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. The value of

$$7 - x - x^2 + x^3$$

when $x = 2$ is

A -57

B -3

C 51

D 9

2. For the quadratic equation

$$x^2 - 5x + 3 = 0$$

the value of the discriminant is

A -37

B 13

C 37

D 63

3. A circle has equation

$$x^2 + y^2 - 6x + 4y - 12 = 0$$

The length of its radius is

A 1

B 5

C $2\sqrt{10}$

D 8

4. Given that $\cos\alpha = \frac{2}{3}$, the value of $\cos 2\alpha$ is

A $\frac{4}{3}$

B $\frac{\sqrt{5}}{3}$

C $-\frac{1}{9}$

D $\frac{4\sqrt{5}}{3}$

5. A curve for which $\frac{dy}{dx} = 4x + 1$ passes through (1, -1). If y is expressed in terms of x then $y =$ ……..

A $2x^2 + x - 4$

B $2x^2 + x$

C $2x^2 + x + 4$

D 4

Section B

ALL QUESTIONS SHOULD BE ATTEMPTED

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

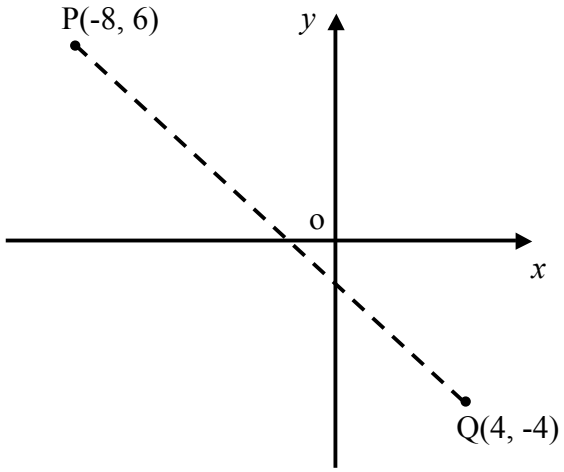
6. Evaluate $\int_4^9 \frac{1-x^2}{\sqrt{x}}\,dx$ **6**

7. **(a)** Show that $(x-3)$ is a factor of $2x^3 - 3x^2 - 11x + 6$ **2**

(b) Hence, solve the equation

$$2x^3 - 3x^2 - 11x + 6 = 0$$ **3**

8. The points P and Q have coordinates (-8, 6) and (4, -5).



Find the equation of the circle which has PQ as its diameter. **3**

9. Solve the equation $2(\cos 2x + 4\sin x) = 5$ in the interval $0 \le x \le 2\pi$. **5**

10. **(a)** Show that the point (-1, -8) lies on the circle with equation

$$x^2 + y^2 - 4x + 8y - 5 = 0$$ **2**

(b) Find the equation of the tangent to the circle at the point (-1, -8). **4**

11. Show that the line with equation $3x - y - 10 = 0$ is a tangent to the circle $x^2 + y^2 = 10$ and find the point of contact. **5**

END OF QUESTION PAPER