Dr Oliver Mathematics
AQA Further Maths Level 2
June 2025 Paper 2
1 hour 45 minutes

The total number of marks available is 80.
You must write down all the stages in your working.
You are permitted to use a scientific or graphical calculator in this paper.

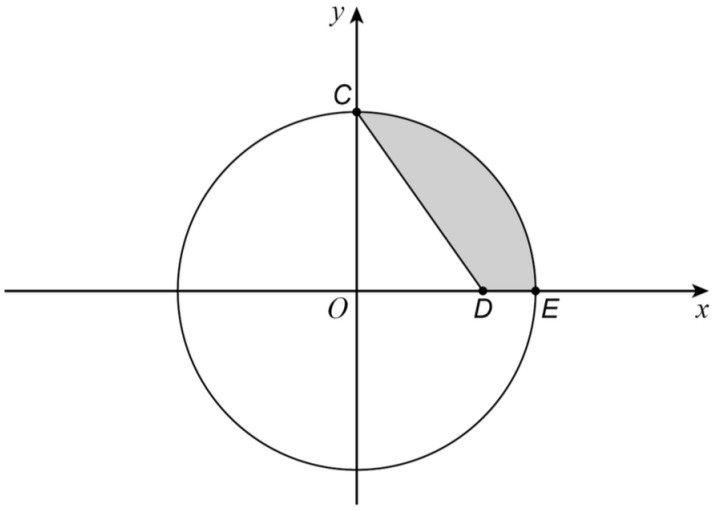
1. The 5th term in sequence A is also a term in sequence B. (3)

Sequence	nth term
A	$\dfrac{6n}{7n+25}$
B	$\dfrac{20}{n+4}$

Work out the **position** of the term in sequence B.

2. C and E are points on the circle with equation (4)

$$x^2 + y^2 = 144.$$



Not drawn accurately

- CD is a straight line.
- $OD : DE = 5 : 1$.

Work out the shaded area.
Give your answer as a decimal.

3. The equation of a straight line is (3)

$$2ax + y = 25, \text{ where } a \text{ is a constant.}$$

The line passes through the point $(3, 1)$.

Work out the value of the gradient of the line.

4. (2)

$$-5 \leqslant n \leqslant 5.$$

Work out the range of possible values of n^2.

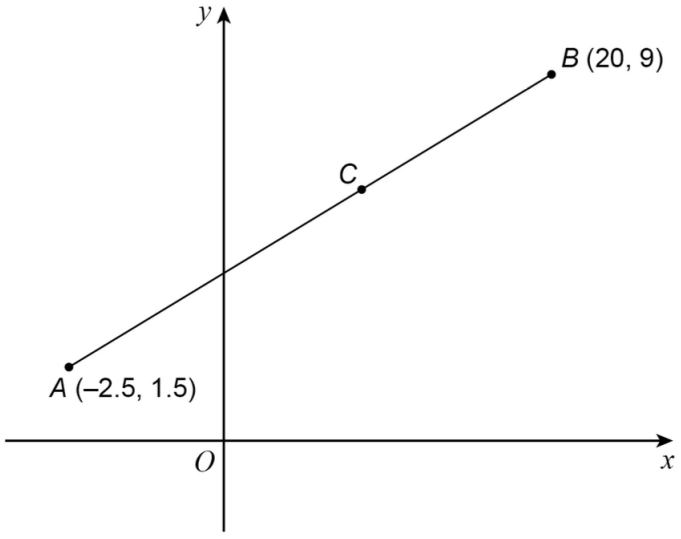
5. The equation of a curve is (3)

$$y = x^5 + px^4, \text{ where } p \text{ is a constant.}$$

When $x = -1$, the gradient of the curve is -3.

Work out the value of p.

6. C is a point on the straight line AB. (3)



Not drawn accurately

$AC : CB = 3 : 2$.

Work out the equation of the straight line passing through O and C.

7. (a) (2)

$$2^{5a+1} = 2^a.$$

Work out the value of a.

(b) (3)

$$3^{-7} \div 3^c = (3^{-3})^{2c}.$$

Work out the value of c.

8. k is a positive integer. (3)

Prove that

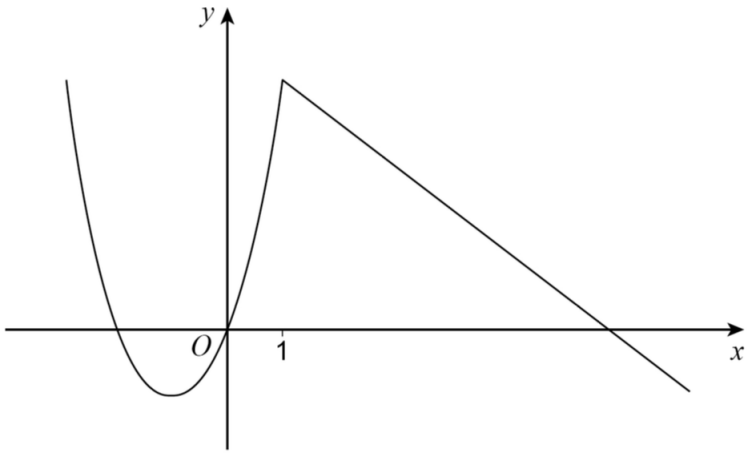
$$4k(k+8) - (4k+9)(k-1)$$

is a multiple of 9.

9. (2)

$$\mathrm{f}(x) = \begin{cases} x^2 + px, & x \leqslant 1 \\ 2p - \frac{1}{2}x, & x > 1. \end{cases}$$

A sketch of $y = \mathrm{f}(x)$ is shown.



Work out the value of p.

10. The first four terms of a quadratic sequence are (2)

$$-1 \qquad 11 \qquad 31 \qquad 59.$$

Work out an expression for the nth term.
Give your answer in the form $an^2 + b$, where a and b are constants.

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11. (a) Simplify fully (2)

$$\frac{3}{4w} + \frac{1}{6w}.$$

(b) Factorise fully (2)

$$(x-1)^9 + (x-1)^8(x+4).$$

(c) Factorise fully (2)

$$8y^2 - 50.$$

12. (a) Circle the matrix that represents an enlargement, scale factor 3, centre O. (1)

$$\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix} \quad \begin{pmatrix} 3 & 3 \\ 0 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 3 \\ 3 & 0 \end{pmatrix} \quad \begin{pmatrix} 3 & 0 \\ 3 & 0 \end{pmatrix}$$

(b) $OABC$ is the unit square, where $O(0,0)$, $A(1,0)$, $B(1,1)$, and $C(0,1)$. (3)

- **K** is the transformation represented by

$$\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}.$$

- **L** is the transformation represented by

$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}.$$

$OABC$ is mapped to $OA'B'C'$ under a combined transformation of **K** followed by **L**.

Work out the coordinates of A', B', and C'.

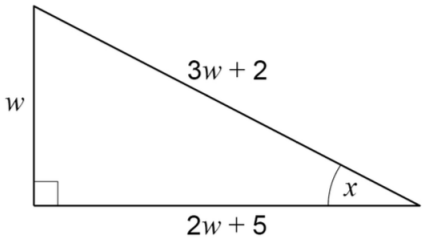
13. Rearrange (4)

$$x = \frac{3k^2}{5k^2 - 2}$$

to make k the subject.

14. All lengths shown are in centimetres.

Not drawn accurately



(a) Use Pythagoras' theorem to show that (2)

$$4w^2 - 8w - 21 = 0.$$

(b) Work out the size of angle x. (3)

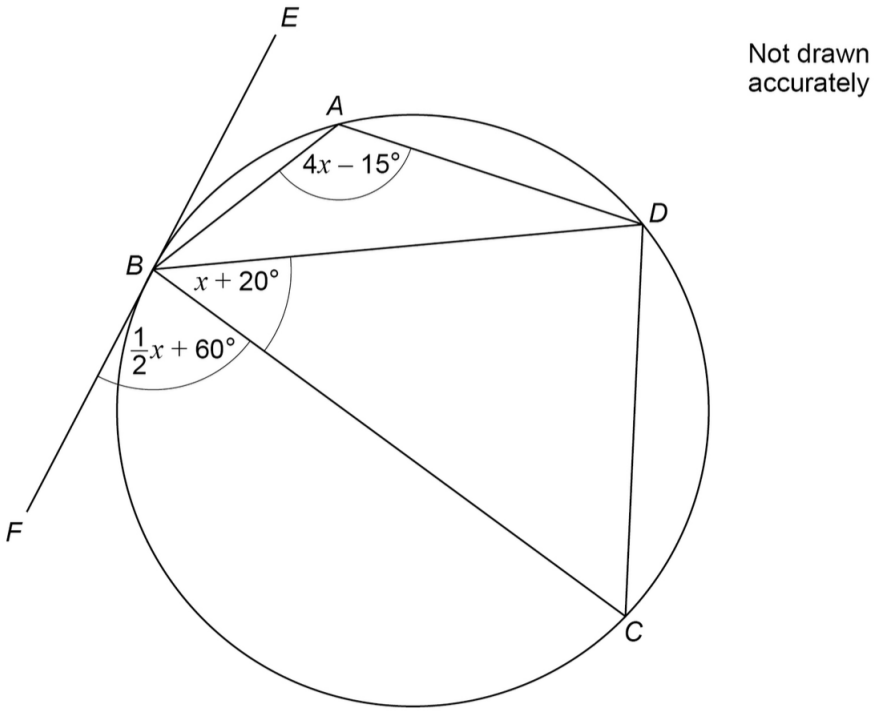
15. For a curve $y = \mathrm{f}(x)$,

$$\frac{\mathrm{d}y}{\mathrm{d}x} = 1 - \frac{9}{x^2}.$$

(a) Show that the curve has a turning point where $x = 3$. (1)

(b) Use $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2}$ to work out the nature of the turning point. (2)
You **must** show your working.

16. A, B, C, and D are points on a circle. (4)



EBF is a tangent.

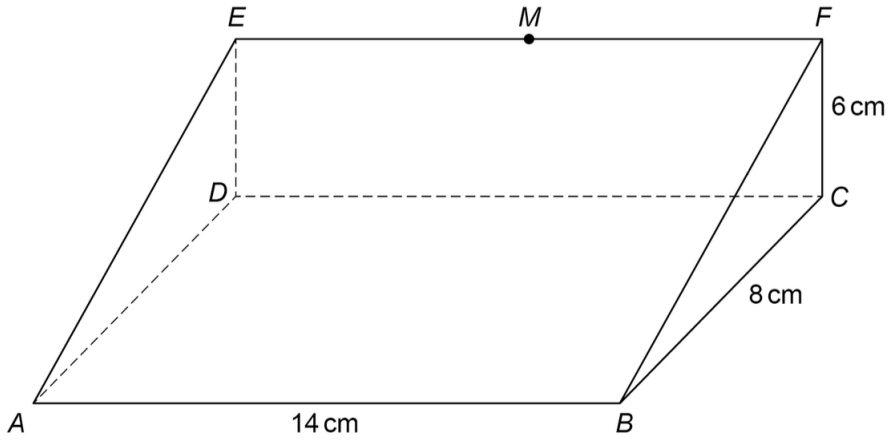
Work out the value of x.

17. Solve (5)

$$2a + 4b + c = 12$$
$$3a - b + 2c = -2$$
$$a - 5b - 3c = 6.$$

Do **not** use trial and improvement.
You **must** show your working.

18. $ABCDEF$ is a triangular prism. (5)



- $ABCD$ is a rectangle and angle BCF is $90°$.
- $AB = 14$ cm.
- $BC = 8$ cm
- $CF = 6$ cm.
- M is the midpoint of EF.

Work out the size of angle BMD.

19. (4)

$$\mathrm{f}(x) = 4x^3 - 7 \text{ and } \mathrm{g}(x) = 6x + 8.$$

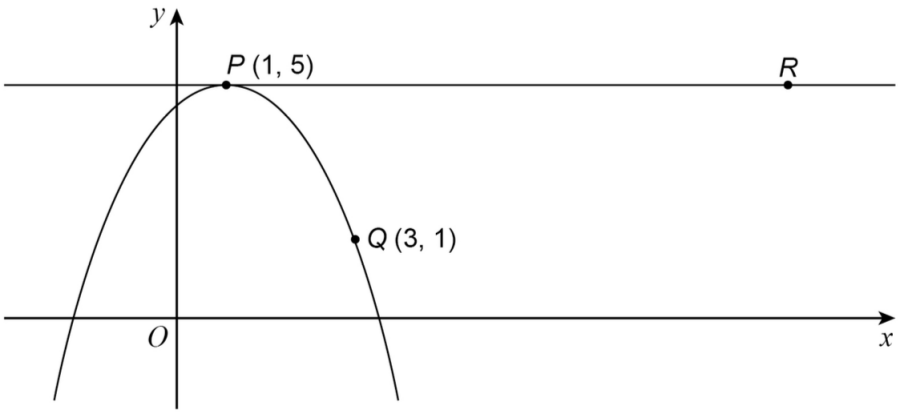
Work out the value of x for which

$$\mathrm{f}(2x) = \mathrm{g}\,\mathrm{f}(x).$$

20. Here is a sketch of the curve with equation (5)

$$y = 4 + 2x - x^2.$$

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- The tangent to the curve at the turning point P is shown.
- The normal to the curve at Q meets this tangent at R.

Work out the x-coordinate of R.

21. (a) θ is an angle between 270° and 360°. (2)

$$\cos\theta = \tfrac{1}{5k} \text{ and } \tan\theta = -3k, \text{ where } k \text{ is a positive constant.}$$

Work out the value of θ.

(b) Work out the values of x between 0° and 360° for which (3)

$$8\cos^2 x - \cos x = 0.$$

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