

MATHEMATICS

Higher Grade Extended Unit Test - UNIT 2

Time allowed - 50 minutes

Read Carefully

1. Full credit will be given only where the solution contains appropriate working.
2. **Calculators may be used.**
3. Answers obtained by readings from scale drawings will not receive any credit.
4. **This Unit Test contains questions graded at all levels.**

FORMULAE LIST

Circle:

The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents a circle centre $(-g, -f)$ and radius $\sqrt{g^2 + f^2 - c}$.

The equation $(x - a)^2 + (y - b)^2 = r^2$ represents a circle centre (a, b) and radius r .

Trigonometric formulae:

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$= 2 \cos^2 A - 1$$

$$= 1 - 2 \sin^2 A$$

Section A

In this section the correct answer to each question is given by one of the alternatives A, B, C or D. Indicate the correct answer by writing A, B, C or D opposite the number of the question. Rough working may be done on the paper provided. 2 marks will be given for each correct answer.

1. A parabola has equation $y = 12 - (x + 1)^2$. Which line of the table gives the correct coordinates and the nature of its turning point?

	Coordinates	Nature
A.	(-1, 12)	Maximum
B.	(1, 12)	Maximum
C.	(1, 12)	Minimum
D.	(-1, 12)	Minimum

2. A circle has equation $x^2 + y^2 - 6x + 10y - 2 = 0$. Which line of the table correctly identifies the centre and radius of it?

	Centre	Radius
A.	(-3, 5)	$4\sqrt{2}$
B.	(-3, 5)	6
C.	(3, -5)	6
D.	(3, -5)	$4\sqrt{2}$

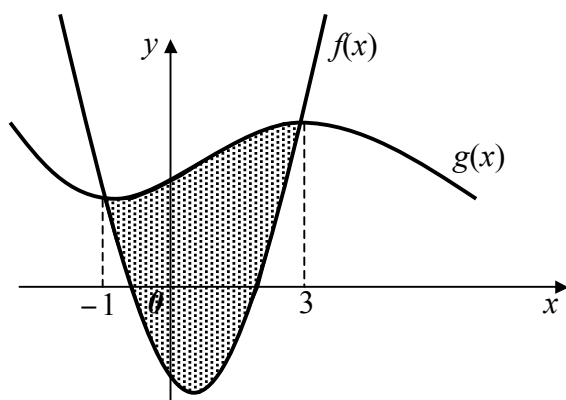
3. The following words can be used to describe the roots of a quadratic.

I Real II Equal III Distinct IV Non-real

Which of the above words can be used to describe the roots of the equation $2x^2 + 3x - 4 = 0$?

- A. I and II
- B. I and III
- C. II and III
- D. IV only

4. The diagram shows the area bounded by the curves $y = f(x)$ and $y = g(x)$



Which of the following gives the value of the shaded area?

- A. $\int_{-1}^3 g(x) + f(x) dx$
- B. $\int_{-1}^3 g(x) - f(x) dx$
- C. $\int_{-3}^1 g(x) + f(x) dx$
- D. $\int_{-3}^1 g(x) - f(x) dx$

5. What is the exact value of $\cos\left(\frac{2\pi}{3}\right)$?

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

B. $\frac{1}{2}$

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

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

End of Section A

Section B
ALL QUESTIONS SHOULD BE ATTEMPTED

In this section credit will be given for all correct working.

6. The points A and B have coordinates (8, 4) and (2, -6) respectively.
- (a) Find the equation of the circle which has AB as diameter. 3
- A tangent to the circle is drawn at the point (10, -4).
- (b) Establish the equation of this tangent. 3
7. Solve the equation
- $$3 \sin 2x^\circ = -2 \sin x^\circ \quad \text{in the interval} \quad 0 \leq x \leq 360 \quad \text{5}$$
8. (a) If $3x^3 - kx^2 - 38x - 24$ is exactly divisible by $(x + 3)$, find the value of k . 3
- (b) Hence, write the expression in fully factorised form when k takes this value. 2
9. Find $\int \frac{1}{x^2} (\sqrt[3]{x^2} - x^3) dx$ 5
10. The equation $kx^2 + (k - 3)x + k = 0$ has equal roots.
- Find the value of k given that $k > 0$. 4
11. A curve has as its derivative $\frac{dy}{dx} = 3 + \frac{6}{x^2}$. Given that the point (6, 4) lies on this curve, express y in terms of x . 5

END OF QUESTION PAPER