Mock Grade 8/9

Maths Booklet 3

Paper 3H
Calculator

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1 A high speed train travels a distance of 742.5 km in 4 hours.

The distance is measured correct to the nearest half a kilometre.
The time is measured correct to the nearest minute.

By considering bounds, work out the average speed, in km/minute, of the train to a suitable degree of accuracy.
You must show all your working and give a reason for your answer.

.....km/minute

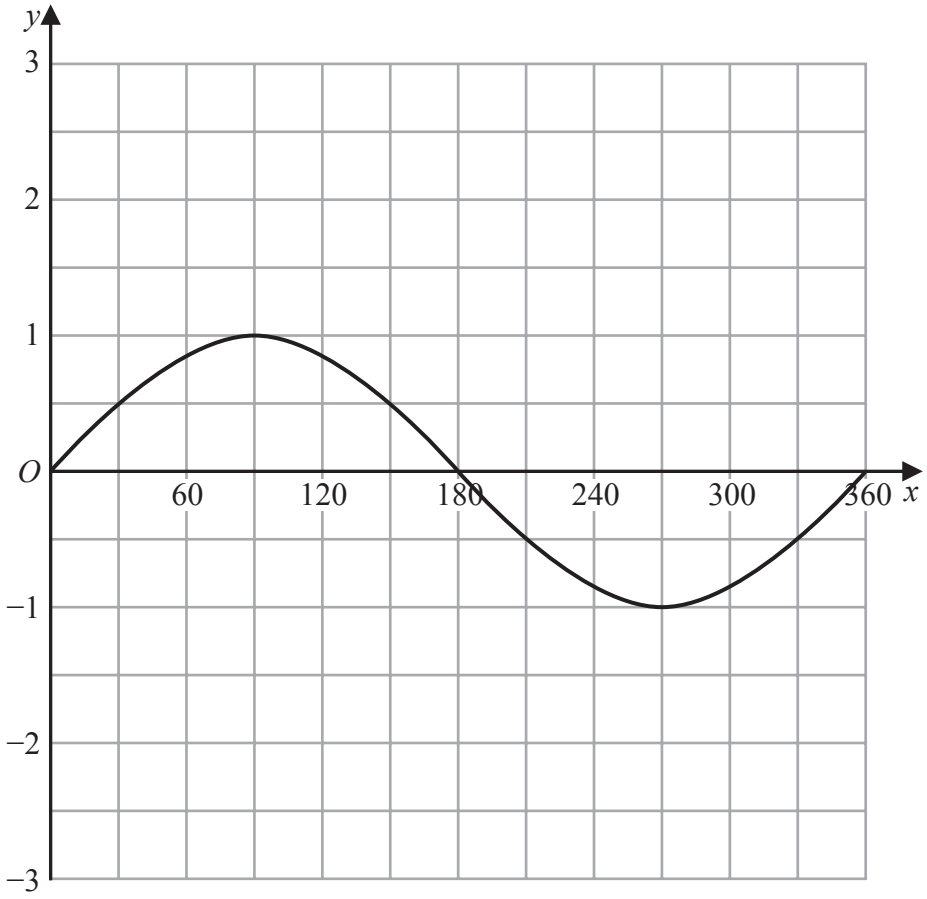
(Total for Question 1 is 5 marks)

2 Solve algebraically the simultaneous equations

$$x - 2y = 3$$
$$x^2 - y^2 + 2x = 10$$

(Total for Question 2 is 5 marks)

3 The graph of $y = \sin x°$ for $0 \leqslant x \leqslant 360$ is drawn on the grid.



(a) On the grid, draw the graph of $y = 2\sin(x + 30)°$ for $0 \leqslant x \leqslant 360$

(2)

(b) (i) Write $x^2 - 6x + 10$ in the form $(x - a)^2 + b$ where a and b are integers.

.....

(2)

(ii) Hence, describe fully the single transformation that maps the curve with equation $y = x^2$ onto the curve with equation $y = x^2 - 6x + 10$

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(2)

(Total for Question 3 is 6 marks)

4 The diagram shows quadrilateral *ABCD*

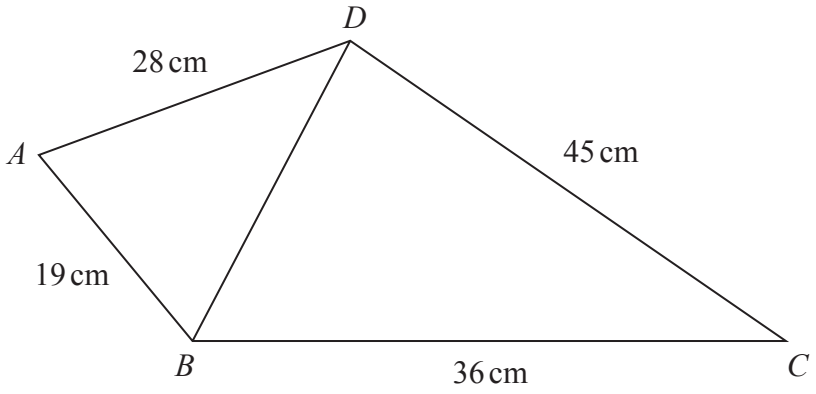

Diagram **NOT** accurately drawn

The angle *BCD* is acute.

Given that the area of triangle *BCD* = 405 cm^2

work out the size of angle *ABD*
Give your answer correct to one decimal place.

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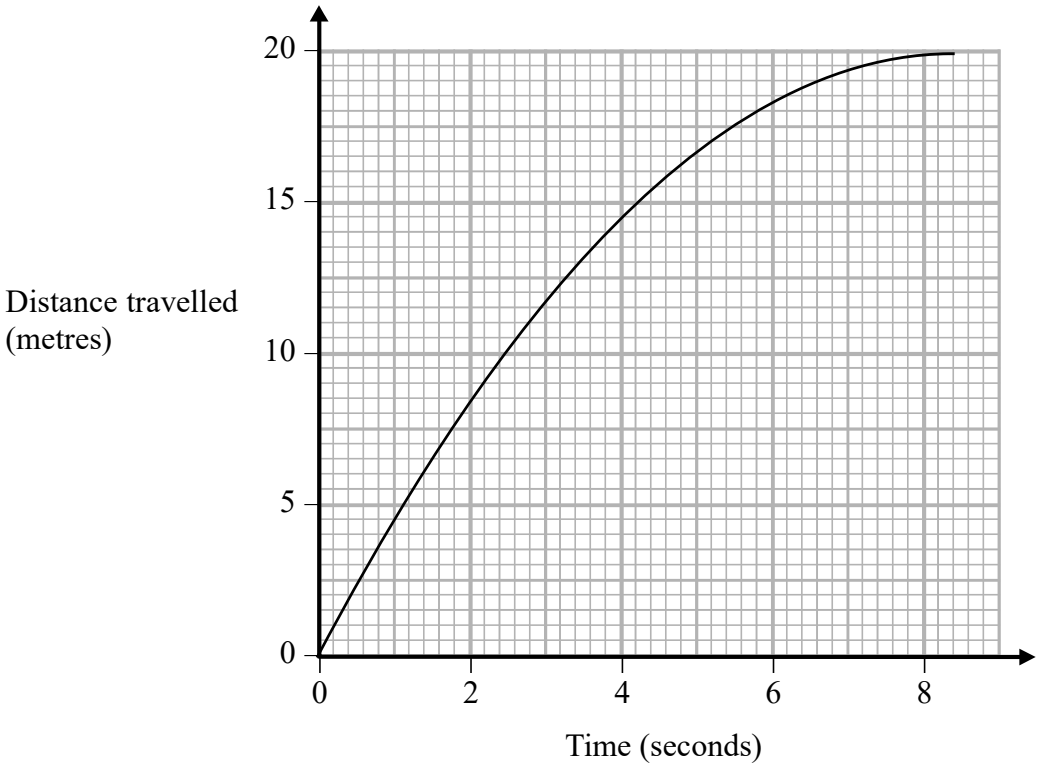
(Total for Question 4 is 5 marks)

5 The graph shows information about part of a cyclist's journey.



Work out an estimate of the speed, in m/s, of the cyclist at time 4 seconds.

..... m/s

(Total for Question 5 is 3 marks)

6 Here are the first five terms of a sequence.

-5 -2 4 13 25

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 6 is 2 marks)

7 When a biased coin is thrown 4 times, the probability of getting 2 heads and 2 tails in any order is $\frac{216}{625}$

Work out the probability of getting 4 tails when the coin is thrown 4 times.

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(Total for Question 7 is 5 marks)

8 Show that $\dfrac{8x^3 - 50x}{2x^2 + x - 10} \div \dfrac{6x^2 - 29x + 35}{3x^2 - 13x + 14}$ simplifies to ax where a is an integer.

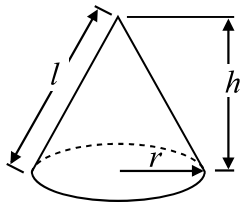
(Total for Question 8 is 5 marks)

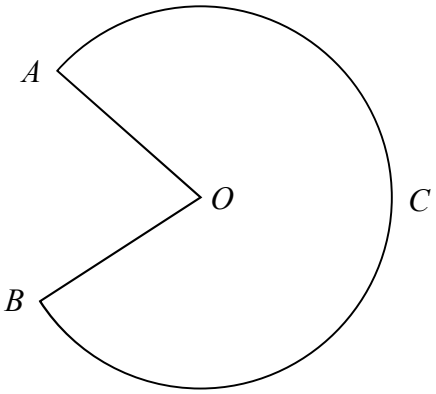
9 The diagram shows a sector $OACB$ of a circle with centre O.
The point C is the midpoint of the arc AB.

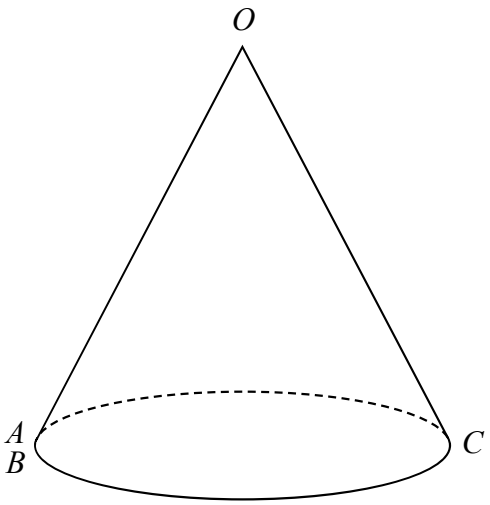
The diagram also shows a hollow cone with vertex O.
The cone is formed by joining OA and OB.

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

Curved surface area of cone = πrl







The cone has volume 82.6 cm^3 and height 5.2 cm.

Calculate the size of angle AOB of sector $OACB$.
Give your answer correct to 3 significant figures.
You must show all your working.

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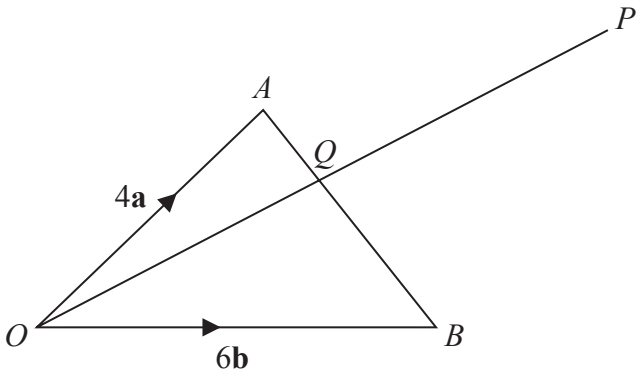
(Total for Question 9 is 5 marks)

10



OAB is a triangle.
Q is the point on AB such that OQP is a straight line.

$\overrightarrow{OA} = 4\mathbf{a}$ $\overrightarrow{OB} = 6\mathbf{b}$ $\overrightarrow{AP} = 2\mathbf{a} + 8\mathbf{b}$

Using a vector method, find the ratio $AQ : QB$

.....

(Total for Question 10 is 5 marks)