

Teach Me Maths

Please write clearly in block capitals.

Name _____

Date _____

Level 2 Certificate

FURTHER MATHEMATICS

Paper 2 Calculator

Mock Set C

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** Expand and simplify fully

$$(x^2 - 4x + 7)(3x + 2) - 2x(x - 5)^2$$

[3 marks]

Answer _____

- 2** The equation of a circle is

$$(x + 3)^2 + (y - 8)^2 = 144$$

Write down the coordinates of the centre of the circle.

Work out the radius of the circle.

[2 marks]

Centre (_____ , _____)

Radius _____

- 3 The function g is given by

$$g(x) = 5 - 3x^3 \quad \text{with domain} \quad -2 < x \leq 1$$

Work out the range of the function.

[2 marks]

Answer _____

- 4 $A(h, -3)$ and $B(9, k)$ are points, where h and k are constants.

The midpoint of AB is $M(4, 1)$

- (a) Work out the values of h and k .

[2 marks]

$$h = \quad \quad \quad k = \quad \quad \quad$$

- (b) Work out the equation of the perpendicular bisector of AB .

Give your answer in the form $y = mx + c$

[3 marks]

Answer _____

5

$$\begin{pmatrix} a & -2 \\ 3 & b \end{pmatrix} \begin{pmatrix} 5 & 1 \\ 2 & a \end{pmatrix} = \begin{pmatrix} -14 & 2 \\ 8 & 10 \end{pmatrix}$$

a and b are constants.

Work out the values of a and b .

[3 marks]

$a =$ _____ $b =$ _____

6 The n th term of a sequence is $\frac{6n+5}{4n-5}$

(a) Write down the limiting value of the sequence as $n \rightarrow \infty$

[1 mark]

Answer _____

(b) The k th term of the sequence is $\frac{1}{30}$ more than the limiting value.

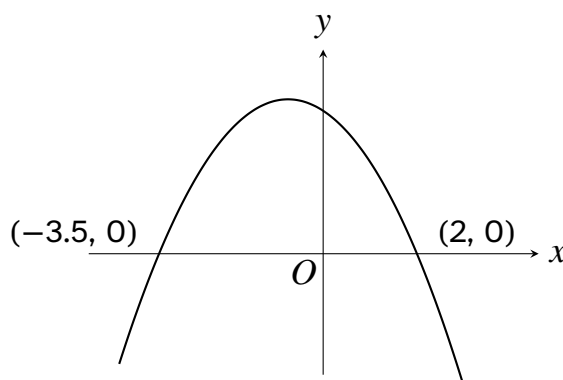
Work out the value of k .

You must show your working.

[3 marks]

$k =$ _____

- 7 Here is a sketch of $y = f(x)$, where $f(x)$ is a quadratic function.
The graph crosses the x -axis at $(-3.5, 0)$ and $(2, 0)$



Not drawn accurately

Solve $f(x) < 0$

[2 marks]

Answer _____

- 8 A factory gives each item it makes a 4-digit serial number.
- Each serial number uses only the digits 1 2 3 4 5 6 7
 - Digits may be repeated.
 - Each serial number is less than 5000
 - Each serial number is a multiple of 5

How many different serial numbers are possible?

[3 marks]

Answer _____

9

$$y = 3x^4 - \frac{2}{x^3}$$

Work out the value of $\frac{d^2y}{dx^2}$ when $x = 0.9$

Give your answer to 3 significant figures.

[4 marks]

Answer _____

10 (a) Simplify fully

$$\frac{72a^5b^9}{(6a^3b^2)^2}$$

[2 marks]

Answer _____

(b)

$$p^4y\sqrt{y} = pq^6$$

Write y in terms of p and q .

Give your answer in the form $y = p^m q^n$, where m and n are constants.

[2 marks]

$y =$ _____

11 Rearrange

$$v = 2\sqrt[3]{\frac{w+k}{w}}$$

to make w the subject.

[3 marks]

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

- 12** (a) Write $4 + 20x - 5x^2$ in the form $a - b(x - c)^2$ where a , b and c are integers.

[3 marks]

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

- (b) Hence, write down the coordinates of the maximum point of the curve

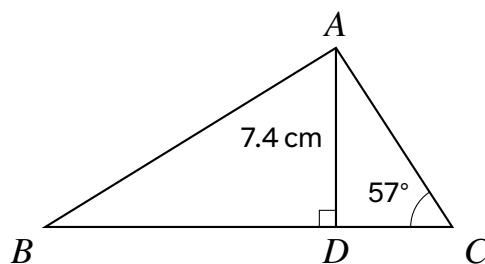
$$y = 4 + 20x - 5x^2$$

[1 mark]

Answer ($\underline{\hspace{2cm}}$, $\underline{\hspace{2cm}}$)

13 ABC is a triangle.

D is the point on BC such that AD is perpendicular to BC .



Not drawn accurately

- $AD = 7.4$ cm
- Angle $ACD = 57^\circ$
- $BD:DC = 5:2$

Work out the length AB .

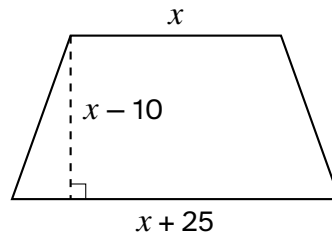
Give your answer to 3 significant figures.

[3 marks]

Answer _____ cm

- 14** The diagram shows the cross-section of a raised garden bed.
The cross-section is a trapezium.
All lengths are in centimetres.

The area of the cross-section is 2000 cm^2



Not drawn accurately

- (a) Show that $2x^2 + 5x - 4250 = 0$

[2 marks]

- (b) Work out the height of the cross-section.
Give your answer to 3 significant figures.

[3 marks]

Answer _____ cm

15 Simplify fully

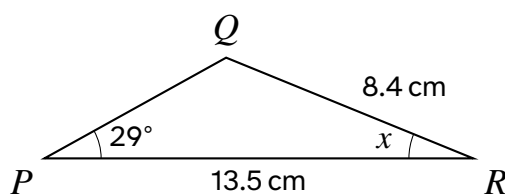
$$\frac{x^2 - 9}{2x^2 + 7x + 3} \div \frac{x^2 - x - 6}{4x + 2}$$

[3 marks]

Answer _____

16 PQR is a triangle.

Angle PQR is obtuse.



Not drawn accurately

Work out the size of angle x .

Give your answer to 1 decimal place.

[3 marks]

Answer _____ degrees

17 $f(x) = (x - 4)^2$

$g(x) = ax + b$, where a and b are constants and $a > 0$

$$fg(x) = (3x + 1)^2$$

(a) Work out $g(x)$.

[1 mark]

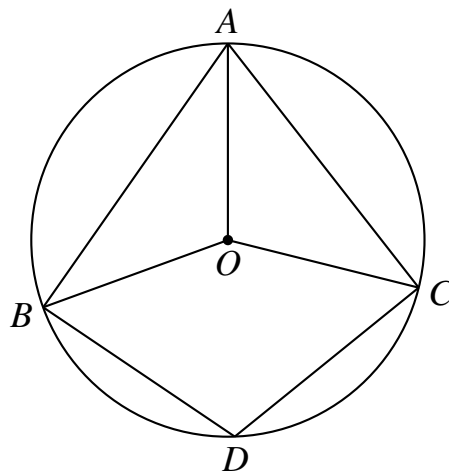
$$g(x) = \underline{\hspace{10cm}}$$

(b) Solve $gf(x) = 32$

[2 marks]

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

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



Not drawn accurately

- Angle $OAB = 2x + 7^\circ$
- Angle $OCA = 3x - 4^\circ$
- Angle $BDC = 8x - 5^\circ$

Work out the value of x .

[4 marks]

$x =$ _____

19 $f(x) = 3x^3 + 16x^2 - 21x + 6$

(a) Use the factor theorem to show that $(3x - 2)$ is a factor of $f(x)$.

[2 marks]

(b) Hence, solve $f(x) = 0$

Give your answers in exact form, with any surds fully simplified.

[4 marks]

Answer _____

20

$$y = (x^2 - 7)(2x - 5)$$

Use calculus to work out the range of values of x for which y is a decreasing function.

Give the values in your answer to 3 significant figures.

[5 marks]

Answer _____

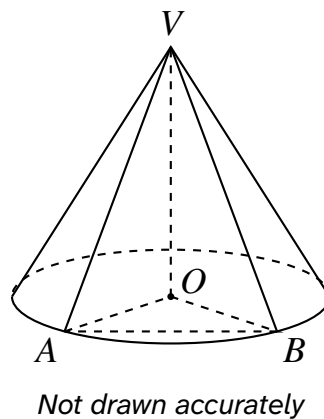
21 The diagram shows a cone.

V is the vertex of the cone and O is the centre of its circular base.

V is vertically above O .

A and B are points on the circumference of the base.

- The radius of the base is 6.4 cm
- $AB = 10.8$ cm
- The angle between VA and the base is 66°



(a) Show that the vertical height VO is 14.4 cm, correct to 3 significant figures.

[2 marks]

(b) Work out the size of angle AVB .

Give your answer to 1 decimal place.

[3 marks]

Answer _____ degrees

22 Solve

$$7 \sin x \cos x = -3 \cos x \quad \text{for } 0^\circ \leq x \leq 360^\circ$$

Give your answers to 1 decimal place where appropriate.

You must show your working.

[4 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:

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

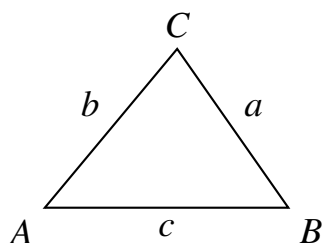
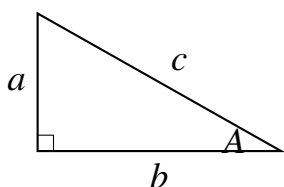
$$\text{Area of a circle} = \pi r^2$$

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 :

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