8

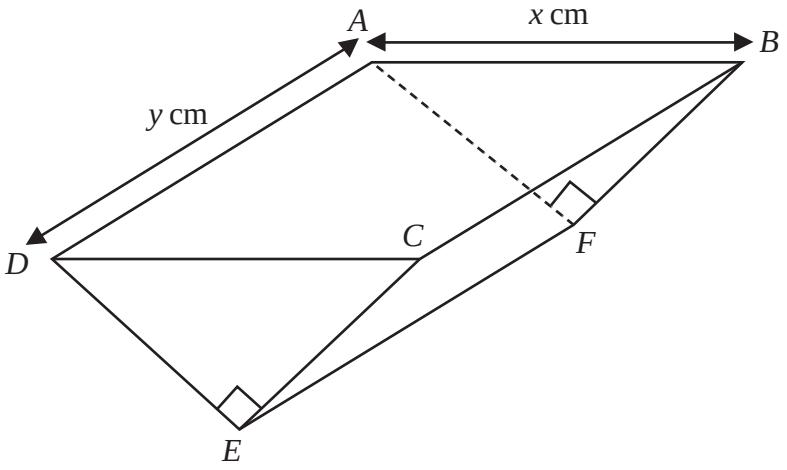

Diagram **NOT** accurately drawn

Figure 4

Figure 4 shows a solid right triangular prism *ABCDEF*

The cross section of the prism is an isosceles triangle.

- $\angle DEC = \angle AFB = 90^{\circ}$
- $AB = DC = x$ cm
- $AD = BC = FE = y$ cm
- $AF = BF = DE = CE$

The triangular faces of the prism are vertical and the edges *AD*, *BC* and *FE* are horizontal.
The volume of the prism is 3.6 cm^3
The total external surface area of the prism is *S* cm^2

(a) Show that *S* satisfies the equation

$$S = \frac{x^2}{2} + \frac{72\left(\sqrt{2}+1\right)}{5x}$$

(4)

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*

(4)

(c) Hence find, to 2 significant figures, the minimum value of *S*

(2)

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.....

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Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 10 marks)

9

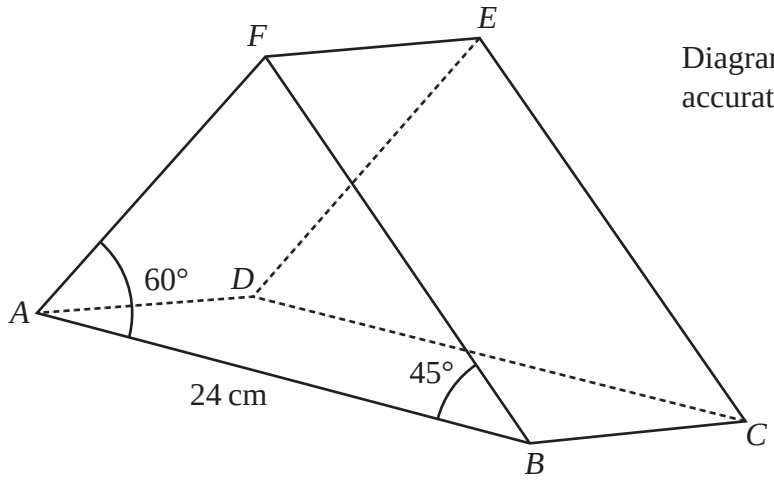

Diagram **NOT** accurately drawn

Figure 5

Figure 5 shows a right triangular prism *ABCDEF* where *ABCD* is a rectangle.

$AF = DE$ $BF = CE$ $AD = FE = BC$ $AB = DC = 24$ cm

$\angle ABF = \angle DCE = 45°$ $\angle BAF = \angle CDE = 60°$

Using a formula from page 2,

(a) show that $\sin AFB = \dfrac{\sqrt{2} + \sqrt{6}}{4}$

(3)

Without using a calculator,

(b) show that $BF = 12\left(3\sqrt{2} - \sqrt{6}\right)$ cm

(5)

The angle between the plane *AEB* and the plane *ABCD* is 65°

(c) Find, in cm to 2 significant figures, the length of *EF*

(3)

(d) Find, in degrees to one decimal place, the size of the angle between the line *CF* and the plane *ABCD*

(4)

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Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 15 marks)