

Please write clearly in block capitals.

Centre number

Candidate number

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

Level 2 Certificate FURTHER MATHEMATICS

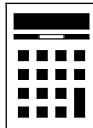
Paper 2 Calculator

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 _____

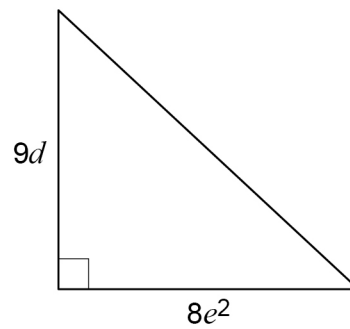
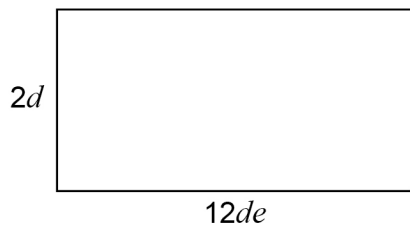


2 (b) Solve $\sqrt[3]{2w-10} = 18$

[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 _____

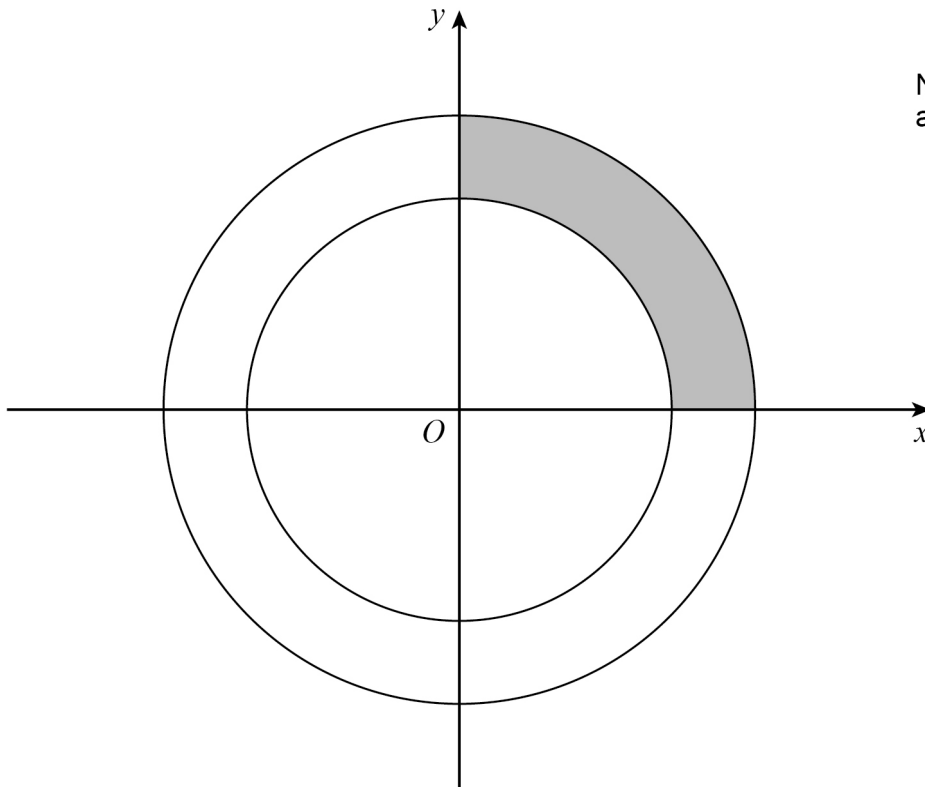
10

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.

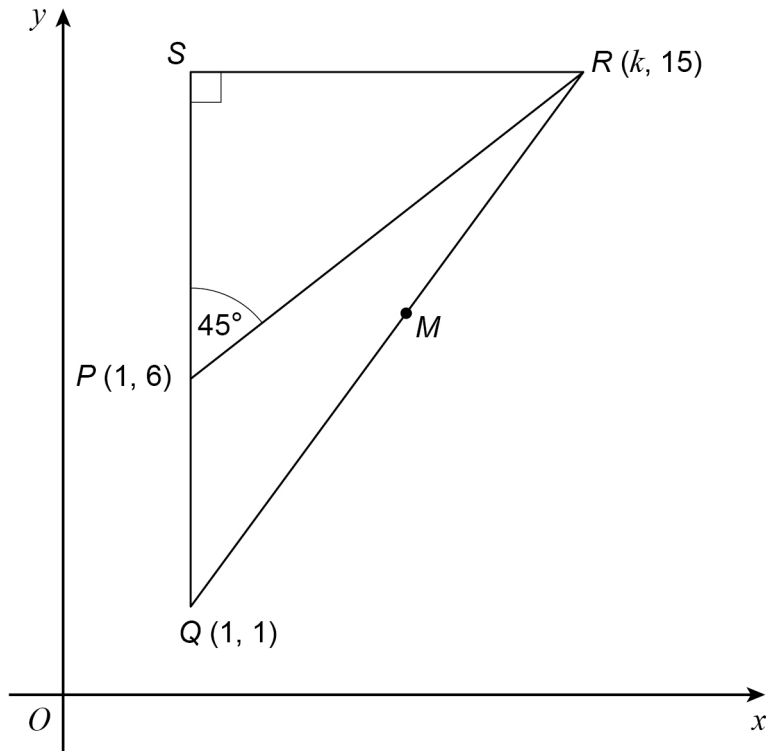
Give your answer as an integer multiple of π .

[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]

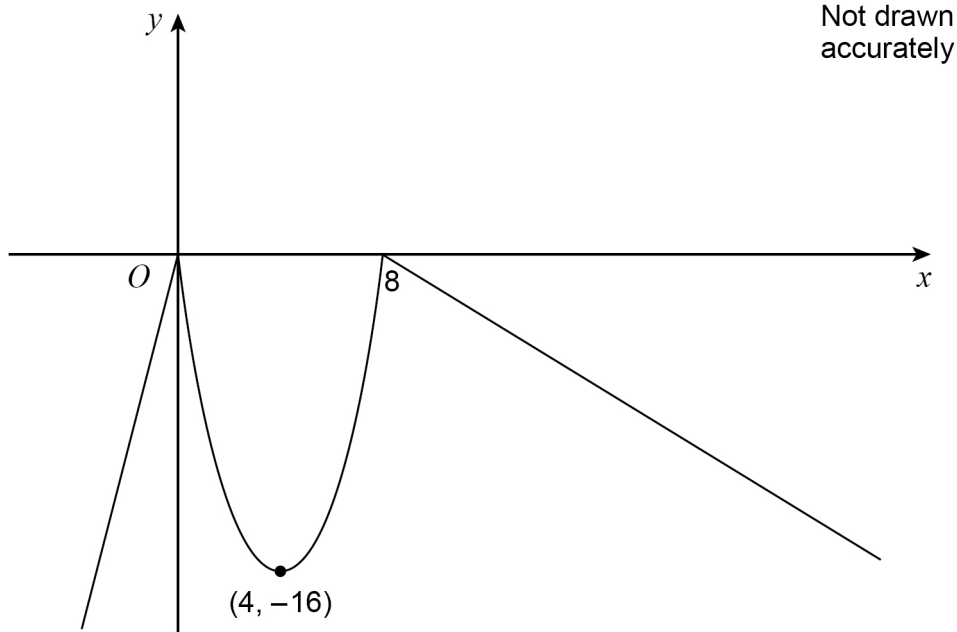
$y =$ _____



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 _____

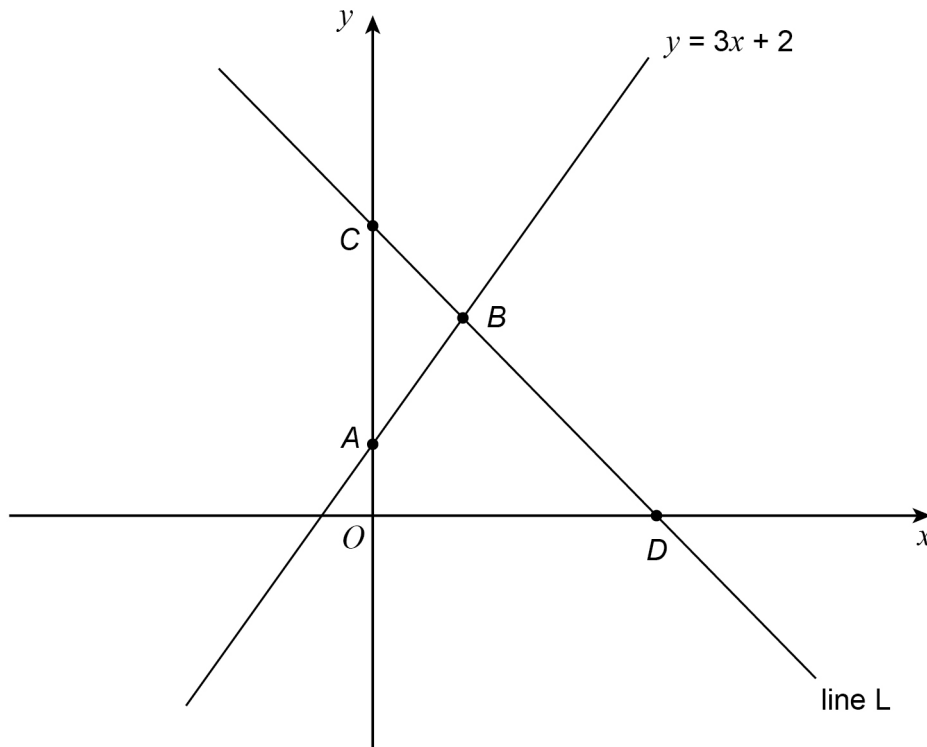
11 Expand and simplify fully $(5x + 3y^2)(4x - y^2)$

[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) $\mathbf{B} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

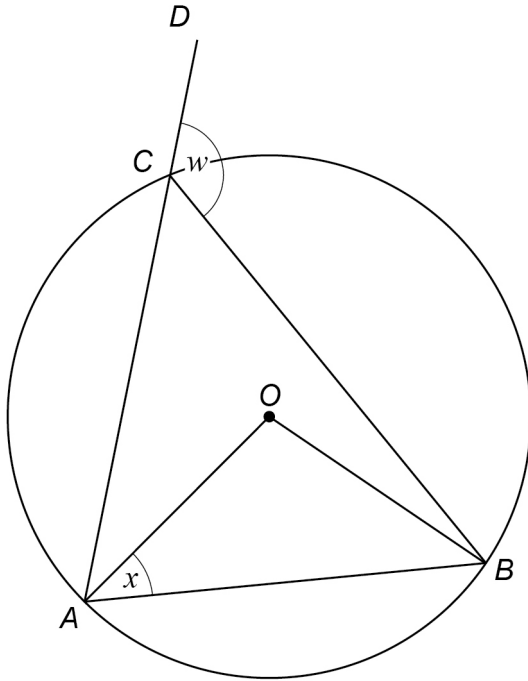
Describe geometrically the single transformation represented by \mathbf{B}^2

[2 marks]

Answer _____



- 15 A, B and C are points on a circle, centre O .
 ACD is a straight line.
Angle $BCD = w$



Not drawn
accurately

Prove that $w = x + 90^\circ$

[5 marks]

8

Turn over ►



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

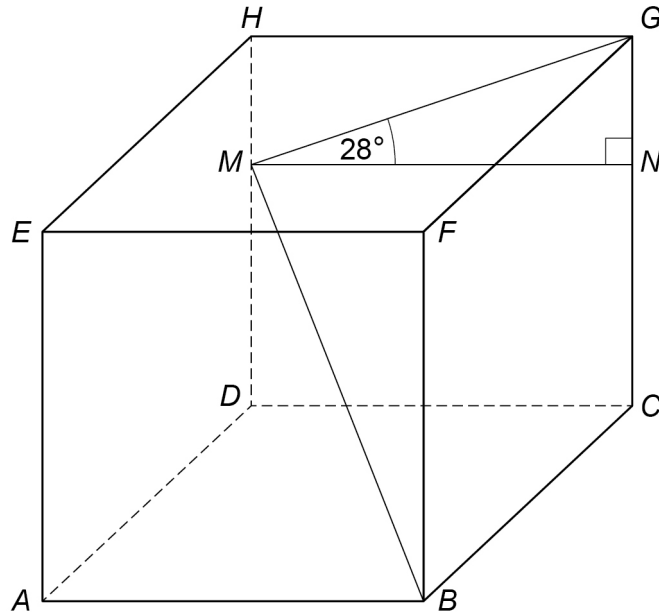
Work out the **two** possible values of a .

[3 marks]

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

8

Turn over ►



18

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

Show that y has a minimum value when $x = 0.5$

[5 marks]



- 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



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]



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]

$a =$ _____ $b =$ _____

$a =$ _____ $b =$ _____

END OF QUESTIONS



There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Copyright information

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.aqa.org.uk.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2021 AQA and its licensors. All rights reserved.



2 4



2 1 6 G 8 3 6 5 / 2

IB/M/Jun21/8365/2