Pearson Edexcel

AS Mathematics 8MA0

Practice Paper A

Pure Mathematics

Time allowed: 2 **hours**

Centre:

Name:

Teacher:

Question	Points	Score
1	4	
2	6	
3	6	
4	6	
5	6	
6	6	
7	7	
8	7	
9	8	
10	10	
11	11	
12	11	
13	12	
Total:	100	

1. Prove that, for all values of x, [4]

$$x^2 + 6x + 18 > 2 - \frac{1}{2}x.$$

2. (a) Find an equation of the straight line passing through the points with coordinates $(4, -7)$ and $(-6, 11)$, giving your answer in the form $ax + by + c = 0$,where a, b and c are integers. [3]

   (b) The line crosses the x-axis at point A and the y-axis at point B and O is the origin. Find the area of triangle AOB. [3]

Total: 6

3. Find, to 1 decimal place, the values of θ in the interval $0 \leq \theta \leq 180°$ for which [6]

$$4\sqrt{3}\sin(3\theta + 20°) = 4\cos(3\theta + 20°).$$

4. [6]

$$\log_{11}(2x-1) = 1 - \log_{11}(x+4).$$

Find the value of x showing detailed reasoning.

5. Given that the resultant of the vectors $a = 2p\mathbf{i}–5\mathbf{j}$ and $b = 6\mathbf{i}–3p\mathbf{j}$ is parallel to the vector $c = 4\mathbf{i}–5\mathbf{j}$,

   (a) find the value of p, [4]

   (b) find the resultant of the vectors a and b. [2]

Total: 6

6. The population, P, of bacteria in an experiment can be modelled by the formula $P = 100e^{0.4t}$, where t is the time in hours after the experiment began.

   (a) Use the model to estimate the population of bacteria 7 hours after the experiment began. [2]

   (b) Interpret the meaning of the constant 100 in the model. [1]

   (c) How many whole hours after the experiment began does the population of bacteria first exceed 1 million, according to the model? [3]

Total: 6

7. The line with equation $mx - y - 2 = 0$ touches the circle with equation $x^2 + 6x + y^2 - 8y = 4$. [7]

   Find the two possible values of m, giving your answers in exact form.

8. Given that point A has the position vector $4\mathbf{i} + 7\mathbf{j}$ and point B has the position vector $10\mathbf{i} + q\mathbf{j}$, where q is a constant, find

   (a) the vector $\overrightarrow{AB}$ in terms of q. [2]

   (b) Given further that $|\overrightarrow{AB}| = 2\sqrt{13}$, find the two possible values of q showing detailed reasoning in your working. [5]

Total: 7

9. (a) Find the first four terms, in ascending powers of x, of the binomial expansion of $(2+px)^9$. [4]

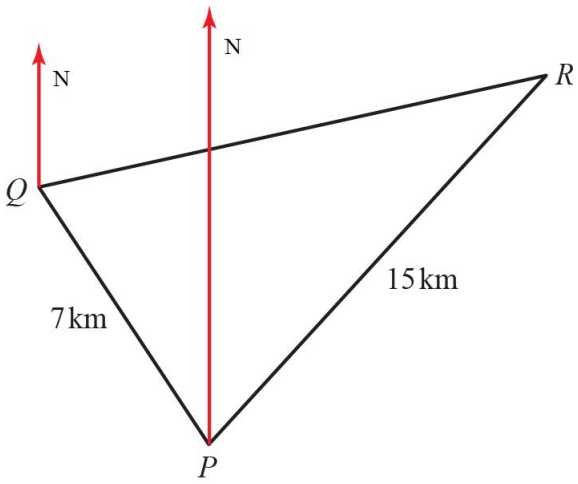
   (b) Given that the coefficient of the x^3 term in the expansion is -84.

      i. Find the value of p. [2]

      ii. Find the numerical values for the coefficients of the x and x^2 terms. [2]

Total: 8

10. The diagram shows the position of three boats, P, Q and R. Boat Q is 7km from boat P on a bearing of 327°. Boat R is 15km from boat P on a bearing of 041°.



(a) Find the distance between boats Q and R to 1 decimal place. [5]

(b) Find the 3 figure bearing of boat R from boat Q. [5]

Total: 10

11. A fish tank in the shape of a cuboid is to be made from 1600 cm^2 of glass.

    The fish tank will have a square base of side length $x$cm, and no lid. No glass is wasted.

    The glass can be assumed to be very thin.

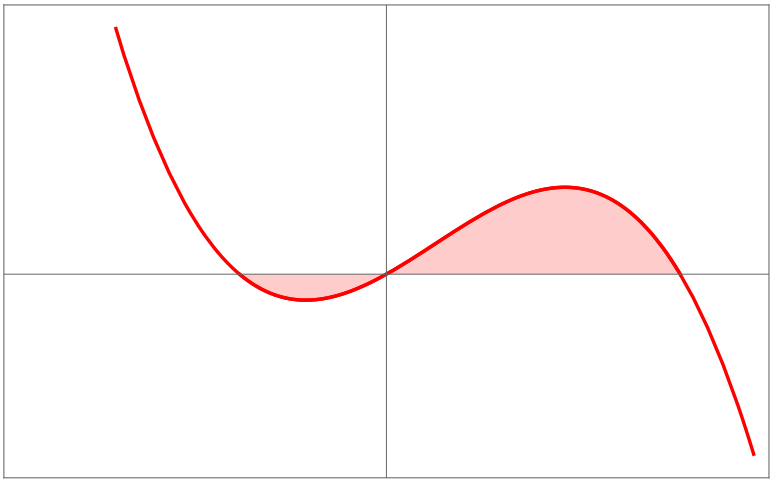
    (a) Show that the volume, $V\text{cm}^3$, of the fish tank is given by $V = 400x - \frac{x^3}{4}$. [4]

    (b) Given that x can vary, use differentiation to find the maximum or minimum value of V. [5]

    (c) Justify that the value of V you found in part b is a maximum. [2]

Total: 11

12. The graph shows part of the curve C with equation $y = -x^3 + 2x^2 + 8x$.



The curve C crosses the x-axis at the origin O and at points A and B.

(a) Using an appropriate algebraic method, find the coordinates of A and B. [3]

(b) The finite region shown shaded is bounded by the curve C and the x-axis. [8]

Use calculus to find the total area of the shaded region.

Total: 11

(Q12 continued)

13.

$$p(x) = 3 - \frac{1}{2}x, \qquad q(x) = x^2 - 10x - 20.$$

(a) Solve the equation $q(x) = 0$. Write your answer in the form $a \pm 3\sqrt{b}$ where a and b are integers to be found. [2]

(b) Sketch the graphs of $y = p(x)$ and $y = q(x)$ on the same set of axes. [4]

Label all points where the curves intersect the coordinate axes.

(c) Use an algebraic method to find the coordinates of any point of intersection of the graphs $y = p(x)$ and $y = q(x)$. [4]

(d) Write down, using set notation, the set of values of x for which $p(x) < q(x)$. [2]

Total: 12

(Q13 continued)

(Q13 continued)