

Name:

Class:

Marked by:

YEAR 1 | PURE MATHEMATICS | PEER MARKED TASK 5

Question	1	2	3	4	5	6	7	8	9	10	Total
Marks											
Max	3	4	5	4	9	8	8	6	8	9	64

1. Show that $\frac{5\sqrt{3}+3}{3\sqrt{3}+4}$ can be expressed in the form $a + b\sqrt{3}$, where a and b are integers to be stated.

[3 marks]

2. (a) Write down the value of p and the value of q given that:

(i) $\sqrt{3} = 3^p$

[1 mark]

(ii) $\frac{1}{27} = 3^q$

[1 mark]

- (b) Find the value of x for which $\sqrt{3} \times 3^{2x+1} = \frac{1}{27}$

[2 marks]

3. The polynomial $p(x)$ is given by $p(x) = x^3 - 13x - 12$.

- (a) Use the Factor Theorem to show that $x - 4$ is a factor of $p(x)$.

[2 marks]

- (b) Show that $p(x)$ can be expressed as the product of three linear factors.

[3 marks]

4. Find the binomial expansion of $(3x - 2)^4$.

[4 marks]

5. The circle with equation $(x - 4)^2 + (y + 1)^2 = 10$ has centre C .

- (a) (i) Write down the radius of the circle.

[1 mark]

- (ii) Write down the coordinates of C .

[1 mark]

- (b) The point $P(3, 2)$ lies on the circle.

Find the equation of the tangent to the circle at P , giving your answer in the form $ax + by = c$

[4 marks]

- (c) Determine whether the point $Q(1, -1)$ lies inside or outside the circle, fully justifying your answer.

[3 marks]

6. The quadratic equation $(2k - 7)x^2 - (k - 2)x + (k - 3) = 0$ has no real roots.

(a) Show that $7k^2 - 48k + 80 > 0$.

[4 marks]

(b) Find the possible values of k .

[4 marks]

7. Solve each of the following equations in the interval $[0, 180]$

(i) $2\sin^2 x = 1 + \cos x$

[4 marks]

(ii) $\sin 2x = -\cos 2x$

[4 marks]

8. Given that a and b are positive constants, solve the simultaneous equations

$$a = 3b$$

$$\log_3 a + \log_3 b = 2$$

Give your answers as exact values.

[6 marks]

9. The points A and B have coordinates $(6, 7)$ and $(8, 2)$ respectively.
The line l passes through the point A and is perpendicular to the line AB .

a) Find an equation for l in the form $ax + by + c = 0$, where a , b and c are integers

[4 marks]

Given that l intersects the y -axis at the point C , find

b) the coordinates of C ,

[2 marks]

c) the area of triangle OCB , where O is the origin.

[2 marks]

10. $f(x) = x^2 + 4kx + (3 + 11k)$, where k is a constant.

a) Express $f(x)$ in the form $(x + p)^2 + q$, where p and q are constants to be found in terms of k .

[3 marks]

Given that the equation $f(x) = 0$ has no real roots,

b) Express find the set of possible values of k .

[4 marks]

Given that $k = 1$,

c) sketch the graphs of $y = f(x)$, showing the coordinates of any point at which the graph crosses a coordinate axis.

[2 marks]