GCSE MATHEMATICS · HIGHER

Targeting Grade 9

Paper 5 · Non-calculator · 50 minutes · 40 marks

Name ..... **Date** .....

Answer **all** questions. Show all your working: answers without working may not get full marks. Diagrams are **not** accurately drawn. You must **not** use a calculator.

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1 a and b are numbers such that

$$2^a = 8^b \quad \text{and} \quad 9^a \times 3^b = 81^2$$

Work out the value of a and the value of b.

$a =$ .....

$b =$ .....

(Total for Question 1 is 4 marks)

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2 Work out $0.4\dot{5} + 0.\dot{4}\dot{5}$

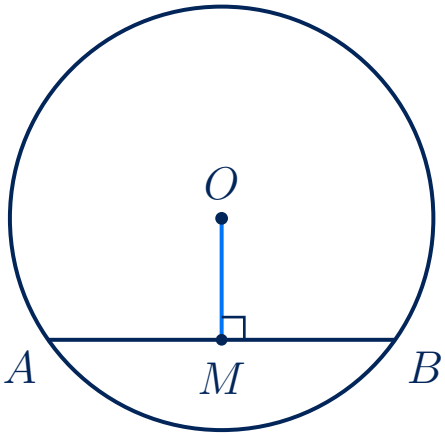
Give your answer as a fraction in its simplest form.

You must show all your working.

. . . . . .

(Total for Question 2 is 4 marks)

3



A and B are points on a circle, centre O.

M is the point on the chord AB such that OM is perpendicular to AB.

Prove that M is the midpoint of AB.

(Total for Question 3 is 4 marks)

4 There are 50 students in a group.

28 of the students study French.

22 of the students study Spanish.

x of the students study both French and Spanish.

The number of students who study neither French nor Spanish is $2x - 6$

(a) Work out the value of x.

$x =$ .....

(2)

(b) Two students who study Spanish are chosen at random.

Work out the probability that both of these students also study French.

.....

(3)

(Total for Question 4 is 5 marks)

5 The functions f and g are such that

$$f(x) = 3 - 2x \qquad g(x) = \frac{1}{x+1} \quad x \neq -1$$

The function h is such that $h(x) = fg(x)$

(a) Find $h^{-1}(x)$

Give your answer as a single fraction.

$h^{-1}(x) =$ .....

(4)

(b) Write down the value of x that cannot be input into h^{-1}

.....

(1)

(Total for Question 5 is 5 marks)

6 The graph of $y = a\cos x^\circ + b$ passes through the points $(0,\ 7)$ and $(60,\ 5)$

a and b are constants.

(a) Work out the value of a and the value of b.

$a =$ .....

$b =$ .....

(2)

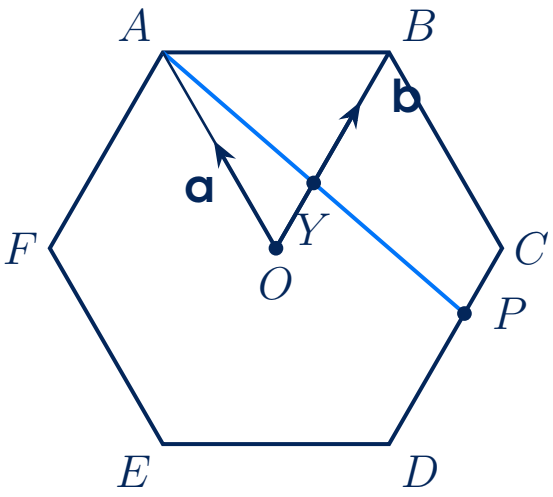
(b) Solve $a\cos x^\circ + b = 1$ for $0 \leqslant x \leqslant 360$

.....

(3)

(Total for Question 6 is 5 marks)

7



$ABCDEF$ is a regular hexagon with centre O.

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

P is the point on CD such that $CP : PD = 1 : 2$

The line AP meets OB at the point Y.

Work out the ratio $OY : YB$

You must show all your working.

. . . . . .

(Total for Question 7 is 6 marks)

8 The curve with equation $y = x^2 + px + q$ has a turning point at $(3,\ k)$
The curve passes through the point $(5,\ 7)$

(a) Work out the values of p, q and k.

$p =$ .....
$q =$ .....
$k =$ .....

(4)

(b) Find the coordinates of the points where the curve meets the line with equation $y = 2x$

.....

(3)

(Total for Question 8 is 7 marks)

TOTAL FOR PAPER IS 40 MARKS

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