram not drawn to scale*

Calculate the length  $x$  to an appropriate degree of accuracy.

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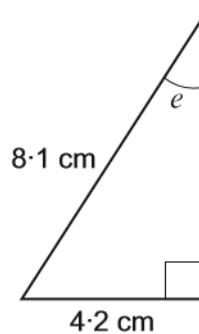
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[4]



*Diagram not drawn to scale*

Calculate the size of angle  $e$ .

[3]

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**6***(a)* Expand and simplify  $(x + 6)(x - 3)$ .

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**[2]***(b)* Simplify  $\frac{3(x+4)^3}{(x+4)^2}$ .

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**[1]****7**

A biased coin is thrown 100 times.

The number of heads thrown is recorded after 20 throws, 40 throws, 60 throws, 80 throws and 100 throws.

Some of the results are recorded in the relative frequency table below.

Complete the table.

**[2]**

Number of throws	20	40	60	80	100
Number of heads	11	18	24	30	
Relative frequency	0.55	0.45		0.375	0.37

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A journey of 45 miles is travelled in 1 hour 15 minutes.  
Calculate the average speed of this journey.  
Give your answer in mph.

[3]

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(b) Each exterior angle of a regular polygon is  $30^\circ$ .  
How many sides are there in this regular polygon?

[2]

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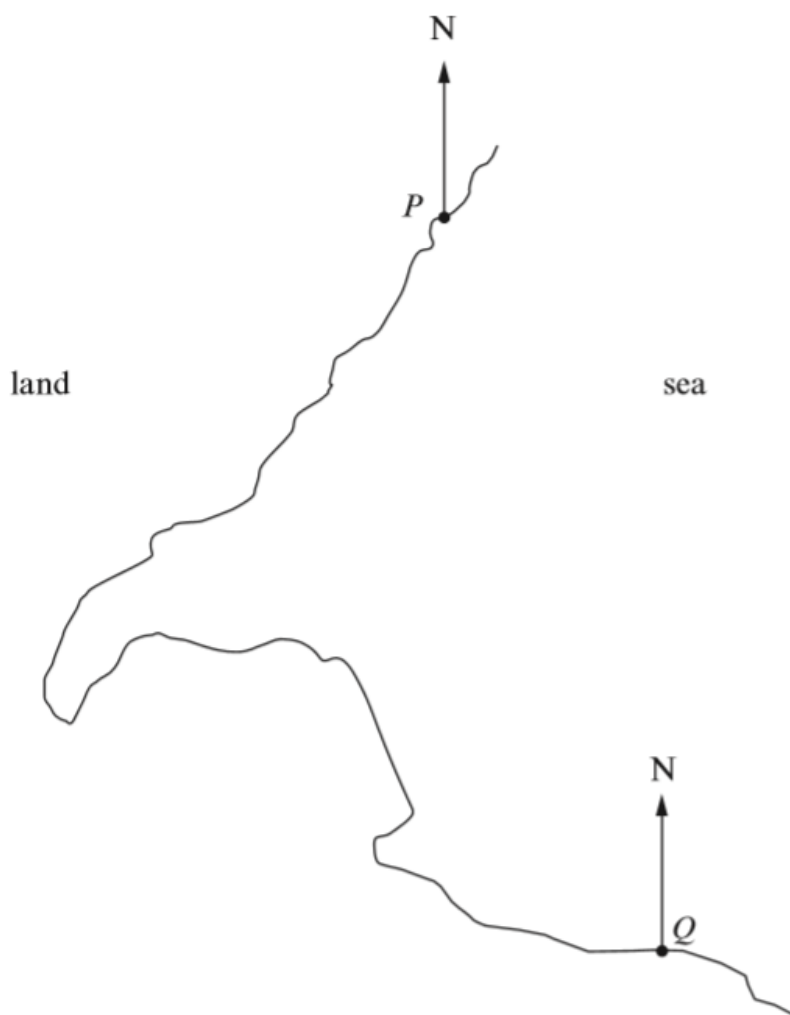
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Number of sides = .....

1  
0

- (a)  $P$  and  $Q$  are two ports shown on a map with scale  $1\text{ cm} = 8\text{ km}$ .  
Find the straight-line distance, in km, from  $P$  to  $Q$ .



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[3]

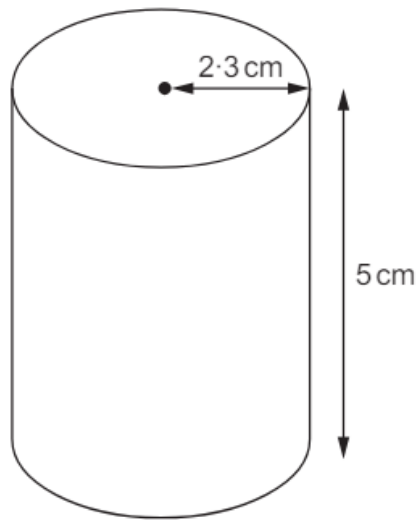
- (b) A ship is on a bearing of  $147^\circ$  from  $P$  and on a bearing of  $021^\circ$  from  $Q$ .  
Plot the position of the ship and mark it  $X$ .

[3]



1  
1

A solid metal cylinder has a radius of 2.3 cm and a height of 5 cm.



*Diagram not drawn to scale*

The mass of the cylinder is 423.1 g.

Find the density of the metal.

Give your answer in  $\text{g/cm}^3$ .

[4]

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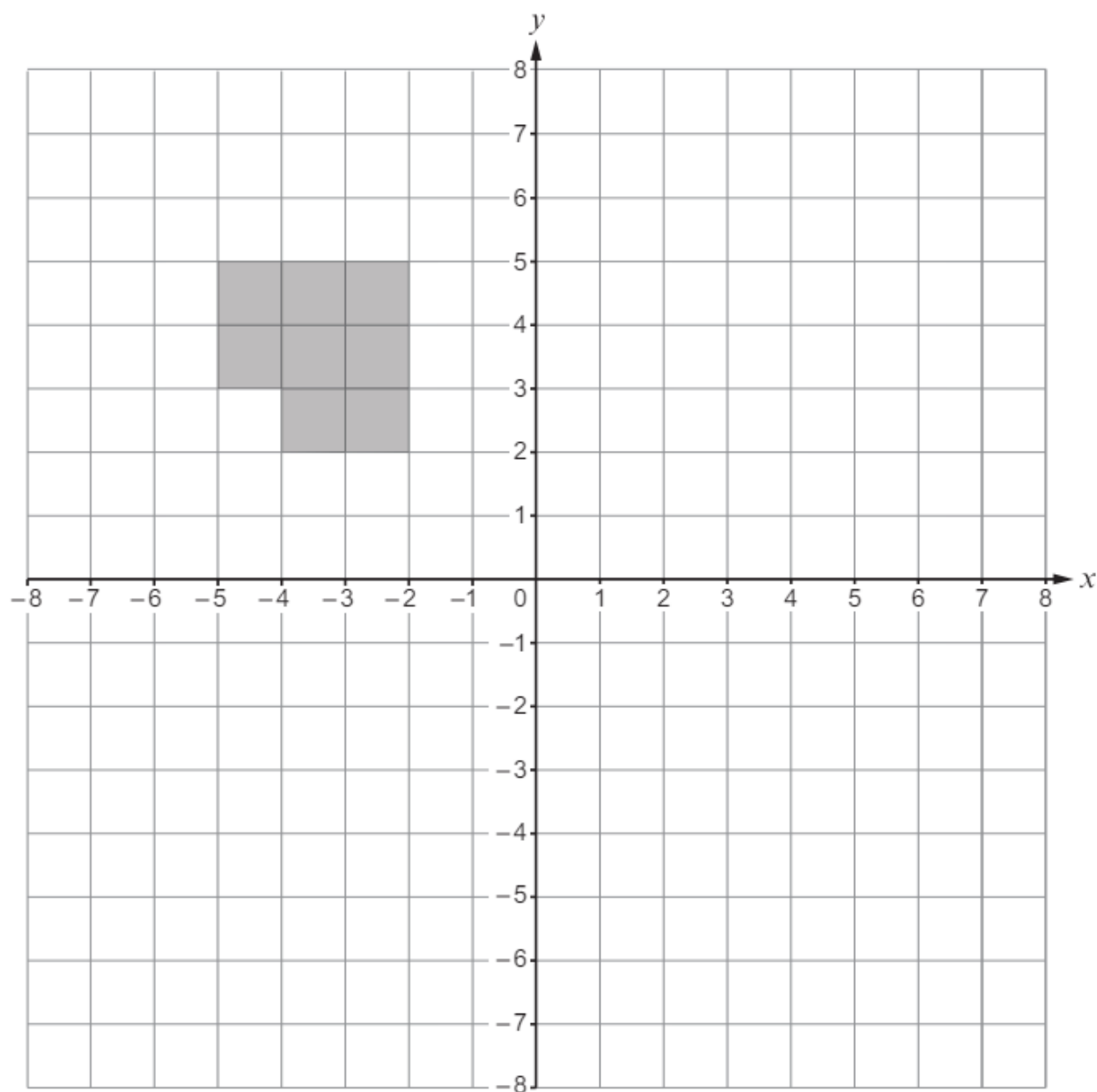
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<p><b>1</b> <b>2</b></p>	<p>The value of <math>y</math> is found using the formula <math>y = \frac{t}{w}</math>.</p> <p><math>t = 98</math>, correct to 2 significant figures.  <math>w = 0.5</math>, correct to 1 significant figure.</p> <p>Calculate the <b>least</b> value of <math>y</math>.  Give your answer correct to 1 decimal place.  You must show all your working.</p> <p style="text-align: right;">[3]</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>Least value of <math>y =</math> .....</p>
<p><b>1</b> <b>3</b></p>	<p>A number has been increased by 60% to give an answer of 64.  What was the original number?</p> <p style="text-align: right;">[2]</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

**1**  
**4**

Rotate the shape below through  $90^\circ$  clockwise about the point  $(-1, 1)$ .



**1**

**4**

Use the quadratic formula to solve  $7x^2 - 4x - 17 = 0$  giving your answers correct to one decimal place.

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**[3]**

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Solid A and Solid B are **similar**.

Solid A has a volume of  $8000\text{ cm}^3$  and a height of 30 cm.  
Solid B has a volume of  $4913\text{ cm}^3$ .

Calculate the height of Solid B.

[3]

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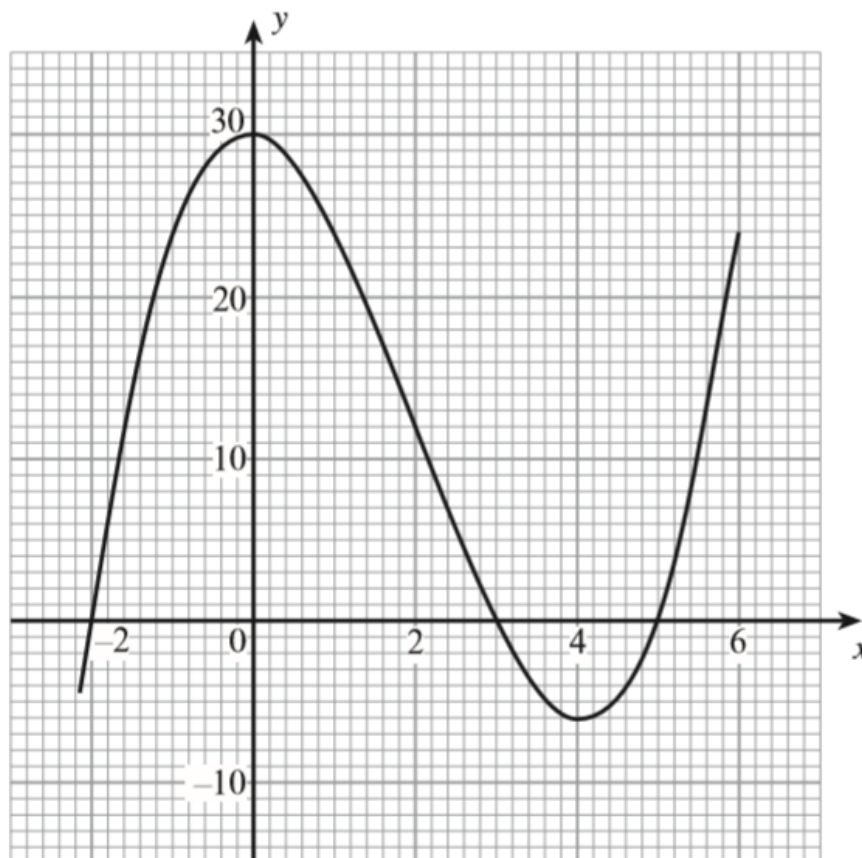
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Height of Solid B = ..... cm

[3]

The graph of the equation  $y = x^3 - 6x^2 - x + 30$  is shown on the graph paper below.



Use the graph above to answer the following questions.

(a) Solve  $x^3 - 6x^2 - x + 30 = 0$ .

[2]

(b) By drawing a suitable straight line, solve the equation  $x^3 - 6x^2 - x + 30 = -5x + 10$ .

[4]

1  
8

The sphere and cone below have equal volumes.



*Diagram not drawn to scale*

The radius of the sphere is 6.7 cm.

The height of the cone is 10.4 cm.

Calculate the radius of the base of the cone.

Give your answer correct to 1 decimal place.

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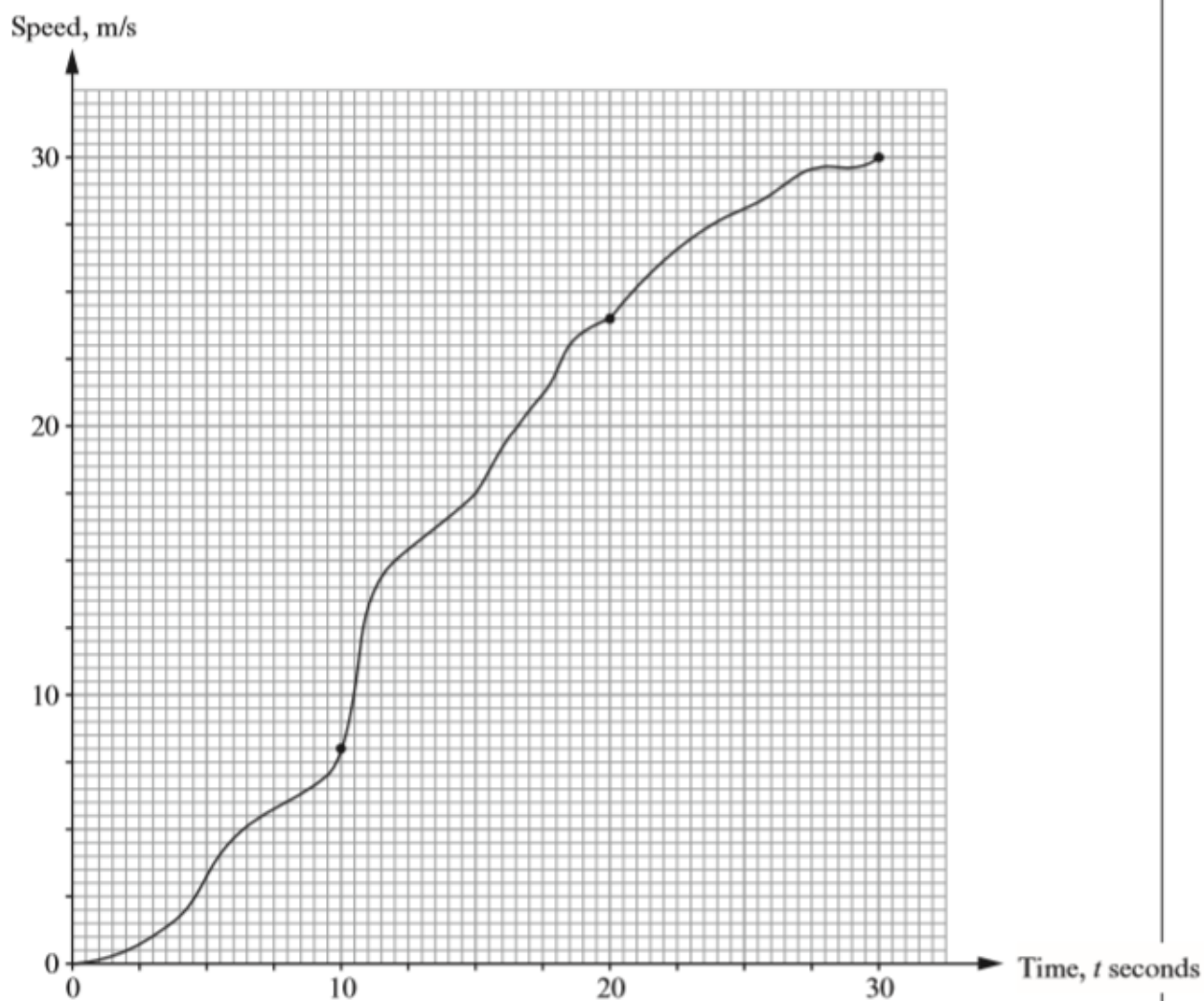
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[5]



1  
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The graph below shows the speed of a train, in m/s, over a period of 30 seconds starting at time  $t = 0$  seconds.



(a) Estimate the acceleration of the train at time  $t = 12$  seconds.

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[3]

(b) The table below gives the speed of the train between  $t = 0$  to  $t = 30$ .

Time $t$ (seconds)	0	10	20	30
Speed (m/s)	0	8	24	30

Use the trapezium rule, with values taken from the table, to estimate the area enclosed by the curve shown on the opposite page, the  $t$ -axis and the line  $t = 30$ .

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[3]

(c) Estimate the total distance travelled during the 30 seconds.

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[1]

The diagram shows triangle  $ABC$ .

