



Surname _____

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Centre Number _____

Candidate Number _____

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I declare this is my own work.

Level 2 Certificate FURTHER MATHEMATICS

8365/2

Paper 2 Calculator

Time allowed: 1 hour 45 minutes

MATERIALS

For this paper you must have:

- a calculator
- mathematical instruments.



At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



J U N 2 1 8 3 6 5 2 0 1

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INSTRUCTIONS

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer ALL questions.
- You must answer the questions in the spaces provided. Do not write on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

INFORMATION

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more graph paper and tracing paper. These must be tagged securely to this answer book.
- The use of a calculator is expected but calculators with a facility for symbolic algebra must NOT be used.

DO NOT TURN OVER UNTIL TOLD TO DO SO



Answer ALL questions in the spaces provided.

1 Expand and simplify $5(2x - 1) + 4(11 - x)$

**Give your answer in the form $a(bx + c)$
where a , b and c are integers greater than 1
[3 marks]**

Answer _____



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[Turn over]



2 (a) $5m$ is decreased by 40%

The answer is $(m + 1)$

Work out the value of m . [2 marks]

Answer _____



2 (b) Solve $\sqrt[3]{2w-10} = 18$ [2 marks]

$w =$

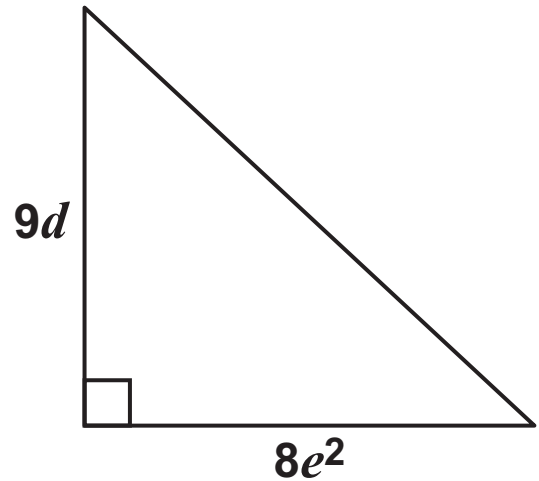
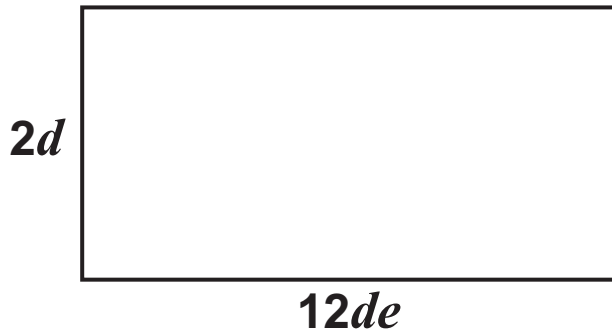
[Turn over]



3

The rectangle and triangle shown have equal areas.

The diagrams are not drawn accurately.



Work out the value of $\frac{d}{e}$

Give your answer in its simplest form.
[3 marks]



Answer _____

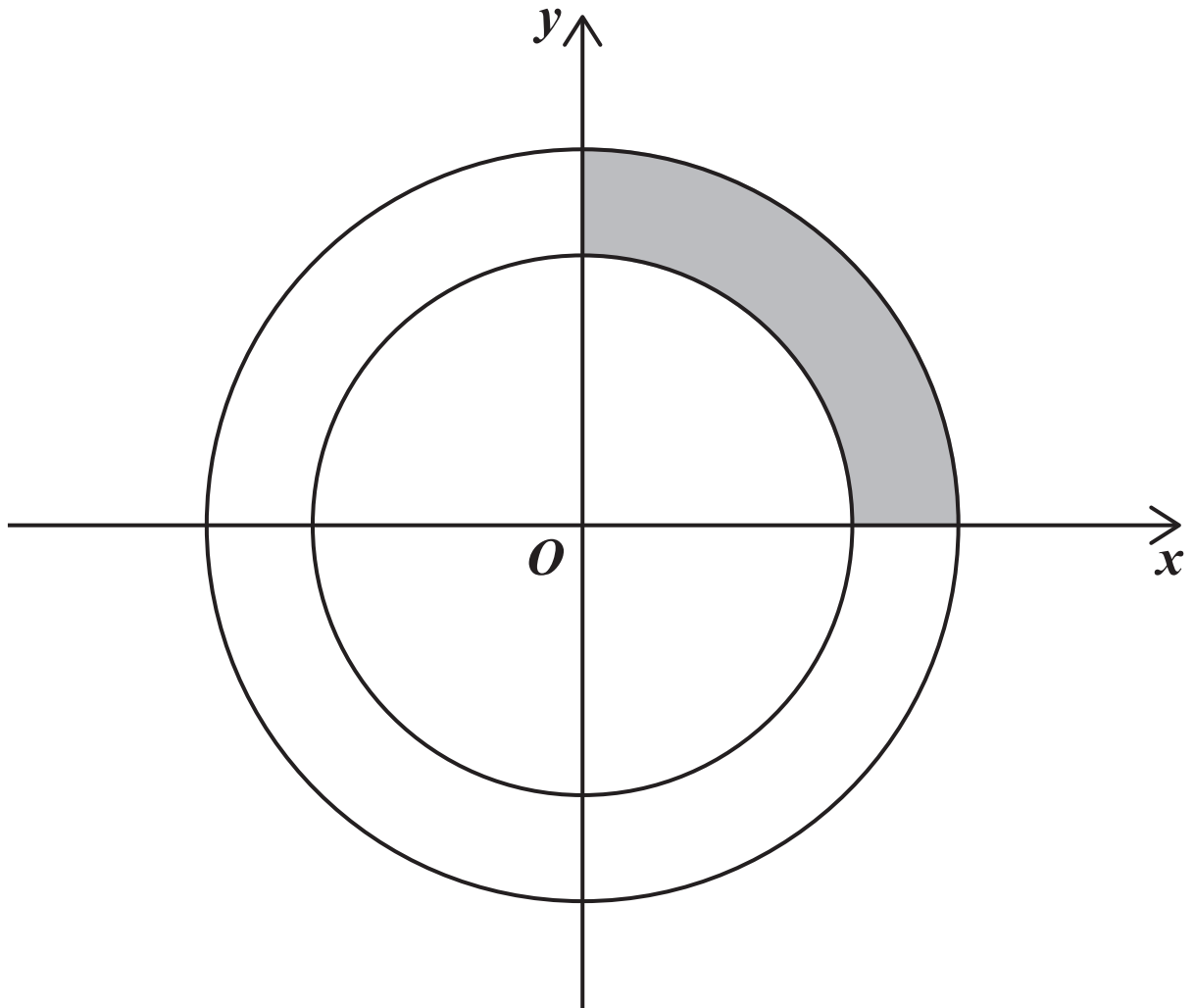
10

[Turn over]



- 4 The equations of the two circles shown are $x^2 + y^2 = 100$ and $x^2 + y^2 = 36$

The diagram is not drawn accurately.



Work out the shaded area.

**Give your answer as an integer multiple of π .
[3 marks]**

[illegible]

Answer _____ **units²**

[Turn over]



5

SQR is a right-angled triangle.

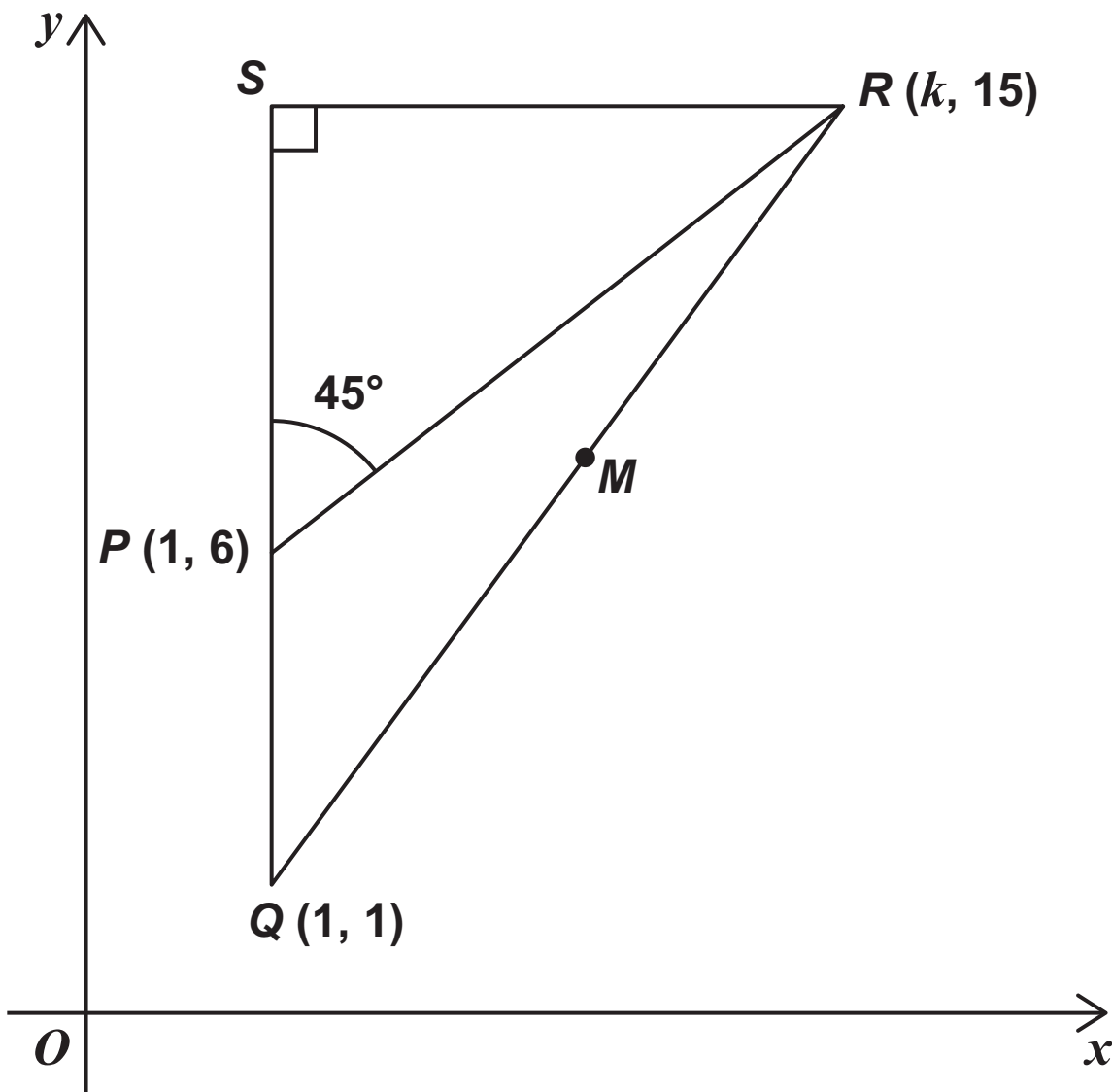
P is a point on SQ .

Angle $SPR = 45^\circ$

M is the midpoint of QR .

k is a constant.

The diagram is not drawn accurately.



Work out the coordinates of M . [3 marks]

Answer (_____ , _____)

6

[Turn over]



6

Rearrange $y = \sqrt{\frac{x+2w}{3}}$

to make w the subject. [3 marks]

Answer _____



7 (a) a is a value greater than 1

Work out the value of m for which
 $(a^m)^4 = (a^5)^{2m}$ [2 marks]

$m =$ _____

7 (b) $w^3x^2y^5 = w^{13}x^7$

Write y in terms of w and x .

Give your answer in its simplest form.
[2 marks]

$y =$ _____

[Turn over]

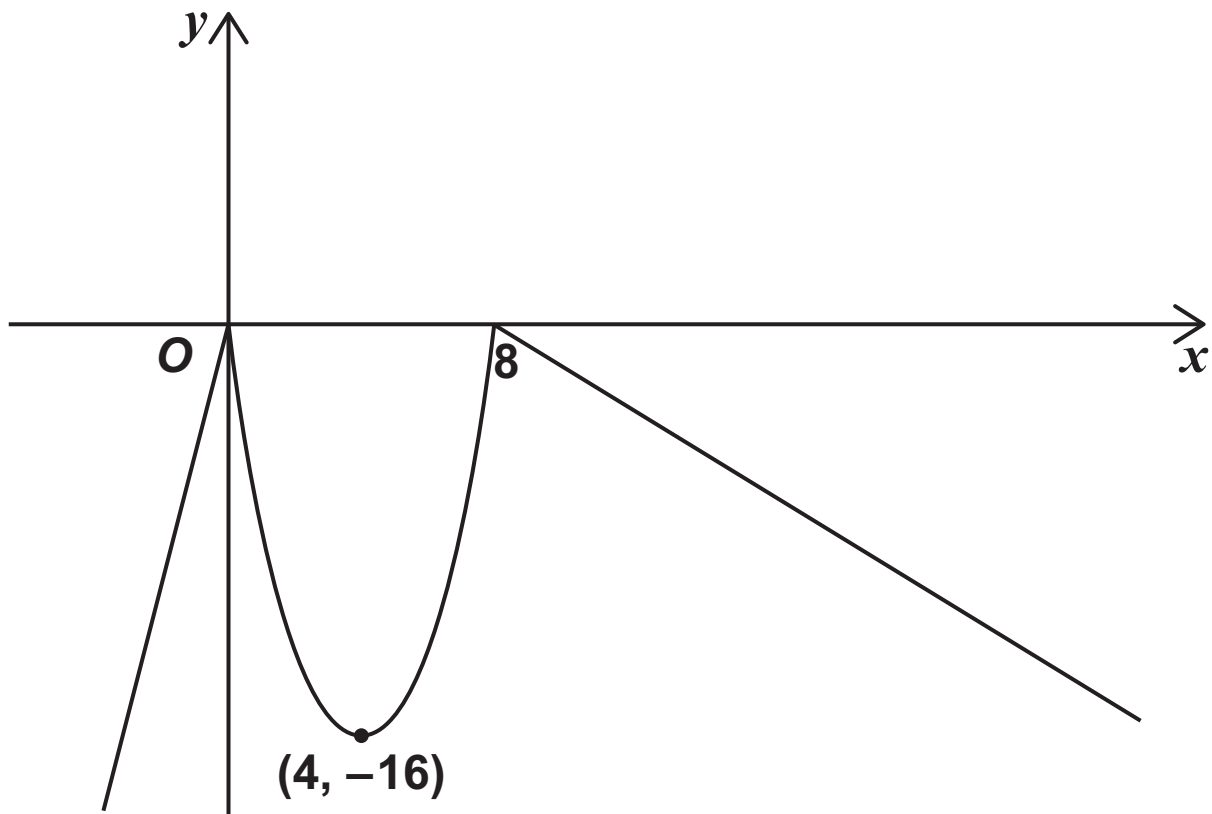


8 A function f is given by

$$\begin{aligned} f(x) &= 4x & x < 0 \\ &= x^2 - 8x & 0 \leq x \leq 8 \\ &= 16 - 2x & x > 8 \end{aligned}$$

A sketch of $y = f(x)$ is shown.

The diagram is not drawn accurately.



Work out ALL the values of x for which $f(x) = -12$ [4 marks]

[illegible]

Answer _____

11

[Turn over]



9 (a) Circle the expression that is equivalent to

$$\frac{1}{a} + \frac{1}{b} \quad [1 \text{ mark}]$$

$$\frac{2}{a + b}$$

$$\frac{ab}{b + a}$$

$$\frac{2}{ab}$$

$$\frac{b + a}{ab}$$

9 (b) Simplify fully $\frac{6c^4 - c^3}{36c^2 - 1}$ [3 marks]

Answer _____



10 The radius of a sphere, in cm, is $\frac{3k}{2}$

The volume of the sphere, in cm^3 , is 972π

Volume of a sphere = $\frac{4}{3}\pi r^3$ where r is the radius

Work out the value of k . [3 marks]

Answer _____

[Turn over]



11

Expand and simplify fully $(5x + 3y^2)(4x - y^2)$
[3 marks]

Answer

10



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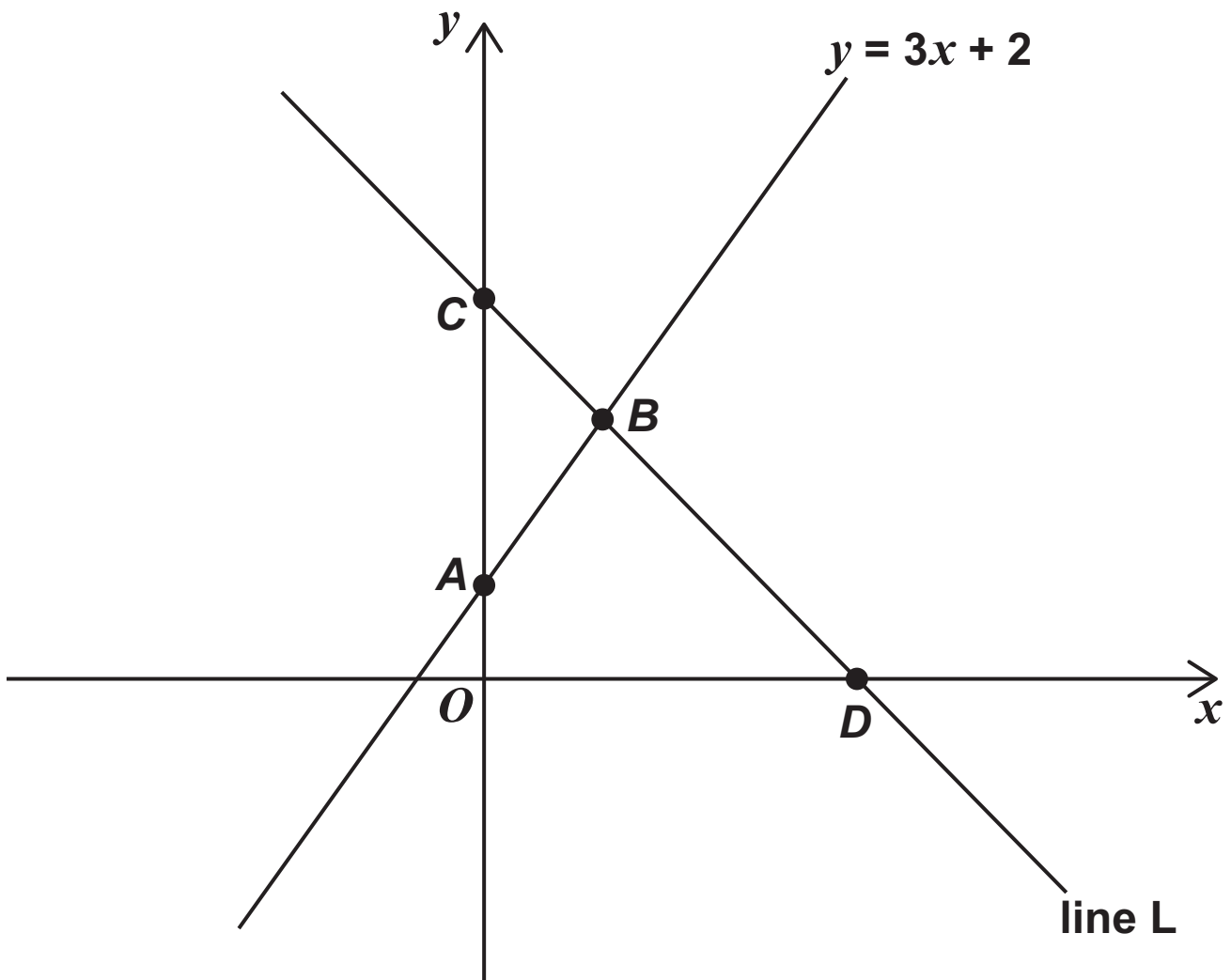
12

A and B are points on the line $y = 3x + 2$

B , C and $D(5, 0)$ are points on the line L .

$$OA : AC = 1 : 4$$

The diagram is not drawn accurately.



Work out the x -coordinate of B . [5 marks]

[illegible]

Answer _____

[Turn over]



13

**P is the point on the curve $y = ax^3 + 10x^2$
where $x = 2$**

The gradient of the NORMAL to the curve at

P is $-\frac{1}{4}$

Work out the value of a . [4 marks]

[illegible]

Answer



14 (a) $A = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

Describe geometrically the single transformation represented by A. [1 mark]

Answer _____

14 (b) $B = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

Describe geometrically the single transformation represented by B² [2 marks]

Answer _____

[Turn over]



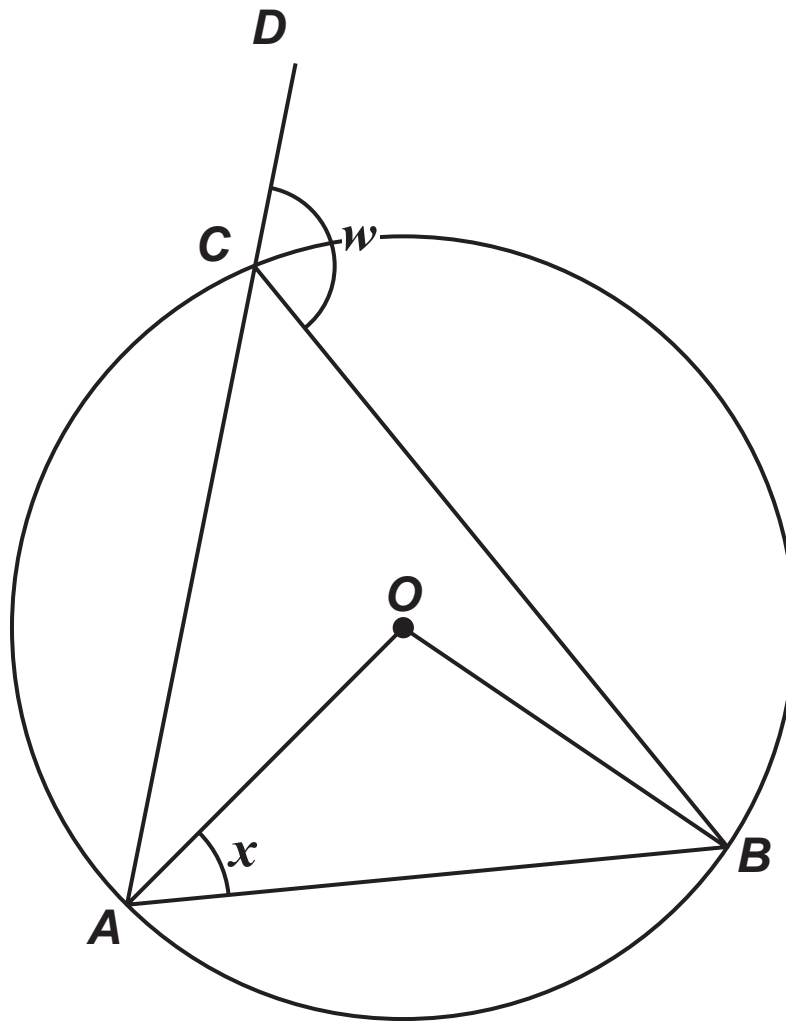
15

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

ACD is a straight line.

Angle $BCD = w$

The diagram is not drawn accurately.



Prove that $w = x + 90^\circ$ [5 marks]

[illegible]

[Turn over]



16

The coefficient of x^4 in the expansion of $(a + 2x)^6$ is 1500

Work out the TWO possible values of a .
[3 marks]

[illegible]

Answer _____ **and** _____



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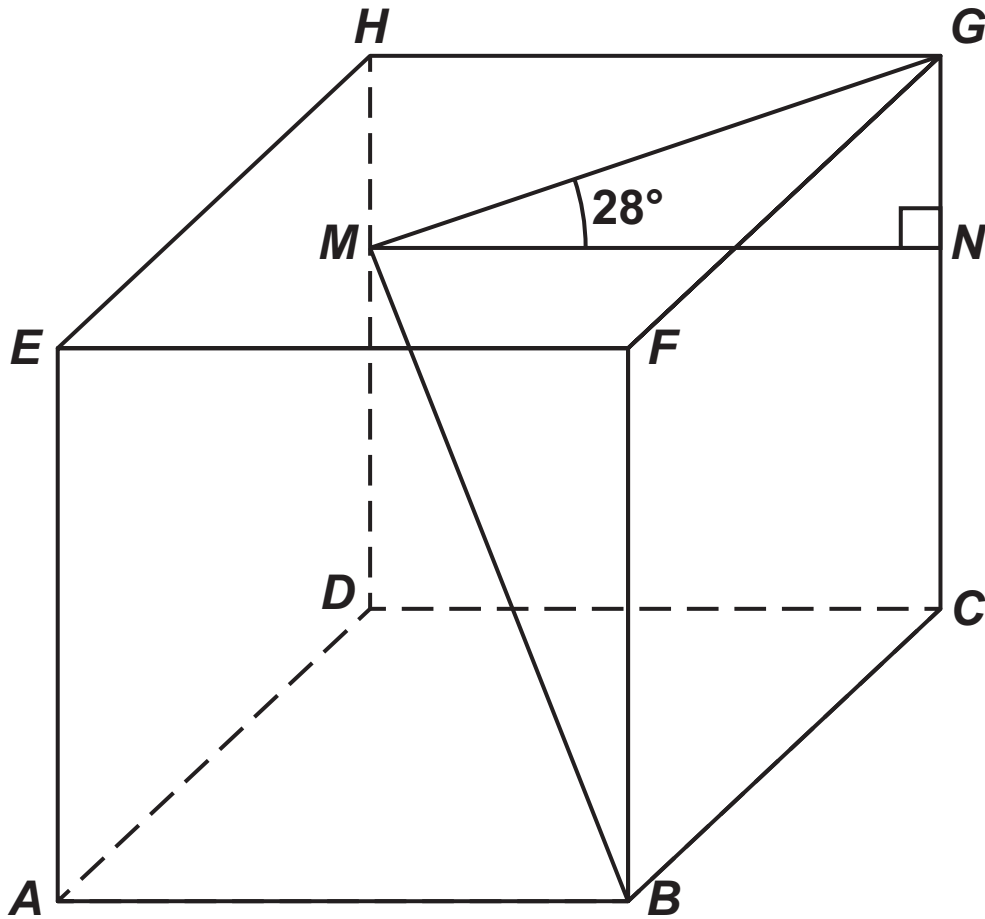
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17

$ABCDEFGH$ is a cube with side length 32 cm

M and N are points on DH and CG respectively.



Work out the size of the angle that the line BM makes with the plane $ABCD$. [5 marks]

[illegible]

Answer _____ **degrees**

3

[Turn over]



18

$$y = 12x + \frac{3}{x}$$

Show that y has a minimum value when $x = 0.5$
[5 marks]

[illegible]

[Turn over]



19 (a) $f(x) = (x + 2)^3$

g is a function such that $gf(x) = (x + 2)^{12}$

Work out an expression for $g(x)$ [1 mark]

Answer



19 (b) $h(x) = x^2 + 5$

k is a function such that $hk(x) = 4x^2 + 5$

Work out an expression for $kh(x)$ [2 marks]

Answer

8

[Turn over]



20

Show that $\frac{2\sin x + \cos x}{\tan x} - \frac{1}{\sin x}$ can be written in the form $a\cos x + b\sin x$ where a and b are integers. [4 marks]

[illegible]

[Turn over]



21

$3x^2 + 2bx + 8a$ can be written in the form $3(x + a)^2 + b + 2$

Work out the TWO possible pairs of values of a and b . [6 marks]

[illegible]

a = _____ **b** = _____

END OF QUESTIONS



Additional page, if required.

Write the question numbers in the left-hand margin.

[illegible]

Additional page, if required.

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