10 The points A, B, C and D are such that

$$\overrightarrow{AB} = 5\mathbf{i} + 5\mathbf{j} \qquad \overrightarrow{AC} = -2\mathbf{i} + 15\mathbf{j} \qquad \overrightarrow{AD} = -7\mathbf{i} + 10\mathbf{j}$$

(a) (i) Find $\overrightarrow{DC}$ as a simplified expression in terms of $\mathbf{i}$ and $\mathbf{j}$.

   (ii) Hence show that $ABCD$ is a parallelogram.

(4)

(b) Find a unit vector parallel to $\overrightarrow{BD}$ as a simplified expression in terms of $\mathbf{i}$ and $\mathbf{j}$.

(4)

The point E lies on BD and $BE:ED = 3:10$

(c) Find $\overrightarrow{AE}$ as a simplified expression in terms of $\mathbf{i}$ and $\mathbf{j}$.

(2)

The point F is such that DCF and AEF are both straight lines.

(d) Find $DC:CF$

(6)

Question 10 continued

Question 10 continued

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Question 10 continued
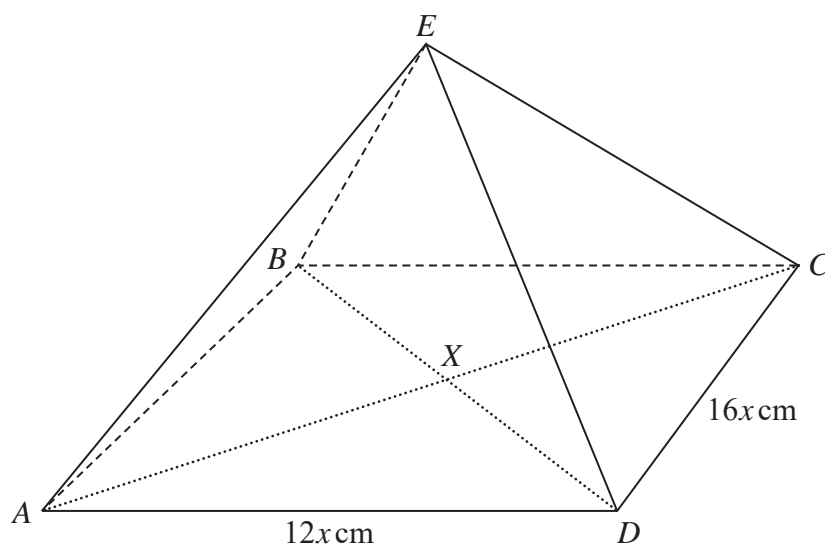
(Total for Question 10 is 16 marks)

11

Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows the right pyramid *ABCDE*. The base of the pyramid, *ABCD*, is a rectangle with *CD* = 16*x* cm and *AD* = 12*x* cm. The diagonals of the base intersect at the point *X*. The edges *EA*, *EB*, *EC* and *ED* are all of equal length. The size of the angle between *EA* and the base *ABCD* is 45°

Find, in terms of *x*,

(a) the height, *EX*, of the pyramid,

(3)

(b) the length of *EA*.

(2)

Find, in degrees to the nearest 0.1°, the size of

(c) the acute angle between the planes *AEB* and *ABCD*,

(3)

(d) the acute angle between the planes *BED* and *AEC*.

(3)

The area of triangle *AED* is 250 cm^2

(e) Find, to 4 significant figures, the value of *x*.

(3)

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Question 11 continued

P 5 3 3 9 1 A 0 3 3 3 6

Question 11 continued

P 5 3 3 9 1 A 0 3 4 3 6

Question 11 continued

P 5 3 3 9 1 A 0 3 5 3 6

Question 11 continued

(Total for Question 11 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS