

Teach Me Maths

Please write clearly in block capitals.

Name _____

Date _____

Level 2 Certificate

FURTHER MATHEMATICS

Paper 2 Calculator

Mock Set B

For AQA Level 2 Certificate in Further Mathematics (8365)

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments
- the Formulae Sheet (the last page of this paper).

Instructions

- Write in black ink or black ball-point pen. Use a pencil for diagrams.
- Write your name and the date at the top of this page.
- Answer **all** questions.
- Write your answers in the spaces provided. If you need more room, use extra paper and write the question number next to your answer.
- Do all your rough work on this paper. Cross out 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 use extra answer paper, graph paper and tracing paper.
- The use of a calculator is expected, but calculators with a facility for symbolic algebra must not be used.

For the marker

TOTAL (out of 80)

Practice paper written by Teach Me Maths in the style of AQA Level 2 Certificate in Further Mathematics (8365). Not an official AQA paper.

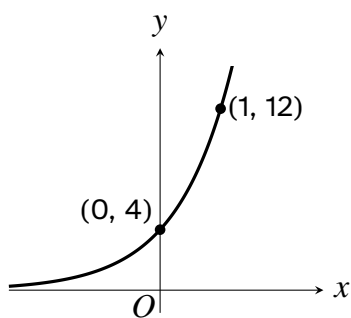
Answer **all** questions in the spaces provided.

- 1 Factorise fully $10(x + 4)^3 - 15(x + 4)^2$

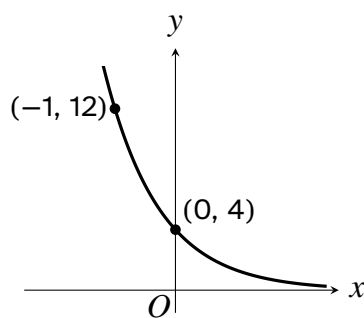
[2 marks]

Answer _____

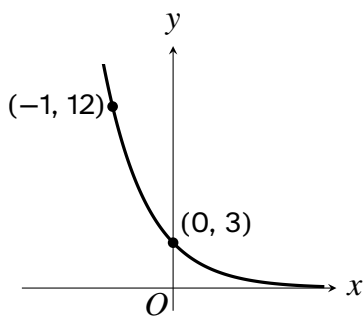
- 2 Here are four sketch graphs.



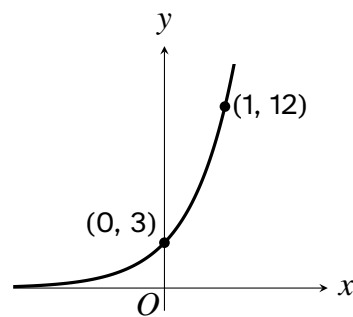
A



B



C



D

Which sketch shows the graph of $y = 4 \times 3^{-x}$?

Circle your answer.

[1 mark]

A

B

C

D

- 3** $P(-7, 2)$ and $Q(3, -4)$ are the ends of a diameter of a circle.

Work out the equation of the circle.

Give your answer in the form $(x - a)^2 + (y - b)^2 = k$

[3 marks]

Answer _____

- 4** Triangle ABC has vertices $A(-5, -1)$, $B(1, 2)$ and $C(3, -2)$

(a) Use gradients to show that angle ABC is a right angle.

[3 marks]

(b) Work out the area of triangle ABC .

[2 marks]

Answer _____ units²

5 Here are the first four terms of a quadratic sequence.

−3 4 17 36

(a) Work out an expression for the n th term.

[3 marks]

Answer _____

(b) The m th term of the sequence is 1041

Work out the value of m .

You must show your working.

[2 marks]

$m =$ _____

- 6 A curve has equation

$$y = \frac{6x^4 - 5x + 8}{2x^2}$$

Work out the gradient of the curve at the point where $x = -2$

You must show your working.

[4 marks]

Answer _____

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

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

[1 mark]

(b) Matrix $\mathbf{B}$ represents a rotation of 90° clockwise about the origin.

Work out $\mathbf{B}^3$ and describe fully the single transformation that $\mathbf{B}^3$ represents.

[2 marks]

8 $7n^2 + 12 < 160$

List all the integer values of n that satisfy this inequality.

[2 marks]

Answer _____

9 Solve the simultaneous equations

$$2x + 3y = 4k$$

$$y = kx + 1$$

where k is a positive constant.

Give x and y in terms of k , each as a single fraction.

[3 marks]

$x =$ _____ $y =$ _____

10 The function f is given by

$$f(x) = x^2 + px - 6 \quad x < 2$$

$$= 5 - px \quad x \geq 2$$

where p is a constant.

$$f(-5) = f(3)$$

Work out the value of p .

[3 marks]

$p =$ _____

11 Simplify

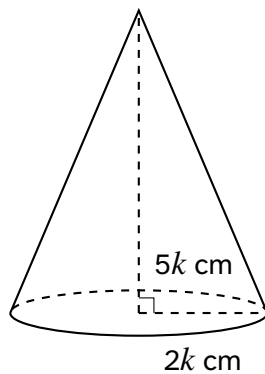
$$\frac{\sqrt{x^5}(\sqrt[3]{x^2} + \sqrt{x})}{x^2}$$

Give your answer in the form $x^{\frac{a}{b}} + x^c$ where a, b and c are integers.

[3 marks]

Answer _____

- 12 A solid cone has base radius $2k$ cm and perpendicular height $5k$ cm.



Not drawn accurately

The volume of the cone is 250π cm³

Volume of a cone = $\frac{1}{3}\pi r^2 h$ where r is the radius and h is the height

Work out the value of k .

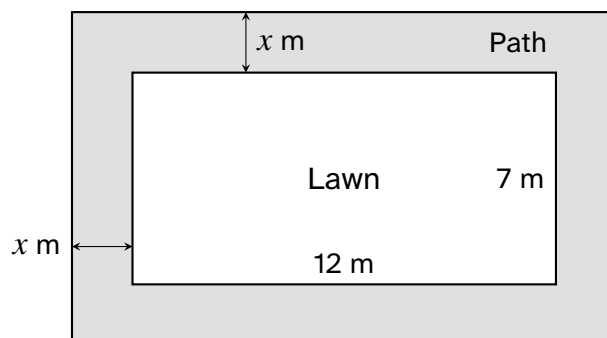
Give your answer to 3 significant figures.

[3 marks]

$k =$ _____

- 13** A rectangular lawn is 12 m long and 7 m wide.

A gravel path of width x metres goes all the way round the lawn.



Not drawn accurately

The area of the path is 50 m^2

Work out the value of x .

Give your answer to 3 significant figures.

[3 marks]

$x =$ _____

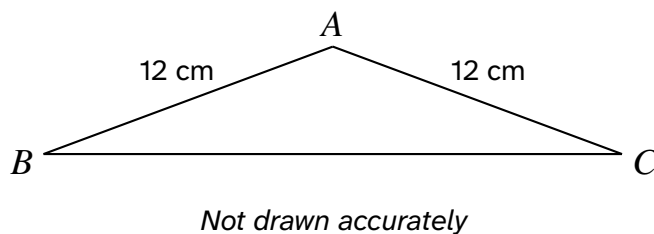
14 Simplify fully

$$\frac{6y^2}{2y^2 - y - 15} \div \frac{4y}{9 - 3y}$$

[4 marks]

Answer _____

- 15 Triangle ABC is isosceles with $AB = AC = 12$ cm.



The area of triangle ABC is 47 cm^2

Angle BAC is obtuse.

Work out the size of angle ABC .

Give your answer to 1 decimal place.

[4 marks]

Answer _____ degrees

- 16** Rearrange $y = \frac{3 + 4k^3}{2k^3 - 5}$ to make k the subject.

[4 marks]

$$k = \underline{\hspace{10cm}}$$

- 17** $(x + 5)$ is a factor of $3x^3 + 14x^2 + ax - 10$ where a is a constant.

(a) Use the factor theorem to work out the value of a .

[2 marks]

$$a = \underline{\hspace{10cm}}$$

(b) Factorise $3x^3 + 14x^2 + ax - 10$ fully.

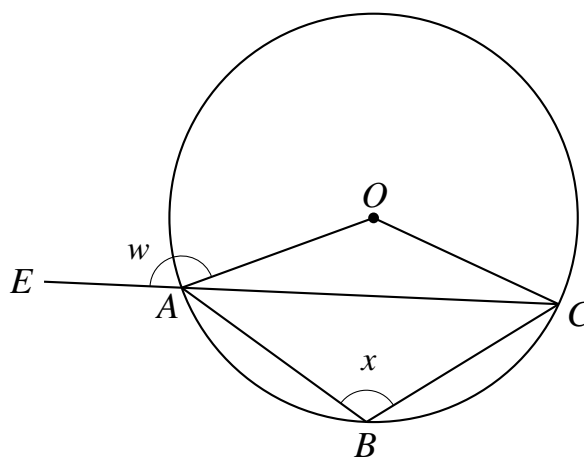
[3 marks]

Answer $\underline{\hspace{10cm}}$

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

EAC is a straight line.

Angle $ABC = x$ Angle $OAE = w$



Not drawn accurately

Prove that $w = 270^\circ - x$

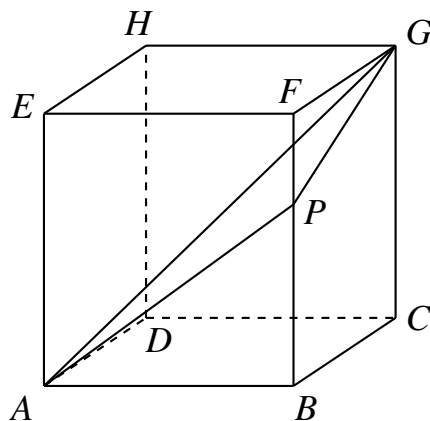
Give a reason for each stage of your working.

[5 marks]

19 $ABCDEFGH$ is a cuboid.

$$AB = 11 \text{ cm} \quad BC = 6 \text{ cm} \quad BF = 12 \text{ cm}$$

P is the point on BF such that $BP:PF = 2:1$



Not drawn accurately

Work out the size of angle APG .

Give your answer to 1 decimal place.

[5 marks]

Answer _____ degrees

20 A curve has equation

$$y = 2x^3 + kx^2 - 24x + 5 \quad \text{where } k \text{ is a constant.}$$

The curve has a stationary point where $x = 4$

Work out the coordinates of the other stationary point of the curve.

You must show your working.

[4 marks]

Answer (_____ , _____)

21 $f(x) = 3x - 4$ $g(x) = 2x^2 + 5x - 1$

Solve $fg(x) = f^{-1}(x)$

Give your answers to 3 significant figures.

You must show your working.

[6 marks]

$x = \underline{\hspace{2cm}}$ or $x = \underline{\hspace{2cm}}$

22 Show that

$$\frac{7 - 7\cos^2 x + 2\sin^2 x}{3\sin x \cos x}$$

can be written as $k \tan x$, where k is an integer.

[3 marks]

END OF QUESTIONS

Formulae Sheet

For AQA Level 2 Certificate in Further Mathematics (8365)

Perimeter, area and volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

$$\text{Area of a trapezium} = \frac{1}{2}(a + b)h$$

Volume of a prism = area of cross section $\times$ length

Where r is the radius and d is the diameter:

$$\text{Circumference of a circle} = 2\pi r = \pi d$$

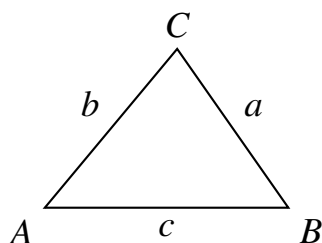
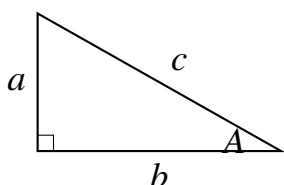
$$\text{Area of a circle} = \pi r^2$$

Quadratic formula

The solution of
 $ax^2 + bx + c = 0$
where $a \neq 0$:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Pythagoras' Theorem and Trigonometry



In any right-angled triangle where a , b and c are the lengths of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a , b and c are the lengths of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b}$$

In any triangle ABC where a , b and c are the lengths of the sides:

$$\text{sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area of triangle} = \frac{1}{2}ab \sin C$$

For any angle θ :

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \quad \text{and} \quad \sin^2 \theta + \cos^2 \theta = 1$$

Coordinate Geometry

Equation of a straight line passing through (x_1, y_1) with gradient m :

$$y - y_1 = m(x - x_1)$$

The general equation of a circle, centre (a, b) , radius r :

$$(x - a)^2 + (y - b)^2 = r^2$$