8

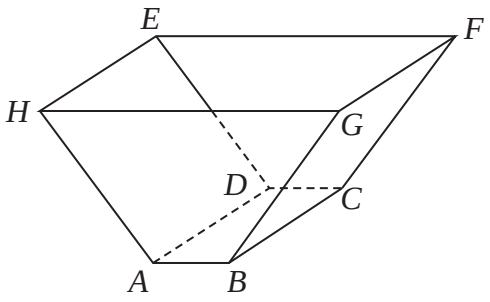

Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows a waste paper basket in the shape of a right prism with 5 faces and a cross section that is a trapezium. The top, *EFGH*, of the waste paper basket is open.

The base of the prism *ABCD* is a rectangle with

$$AB = DC = 2x\,\text{cm} \text{ and } AD = BC = h\,\text{cm}$$

The cross sections *HGBA* and *EFCD* are such that

$$EF = HG = 8x\,\text{cm} \text{ and } AH = BG = CF = DE = 5x\,\text{cm}$$

The top, *EFGH*, of the waste paper basket is such that

$$EH = FG = h\,\text{cm}$$

The volume of the waste paper basket is $2250\,\text{cm}^3$

The total surface area of the 5 faces of the waste paper basket is $S\,\text{cm}^2$

(a) Show that $S = 40x^2 + \dfrac{1350}{x}$

(5)

Given that x can vary,

(b) use calculus, to find, to 3 significant figures, the value of x for which S is a minimum.
Justify that this value of x gives a minimum value of S

(5)

(c) Find, to 3 significant figures, the minimum value of S

(2)

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Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 12 marks)