Year 12 AS Level Maths Homework 12 Due Date: _____ Name: _____ Score: /38

Answer all questions, make sure you show all working otherwise you will not be awarded marks. If you write on any other paper, please hand this in with the sheet.

Q1.

The line l_1 has equation $2x - 5y + 7 = 0$

(a) Find the gradient of l_1 (1)

Given that

- the point A has coordinates $(6, -2)$
- the line l_2 passes through A and is perpendicular to l_1

(b) find the equation of l_2 giving your answer in the form $y = mx + c$, where m and c are constants to be found. (3)

The lines l_1 and l_2 intersect at the point M.

(c) Using algebra and showing all your working, find the coordinates of M.

(*Solutions relying on calculator technology are not acceptable.*) (3)

Given that the diagonals of a square $ABCD$ meet at M,

(d) find the coordinates of the point C. (2)

(Total for question = 9 marks)

Q2.

Figure 1 shows the design for a badge.

The design consists of two congruent triangles,

AOC and BOC, joined to a sector AOB of a circle centre O.

- Angle $AOB = \alpha$
- $AO = OB = 3$ cm
- $OC = 5$ cm

Given that the area of sector AOB is 7.2 cm^2

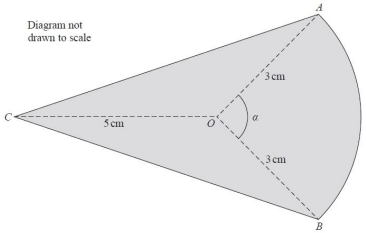


Figure 1

(a) show that $\alpha = 1.6$ radians. (2)

(b) Hence find

(i) the area of the badge, giving your answer in cm^2 to 2 significant figures,
(ii) the perimeter of the badge, giving your answer in cm to one decimal place. (8)

(Total for question = 10 marks)

Q3.

Figure 1 shows a sketch of the curve C with equation $y = f(x)$

The curve C passes through the origin and through $(6, 0)$

The curve C has a minimum at the point $(3, -1)$

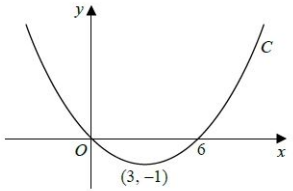


Figure 1

On separate diagrams, sketch the curve with equation

(a) $y = f(2x)$ (3)

(b) $y = f(x + p)$, where p is a constant and $0 < p < 3$ (4)

On each diagram show the coordinates of any points where the curve intersects the x-axis and of any minimum or maximum points.

(Total for question = 7 marks)

Q4.

(a) On Diagram 1 sketch the graphs of

(i) $y = x(3 - x)$
(ii) $y = x(x - 2)(5 - x)$

showing clearly the coordinates of the points where the curves cross the coordinate axes. (4)

(b) Show that the x coordinates of the points of intersection of

$$y = x(3 - x) \quad \text{and} \quad y = x(x - 2)(5 - x)$$

are given by the solutions to the equation $x(x^2 - 8x + 13) = 0$ (3)

The point P lies on both curves. Given that P lies in the first quadrant,

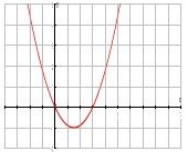
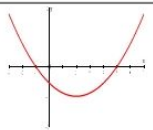
(c) find, using algebra and showing your working, the exact coordinates of P. (5)

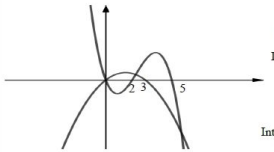
(Total for question = 12 marks)

Year 12 AS Level Maths Homework 12 ANSWERS

Question Number	Scheme	Marks
(a)	$\frac{2}{5}$ or decimal equivalent	B1
		(1)
(b)	$m_N = -1 \div "\frac{2}{5}"$	M1
	$y+2="-\frac{5}{2}"(x-6)$	M1
	$y=-\frac{5}{2}x+13$	A1
		(3)
(c)	$"-\frac{5}{2}x+13"="\frac{2}{5}x+\frac{7}{5}" \Rightarrow "\frac{29}{10}x"="\frac{58}{5}" \Rightarrow x=...(=4)$ or $"\frac{5}{2}y-\frac{7}{2}"="-\frac{2}{5}y+\frac{26}{5}" \Rightarrow "\frac{29}{10}y"="\frac{87}{10}" \Rightarrow y=...(=3)$	M1
	$x="4" \Rightarrow y=...$ or $y="3" \Rightarrow x=...$	dM1
	$(4,3)$	A1
		(3)
(d)	$(2,8)$	B1B1
		(2)
		Total 9

Question	Scheme	Marks
(a)	$\frac{1}{2}\times 3^2\times\alpha=7.2\Rightarrow\alpha=...$ or $\frac{1}{2}\times 3^2\times 1.6=7.2\Rightarrow\alpha=1.6$	M1
	$\alpha=1.6$*	A1*
		(2)
(b)(i)	Angle $COA=\frac{1}{2}(2\pi-1.6)(=2.34...)$ $(\approx 134°)$	M1
	Area $COA=\frac{1}{2}\times 5\times 3\sin("2.34")$ $(=5.38...)$	M1
	Total Area $=2\times\frac{1}{2}\times 5\times 3\sin("2.34")+7.2$	dM1
	$=18$ (cm^2) Awrt 18 (cm^2) (Ans = 17.96)	A1
(ii)	Arc $AB=3\times 1.6(=4.8)$	B1
	$(AC^2=)\ 5^2+3^2-2\times 5\times 3\cos("2.34")$	M1
	Total perimeter $=2\times\sqrt{5^2+3^2-2\times 5\times 3\cos("2.34")}+3\times 1.6$	dM1
	$=$ Awrt 19.6 (cm)	A1
		(8)

Question	Scheme	Marks
(a)	 Shape $\cup$ through (0, 0)	B1
	(3, 0)	B1
	(1.5, −1)	B1
		(3)
(b)	 Shape $\cup$, not through (0, 0)	B1
	Minimum in 4th quadrant	B1
	$(-p, 0)$ and $(6-p, 0)$	B1
	$(3-p, -1)$	B1
		(4)
		(7 marks)

Question Number	Scheme	Marks
(a)	 ∩ shaped quadratic	B1
	Intercepts at O and 3	B1
	-ve cubic	B1
	Intercepts at O, 2 and 5	B1
		(4)
(b)	Sets $x(x-2)(5-x)=x(3-x)$	M1
	$3x-x^2=-x^3+7x^2-10x \Rightarrow \pm(x^3-8x^2+13x)$ $(=0)$ OR $\pm x\{(x-2)(5-x)-(3-x)\}$ $(=0)$	dM1
	Proceeds to $x(x^2-8x+13)=0$ *	A1*
		(3)
(c)	Solves $x^2-8x+13=0\Rightarrow x=4\pm\sqrt{3}$	M1 A1
	Substitutes $x="4-\sqrt{3}"$ into $y=x(3-x)$ oe	M1
	$y=(4-\sqrt{3})(-1+\sqrt{3})=-4+4\sqrt{3}+\sqrt{3}-3=...$	M1
	$y=-7+5\sqrt{3}$	A1
		(5)
		(12 marks)