

Please write clearly in block capitals.

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Forename(s) _____

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I declare this is my own work.

Level 2 Certificate FURTHER MATHEMATICS

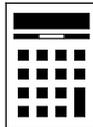
Paper 2 Calculator

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or 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.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
TOTAL	



Answer **all** questions in the spaces provided.

Do not write
outside the
box

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 _____

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

The answer is $(m + 1)$

Work out the value of m .

[2 marks]

Answer _____

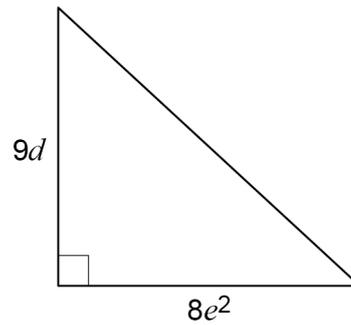
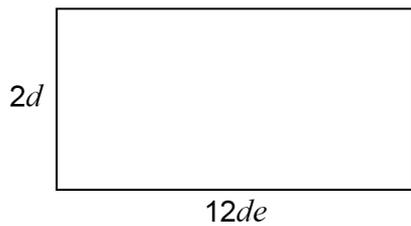


2 (b) Solve $\sqrt[3]{2w-10} = 18$

[2 marks]

$w =$ _____

3 The rectangle and triangle shown have equal areas.

Not drawn
accurately

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

Give your answer in its simplest form.

[3 marks]

Answer _____

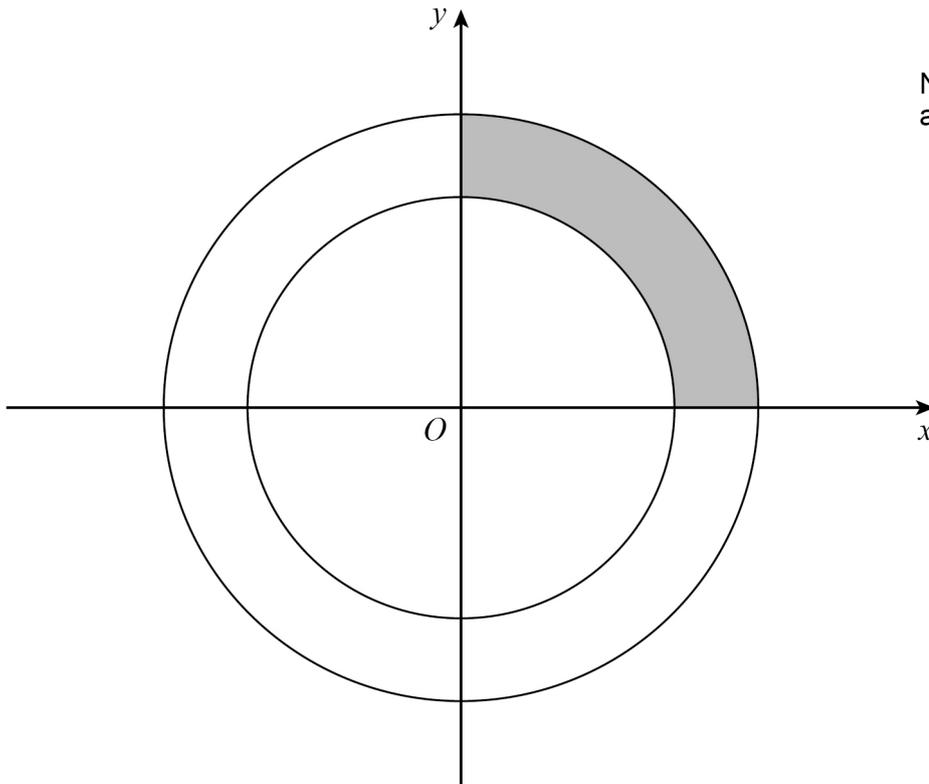
10

Turn over ►



4 The equations of the two circles shown are

$$x^2 + y^2 = 100 \quad \text{and} \quad x^2 + y^2 = 36$$



Not drawn
accurately

Work out the shaded area.

Give your answer as an integer multiple of π .

[3 marks]

Answer _____ units²



5

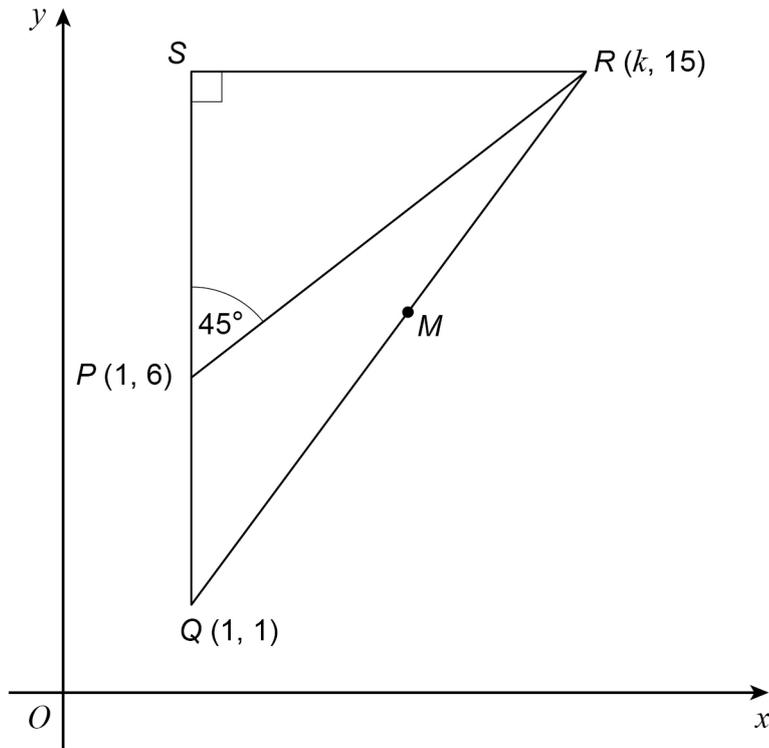
SQR is a right-angled triangle.

P is a point on SQ .

Angle $SPR = 45^\circ$

M is the midpoint of QR .

k is a constant.



Not drawn
accurately

Work out the coordinates of M .

[3 marks]

Answer (_____ , _____)



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]

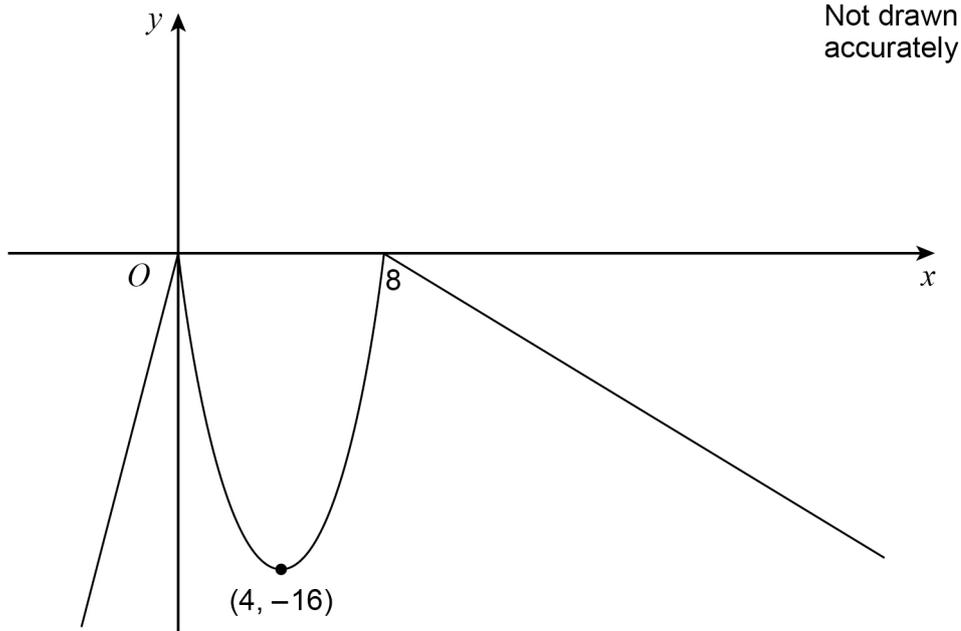
$y =$ _____



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.



Work out **all** the values of x for which $f(x) = -12$

[4 marks]

Answer _____



9 (a) Circle the expression that is equivalent to $\frac{1}{a} + \frac{1}{b}$

[1 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

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

Work out the value of k .

[3 marks]

Answer _____

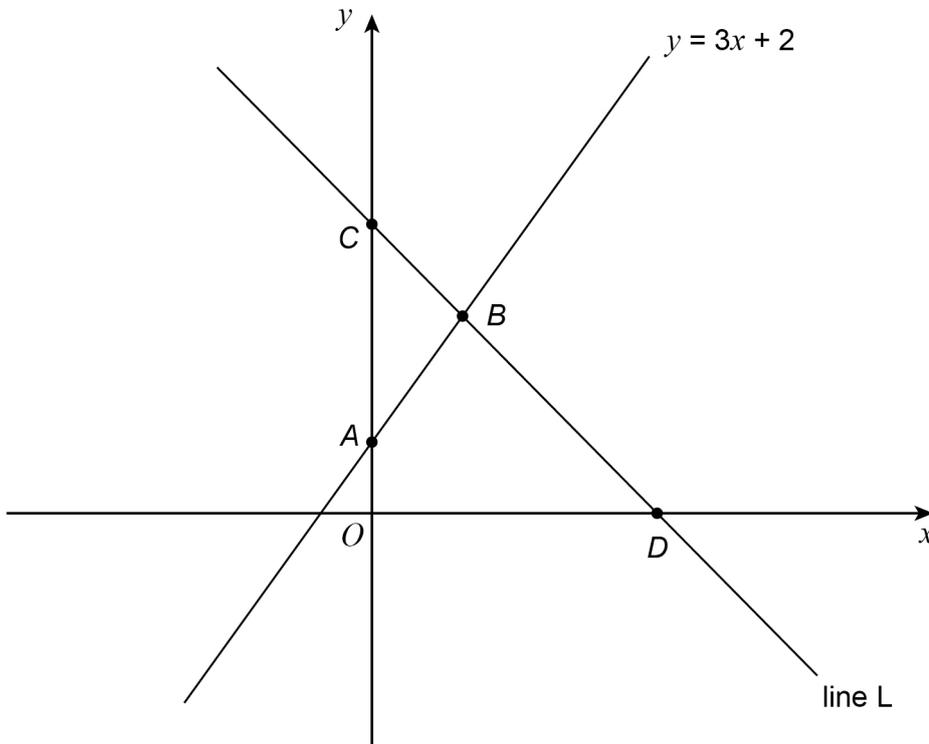
11 Expand and simplify fully $(5x + 3y^2)(4x - y^2)$

[3 marks]

Answer _____



- 12 A and B are points on the line $y = 3x + 2$
 B, C and D (5, 0) are points on the line L.
 $OA : AC = 1 : 4$



Not drawn
accurately

Work out the x -coordinate of B.

[5 marks]

Answer _____



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]

Answer _____

Turn over for the next question



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

Describe geometrically the single transformation represented by \mathbf{A} .

[1 mark]

Answer _____

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

Describe geometrically the single transformation represented by \mathbf{B}^2

[2 marks]

Answer _____



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

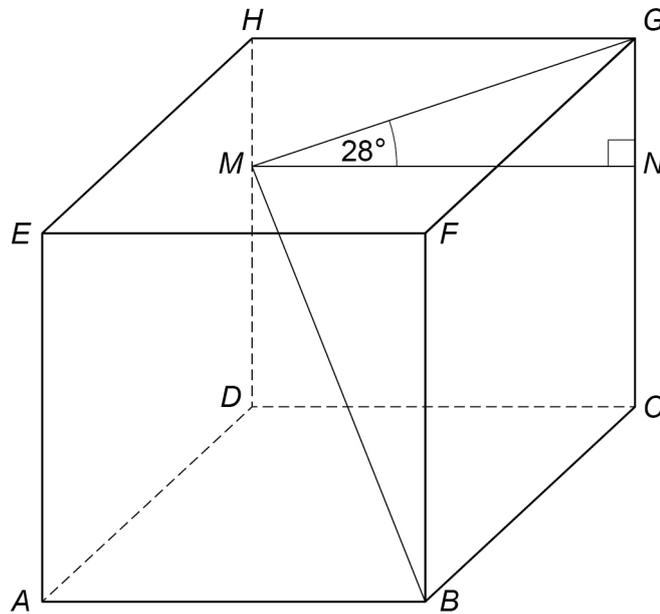
Work out the **two** possible values of a .

[3 marks]

Answer _____ and _____



- 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]

Answer _____ degrees



- 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 _____

Turn over for the next question



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