

Teach Me Maths

Please write clearly in block capitals.

Name _____

Date _____

Level 2 Certificate

FURTHER MATHEMATICS

Paper 1 Non-Calculator

Mock Set D

For AQA Level 2 Certificate in Further Mathematics (8365)

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

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

You must **not** use a calculator.

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.

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** A straight line has gradient $\frac{7}{24}$
The line passes through the point $A(-24, -11)$

The line crosses the y -axis at the point B .

- (a) Work out the coordinates of B .

[2 marks]

Answer (_____ , _____)

- (b) Work out the length AB .

[2 marks]

Answer _____ units

2 Factorise fully

$$24a^2b^3 - 40a^4b$$

[2 marks]

Answer _____

3 $\mathbf{A} = \begin{pmatrix} a & -3 \\ 0 & a \end{pmatrix}$ where a is a constant.

$$\mathbf{A}^2 = \begin{pmatrix} 49 & b \\ 0 & 49 \end{pmatrix} \text{ where } b \text{ is a positive constant.}$$

Work out the values of a and b .

[3 marks]

$a =$ _____ $b =$ _____

- 4 A curve has equation

$$y = (2x + 5)(x - 1)^2$$

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

[3 marks]

Answer _____

- 5 The number

$$\sqrt{147} + \sqrt{12} - \frac{18}{\sqrt{3}}$$

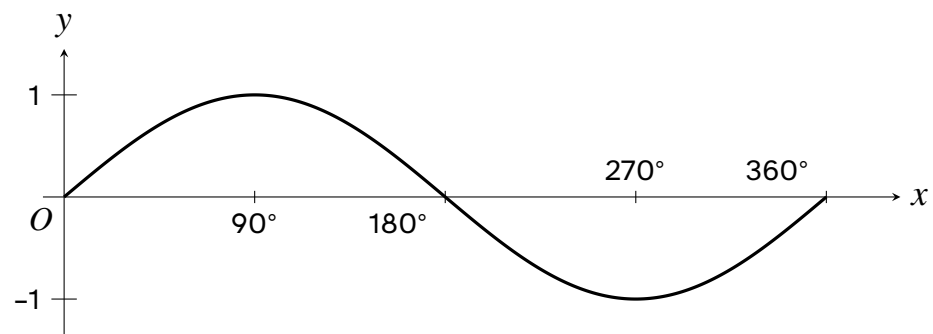
can be written as $\sqrt{n}$, where n is an integer.

Work out the value of n .

[3 marks]

$n =$ _____

- 6 The graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$ is sketched below.



Solve

$$\sin x = -\frac{\sqrt{2}}{2} \quad \text{for } 0^\circ \leq x \leq 360^\circ$$

[2 marks]

Answer _____ $^\circ$ and _____ $^\circ$

- 7 Make p the subject of

$$\frac{3p+2}{q} = p - 5$$

[3 marks]

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

- 8 The n th term of a quadratic sequence is

$$an^2 + bn + 5 \quad \text{where } a \text{ and } b \text{ are integers.}$$

The 3rd term of the sequence is 26

The 5th term of the sequence is 25 more than the 4th term.

Work out the 1st term and the 2nd term of the sequence.

[4 marks]

1st term 2nd term

- 9 (a) Which expression is equal to $8x^{-3}$?

Circle your answer.

[1 mark]

$$(8x)^{-3}$$

$$\frac{1}{8x^3}$$

$$\frac{8}{x^3}$$

$$8x^3$$

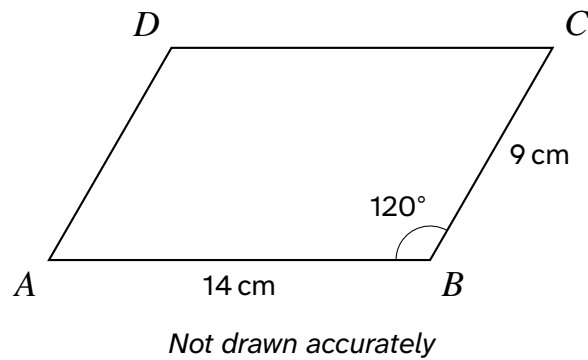
- (b) Simplify fully

$$\frac{10x^{\frac{3}{2}}y^{-1} \times 3x^{\frac{1}{2}}y^4}{6x^{-2}y}$$

[3 marks]

Answer _____

- 10 $ABCD$ is a parallelogram.



Work out the area of the parallelogram.

Give your answer in the form $a\sqrt{b}$ where a and b are integers.

[3 marks]

Answer _____ cm^2

11 $(x - 4)(x^2 + qx + r) \equiv x^3 + px^2 - 11x + 12$

Work out the values of p , q and r .

[3 marks]

$p =$ _____ $q =$ _____ $r =$ _____

12 Solve

$$(2x + 5)(2x - 7) \leq 4x - 3$$

[3 marks]

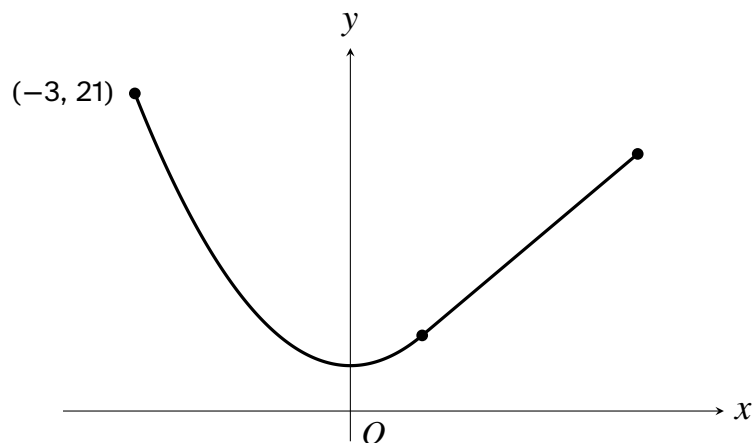
Answer _____

13 A function f is given by

$$\begin{aligned} f(x) &= ax^2 + b & -3 \leq x \leq 1 \\ &= 4x + 1 & 1 < x \leq 4 \end{aligned}$$

where a and b are constants.

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



(a) Work out the values of a and b .

[3 marks]

$a =$ _____ $b =$ _____

(b) Solve $f(x) = 11$

[2 marks]

Answer _____

- 14** A circle has equation

$$(x + 2)^2 + (y - 5)^2 = 13$$

The point $P(1, 3)$ lies on the circle.

Work out the equation of the tangent to the circle at P .

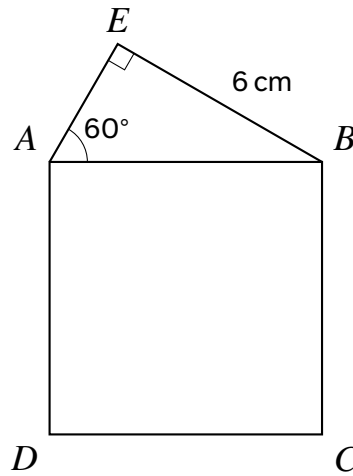
Give your answer in the form $ax + by = c$ where a , b and c are integers.

[4 marks]

Answer _____

- 15 The shape is made from a square $ABCD$ and a right-angled triangle ABE .

Angle $AEB = 90^\circ$ Angle $EAB = 60^\circ$ $EB = 6 \text{ cm}$



Not drawn accurately

Work out the perimeter of the shape.

Give your answer in the form $a + b\sqrt{3}$ where a and b are integers.

[3 marks]

Answer _____ cm

16 Simplify fully

$$\frac{6x^2}{5x+15} \div \frac{2x^2-10x}{x^2-2x-15}$$

[3 marks]

Answer _____

17 The diagram shows a rectangle.

The width of the rectangle is $(1 + \sqrt{3})$ cm.

The area of the rectangle is $(8 + 6\sqrt{3})$ cm²



Not drawn accurately

Work out the length of the rectangle.

Give your answer in the form $p + q\sqrt{3}$ where p and q are integers.

You must show your working.

[3 marks]

Answer _____ cm

- 18** (a) Factorise fully $2x^3 - 7x^2 - 12x + 45$

You must show your working.

[3 marks]

Answer _____

- (b) Write down the coordinates of the point where the curve $y = 2x^3 - 7x^2 - 12x + 45$ touches the x -axis.

[1 mark]

Answer (_____ , _____)

- 19** (a) Write $x^2 + 12x + 18$ in the form $(x + p)^2 + q$ where p and q are integers. **[2 marks]**

Answer _____

- (b) Hence solve $x^2 + 12x + 18 = 0$
Give your answers in simplified surd form.

[1 mark]

Answer _____

20 Solve the simultaneous equations

$$2p + 3q - 4r = -2$$

$$p - q + 6r = 8$$

$$4p + q + 2r = 11$$

Do not use trial and improvement.

You must show your working.

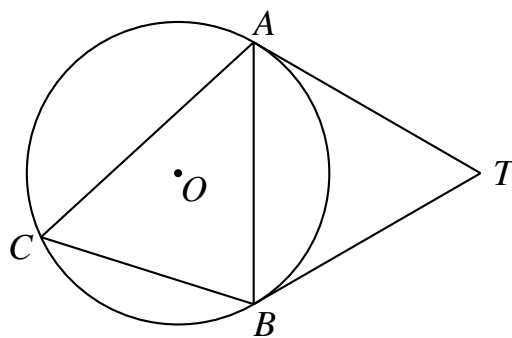
[5 marks]

$p =$ _____ $q =$ _____ $r =$ _____

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

TA and TB are tangents to the circle.

Angle $ATB = \text{angle } ACB$



Not drawn accurately

Prove that triangle ABT is equilateral.

[4 marks]

22 Prove that

$$\frac{(1 - \sin x)(1 + \sin x)}{\cos x} + \sin x \tan x \equiv \frac{1}{\cos x}$$

[3 marks]

23 A curve has equation

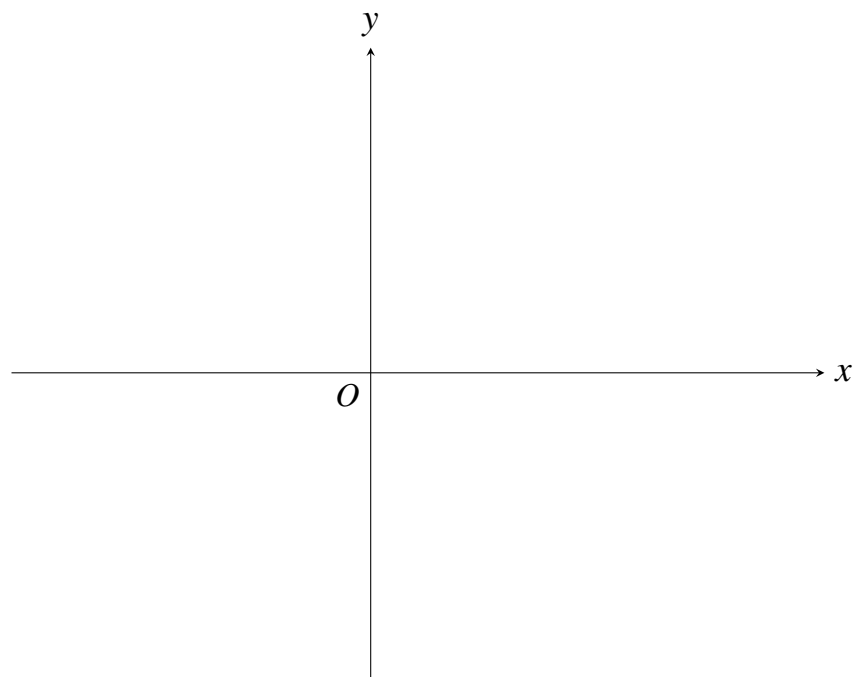
$$y = 4x^3 - 3x^2 - 6x + 2$$

- (a) Work out the coordinates of the two stationary points on the curve.
You must show your working.

[4 marks]

Answer (_____ , _____) and (_____ , _____)

- (b) Sketch the curve on the axes below.
Label the coordinates of the stationary points and the point where the curve crosses the y-axis.



[2 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:

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

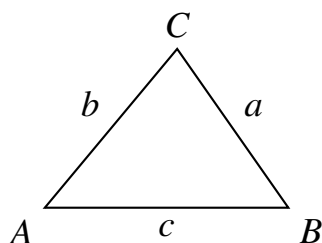
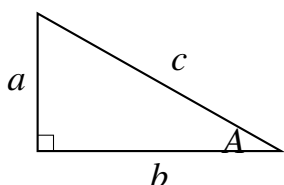
$$\text{Area of a circle} = \pi r^2$$

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 :

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