Year 1 | Pure Mathematics | Peer Marked Task 4

Question	1	2	3	4	5	6	Total
Marks							
Max Marks	5	7	9	14	11	11	57

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

(a)   Use the Factor Theorem to show that $x + 3$ is a factor of $p(x)$.

[2 marks]

(b)   Express $p(x)$ as the product of three linear factors.

[3 marks]

2. (a)   Find the first 4 terms in ascending power of x, of the binomial expansion of $(1 + kx)^8$, where k is a non-zero constant. Give each term in its simplest form.
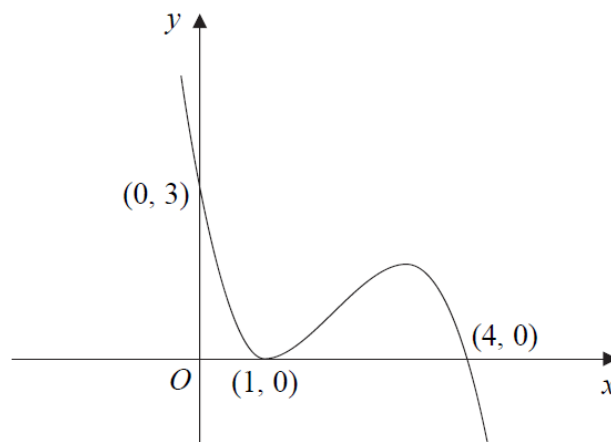
[4 marks]

Given that the coefficient of x^3 in this expansion in 1512.

(b)   find the value of k.

[3 marks]

3.

The diagram shows a sketch of the curve with equation $y = f(x)$. The curve passes through the points $(0,3)$ and $(4,0)$, and touches the x-axis at the point $(1,0)$.

On separate diagrams sketch the curve with equation

(a) $y = f(x + 1)$,

[3 marks]

(b) $y = 2f(x)$,

[3 marks]

(c) $y = f\left(\dfrac{1}{2}x\right)$.

On each diagram show clearly the coordinates of all the points where the curve meets the axes.

[3 marks]

4. (a) Find the equation of the circle with radius 10 and centre $(2, 1)$, giving your answer in the form
$x^2 + y^2 + ax + by + c = 0$.

[3 marks]

(b) The circle passes through the point $(5, k)$ where $k > 0$. Find the value of k in the form $p + \sqrt{q}$.
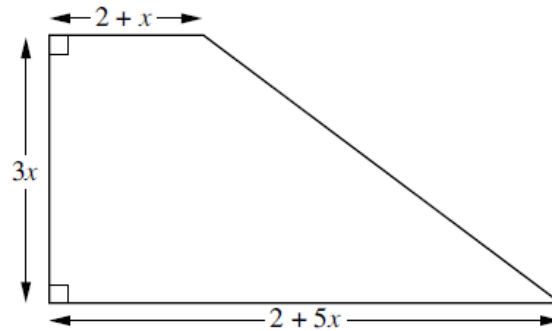
[3 marks]

(c) Determine, showing all working, whether the point $(-3, 9)$ lies inside or outside the circle.

[3 marks]

(d) Find an equation of the tangent to the circle at the point $(8, 9)$.

[5 marks]

5. A lawn is to be made in the shape shown below. The units are metres.

(a) The perimeter of the lawn is P m. Find P in terms of x.

[2 marks]

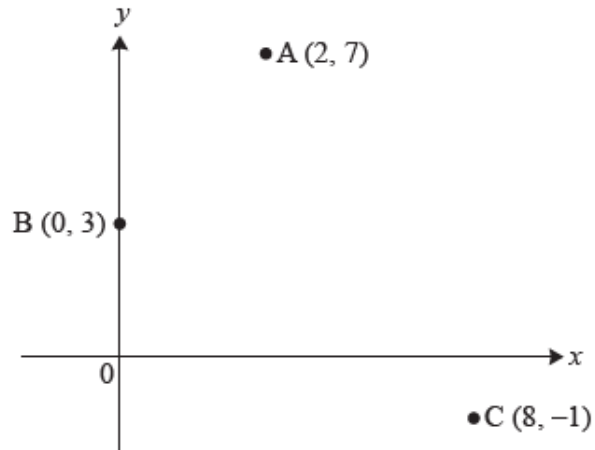(b) Show that the area, $A\,\text{m}^2$, of the lawn is given by $A = 9x^2 + 6x$.

[2 marks]

The perimeter of the lawn must be at least $39\,\text{m}$ and the area of the lawn bust be less than $99\,\text{m}^2$.

(c) By writing down and solving appropriate inequalities, determine the set of possible values of x.

[7 marks]

6.   The diagram shows a sketch of the points $A(2,7)$, $B(0,3)$ and $C(8,-1)$.

(a)   Prove that angle ABC is $90°$.

[3 marks]

(b)   Find the equation of the circle which has AC as a diameter.

[4 marks]

(c)   Find the equation of the tangent to this circle at A. Give your answer in the form $ay = bx + c$, where a, b and c are integers.

[4 marks]