8

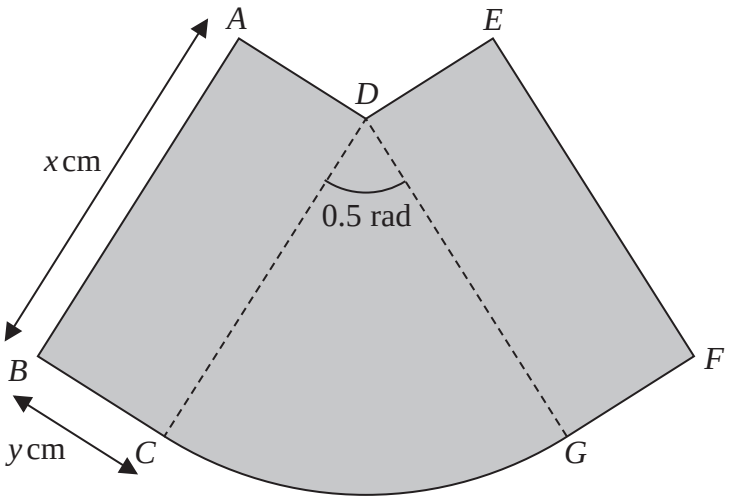

Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a badge, shown shaded, made from two identical rectangles, *ABCD* and *DEFG*, and a sector *DCG* of a circle with centre *D*.

Each rectangle measures x cm by y cm.
The radius of the sector is x cm and the angle *CDG* is 0.5 radians.

The area of the badge is $50\,\text{cm}^2$
The perimeter of the badge is P cm.

(a) Show that

$$P = 2x + \frac{100}{x}$$

(5)

Given that x can vary,

(b) use calculus, to find the exact value of x for which P is a minimum.
Justify that this value of x gives a minimum value for P

(6)

(c) Find the minimum value of P
Give your answer in the form $k\sqrt{2}$, where k is an integer to be found.

(2)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 13 marks)