GCSE Grade 8/9

Maths Booklet 6

Paper 3H
Calculator

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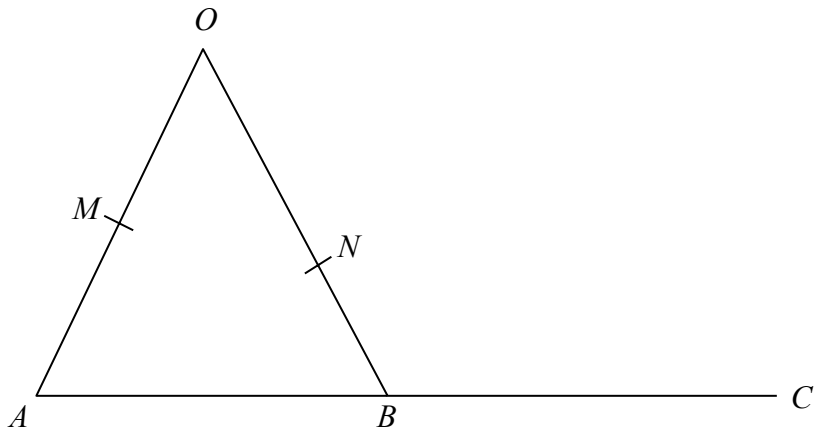
1

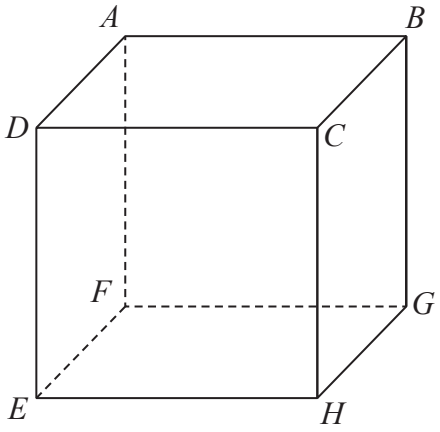


OMA, ONB and *ABC* are straight lines.
M is the midpoint of *OA*.
B is the midpoint of *AC*.
$\overrightarrow{OA} = 6\mathbf{a}$ $\overrightarrow{OB} = 6\mathbf{b}$ $\overrightarrow{ON} = k\mathbf{b}$ where *k* is a scalar quantity.

Given that *MNC* is a straight line, find the value of *k*.

(Total for Question 1 is 5 marks)

2 The diagram shows a cube.



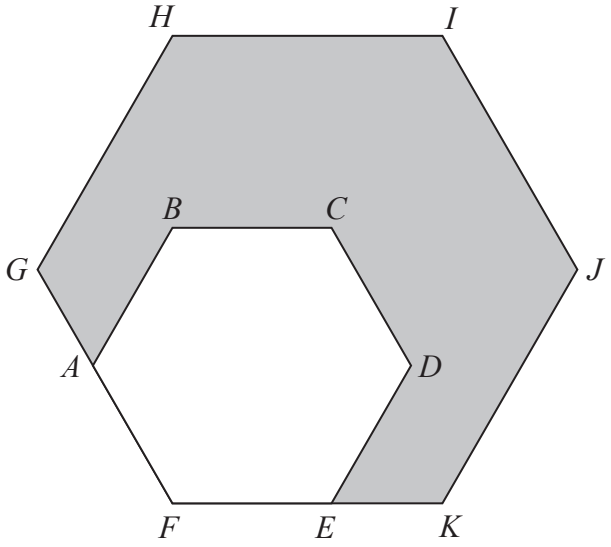
AH = 11.3 cm correct to the nearest mm.

Calculate the lower bound for the length of an edge of the cube.
You must show all your working.

..... cm

(Total for Question 2 is 4 marks)

3



ABCDEF is a regular hexagon with sides of length x.
This hexagon is enlarged, centre F, by scale factor p to give hexagon *FGHIJK*.

Show that the area of the shaded region in the diagram is given by $\frac{3\sqrt{3}}{2}(p^2 - 1)x^2$

(Total for Question 3 is 4 marks)

4 $5c + d = c + 4d$

(a) Find the ratio $c : d$

.....

(2)

$6x^2 = 7xy + 20y^2$ where $x > 0$ and $y > 0$

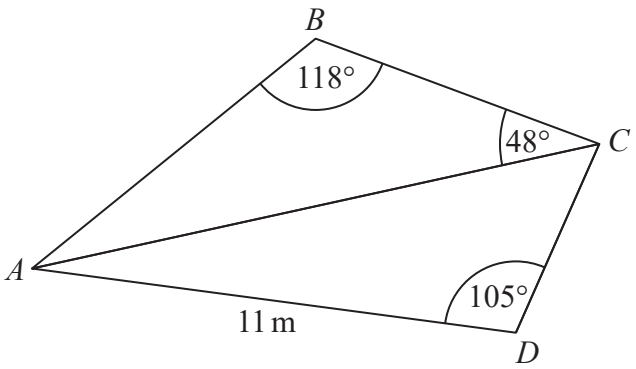
(b) Find the ratio $x : y$

.....

(3)

(Total for Question 4 is 5 marks)

5 *ABC* and *ADC* are triangles.



The area of triangle *ADC* is $56\,m^2$

Work out the length of *AB*.
Give your answer correct to 1 decimal place.

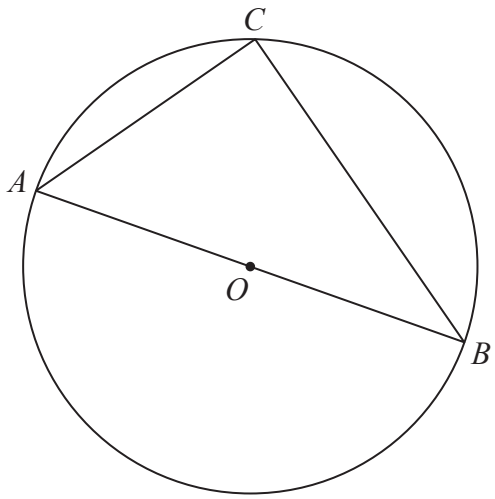
..... m

(Total for Question 5 is 5 marks)

6 Prove algebraically that the straight line with equation $x - 2y = 10$ is a tangent to the circle with equation $x^2 + y^2 = 20$

(Total for Question 6 is 5 marks)

7

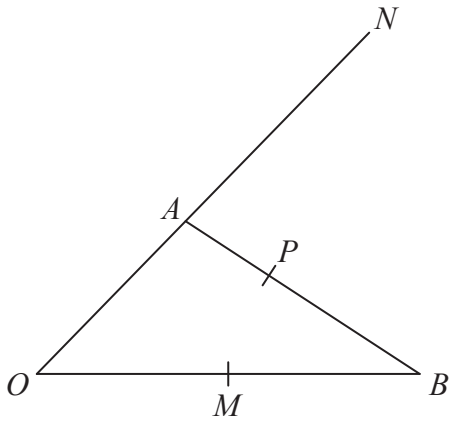


A, *B* and *C* are points on the circumference of a circle, centre *O*.
AOB is a diameter of the circle.

Prove that angle *ACB* is 90°
You must **not** use any circle theorems in your proof.

(Total for Question 7 is 4 marks)

8



OAN, *OMB* and *APB* are straight lines.
$AN = 2OA$.
M is the midpoint of *OB*.

$\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{OB} = \mathbf{b}$

$\overrightarrow{AP} = k\overrightarrow{AB}$ where *k* is a scalar quantity.

Given that *MPN* is a straight line, find the value of *k*.

.....

(Total for Question 8 is 5 marks)