

Teach Me Maths

Please write clearly in block capitals.

Name _____

Date _____

Level 2 Certificate

FURTHER MATHEMATICS

Paper 1 Non-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:

- 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) The function f is given by

$$f(x) = 11 - 3x$$

The domain of f is $-2 \leq x < 5$

Work out the range of f .

[1 mark]

Answer _____

- (b) The function g is given by

$$g(x) = x^2 - 7$$

The domain of g is $-4 < x \leq 3$

Work out the range of g .

[2 marks]

Answer _____

2 $\begin{pmatrix} 4 & -3 \\ 2 & a \end{pmatrix} \begin{pmatrix} b \\ 5 \end{pmatrix} = \begin{pmatrix} 9 \\ -8 \end{pmatrix}$

Work out the values of a and b .

[3 marks]

$a =$ _____ $b =$ _____

3 A is the point $(6, -1)$

B is the point $(-3, 5)$

(a) Work out the equation of the line AB .

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

[3 marks]

Answer _____

(b) The line AB crosses the y -axis at C .

Show that $AC = 2\sqrt{13}$

[2 marks]

- 4 Here are the first four terms of a linear sequence.

4.6 3.8 3.0 2.2

Work out the position of the first term in the sequence that is less than -30

[3 marks]

Answer _____

- 5 Expand and simplify

$$(2x + 7)(3x - 1)(4 - x)$$

[3 marks]

Answer _____

- 6 A curve has equation

$$y = x^3 - 2x^2 - 5x + 4$$

The gradient of the curve is 2 at two points.

Work out the x -coordinates of these two points.

[3 marks]

Answer _____ and _____

- 7 (a) Circle the value of $\cos 210^\circ$

[1 mark]

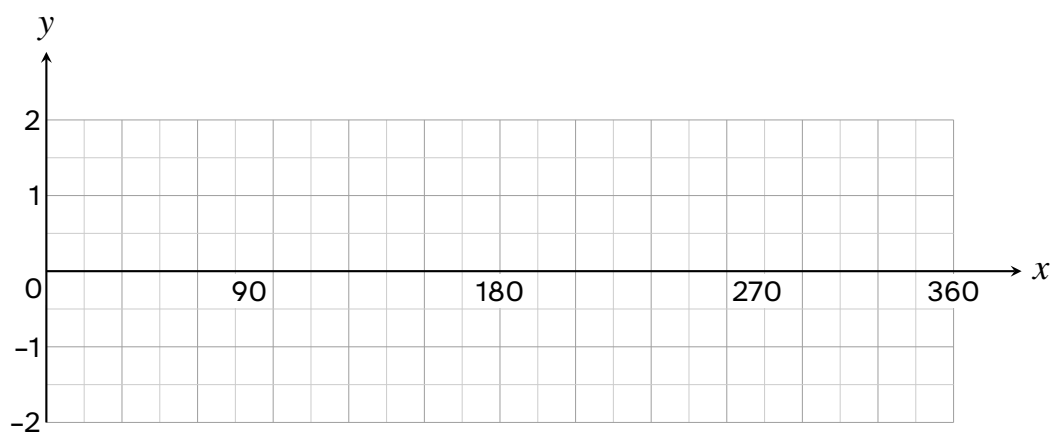
$$-\frac{\sqrt{3}}{2}$$

$$-\frac{1}{2}$$

$$\frac{1}{2}$$

$$\frac{\sqrt{3}}{2}$$

- (b) On the axes, sketch $y = \tan x$ for $0^\circ \leq x \leq 360^\circ$



[2 marks]

- 8 Rationalise the denominator and simplify fully

$$\frac{\sqrt{5} + \sqrt{7}}{\sqrt{5} - \sqrt{7}}$$

Give your answer in the form $m + n\sqrt{35}$ where m and n are integers.

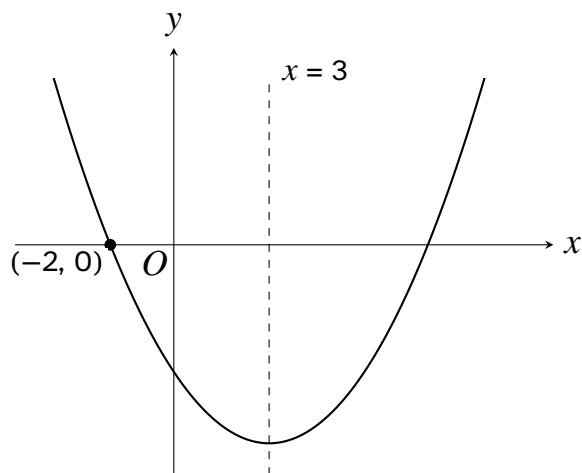
[4 marks]

Answer _____

9 Here is a sketch of $y = x^2 + bx + c$

The curve crosses the x -axis at $(-2, 0)$ and at one other point.

The line $x = 3$ is the line of symmetry of the curve.



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

[3 marks]

$b =$ _____ $c =$ _____

(b) Work out the coordinates of the turning point of the curve.

[1 mark]

Answer (_____ , _____)

10 Solve $4x^3 + 4x^2 - 15x = 0$

You must show your working.

[3 marks]

Answer _____

11 Raffle tickets are numbered with 3-digit numbers.

Each ticket number uses three different digits chosen from

0 1 2 3 4 5 6 7 8 9

The first digit of a ticket number cannot be 0

A ticket wins a prize if its number is

- greater than 300
- a multiple of 5

How many of the ticket numbers win a prize?

[3 marks]

Answer _____

12 Expand and simplify fully

$$(2 - 3x)^4$$

[3 marks]

Answer _____

13 (a) Write

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

as a single power of x .

Circle your answer.

[1 mark]

$$x^{-2}$$

$$x$$

$$x^{\frac{4}{3}}$$

$$x^{-\frac{1}{18}}$$

(b) Solve $2x^{-\frac{3}{2}} = 250$

[3 marks]

$x =$ _____

14 Write

$$\frac{3}{x-2} - \frac{5}{x+4} + 1$$

as a single fraction in its simplest form.

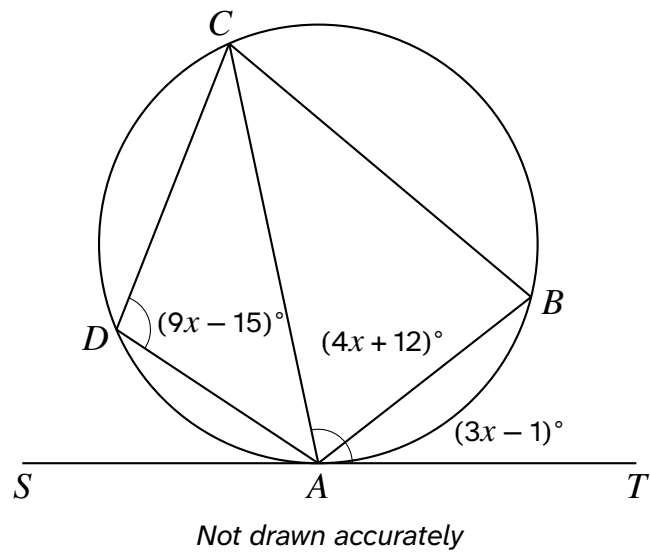
[3 marks]

Answer _____

15 A, B, C and D are points on a circle.

SAT is a tangent to the circle at A .

Angle $TAB = (3x - 1)^\circ$ angle $BAC = (4x + 12)^\circ$ angle $ADC = (9x - 15)^\circ$



Work out the size of angle ABC .

You must show your working.

[4 marks]

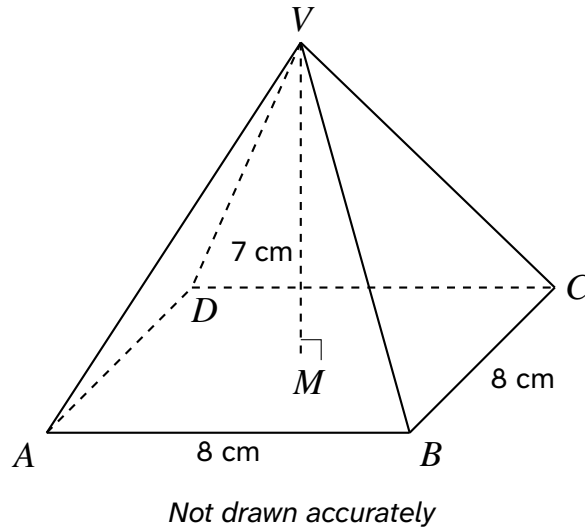
Answer _____ degrees

16 $VABCD$ is a pyramid.

The base $ABCD$ is a square of side 8 cm.

M is the centre of the base.

V is vertically above M and $VM = 7$ cm



Work out the length of the sloping edge VA .

[3 marks]

Answer _____ cm

17 The equation of a curve is

$$y = x^3 - 3x^2 - 2x + 5$$

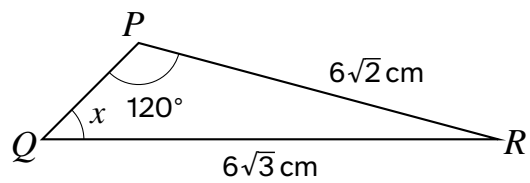
The point P on the curve has x -coordinate -1

Show that the equation of the normal to the curve at P is

$$x + 7y - 20 = 0$$

[4 marks]

18 PQR is a triangle.



Not drawn accurately

Work out the value of x .

You must show your working.

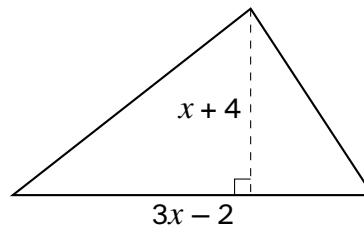
[3 marks]

$x =$ _____ degrees

19 The diagram shows a triangle.

The base of the triangle is $(3x - 2)$ cm.

The perpendicular height of the triangle is $(x + 4)$ cm.



Not drawn accurately

The area of the triangle is less than 12 cm^2

Work out the set of values of x for which this is possible.

Write your answer in the form $m < x < n$

Do not use trial and improvement.

You must show your working.

[5 marks]

Answer _____ $< x <$ _____

20 A curve has equation

$$y = x^3 + 12x^2 + 63x - 4$$

- (a) Show that y is an increasing function for all values of x .

[4 marks]

- (b) Work out the least value of the gradient of the curve.

[1 mark]

Answer _____

21 The centre of a circle is the point (3, 0)

The radius of the circle is $\sqrt{17}$

The line $x + 3y = -8$ meets the circle at two points.

Work out the coordinates of these points.

Do not use trial and improvement.

You must show your working.

[6 marks]

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

22 Solve $4 \cos^2 x = 3$ for $0^\circ \leq x \leq 360^\circ$

[3 marks]

Answer _____

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:

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

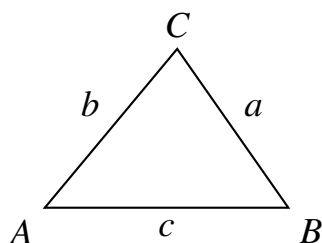
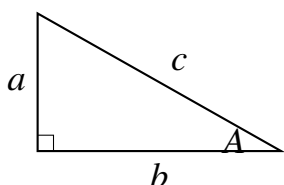
$$\text{Area of a circle} = \pi r^2$$

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 :

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