5. A plot of land OAB is in the shape of a sector of a circle with centre O.

Given

- $OA = OB = 5\,\text{km}$
- angle $AOB = 1.2$ radians

(a) find the perimeter of the plot of land.

(2)

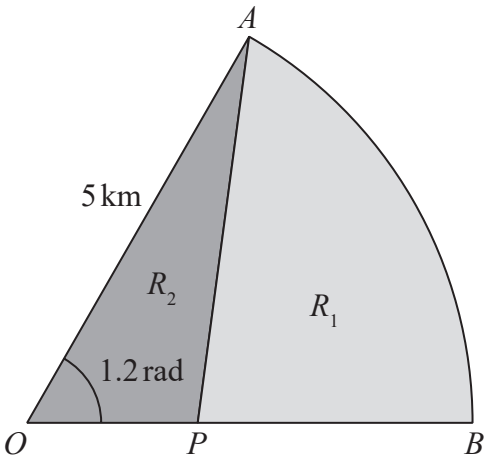

Diagram **NOT** accurately drawn

Figure 2

A point P lies on OB such that the line AP divides the plot of land into two regions R_1 and R_2 as shown in Figure 2.

Given that

$$\text{area of } R_1 = 3 \times \text{area of } R_2$$

(b) show that the area of $R_2 = 3.75\,\text{km}^2$

(3)

(c) Find the length of AP, giving your answer to the nearest 100 m.

(4)

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Question 5 continued

(Total for Question 5 is 9 marks)

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6. **In this question you must show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

(a) Sketch the curve C with equation

$$y = \frac{1}{2 - x} \qquad x \neq 2$$

State on your sketch

- the equation of the vertical asymptote
- the coordinates of the intersection of C with the y-axis

(3)

The straight line l has equation $y = kx - 4$, where k is a constant.

Given that l cuts C at least once,

(b) (i) show that

$$k^2 - 5k + 4 \geqslant 0$$

(ii) find the range of possible values for k.

(6)

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