10 The points A, B, C and D are the vertices of a quadrilateral and

$\overrightarrow{AB} = 3\mathbf{i} + 5\mathbf{j},$ $\overrightarrow{AC} = 6\mathbf{i} + 6\mathbf{j}$ and $\overrightarrow{AD} = 9\mathbf{i} + 3\mathbf{j}$

(a) (i) Find $\overrightarrow{BC}$

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

(3)

(b) (i) Find the exact value of $\left|\overrightarrow{BD}\right|$

(ii) Find a unit vector parallel to $\overrightarrow{BD}$

(4)

The point F is on the line BD and $BF : FD = 1 : 2$

(c) Find $\overrightarrow{AF}$

(2)

The point E is on the line AD such that $ABCE$ is a parallelogram.

(d) (i) Show that F lies on the line CE

(ii) Find the ratio $EF : FC$

(6)

Question 10 continued

Question 10 continued

Question 10 continued

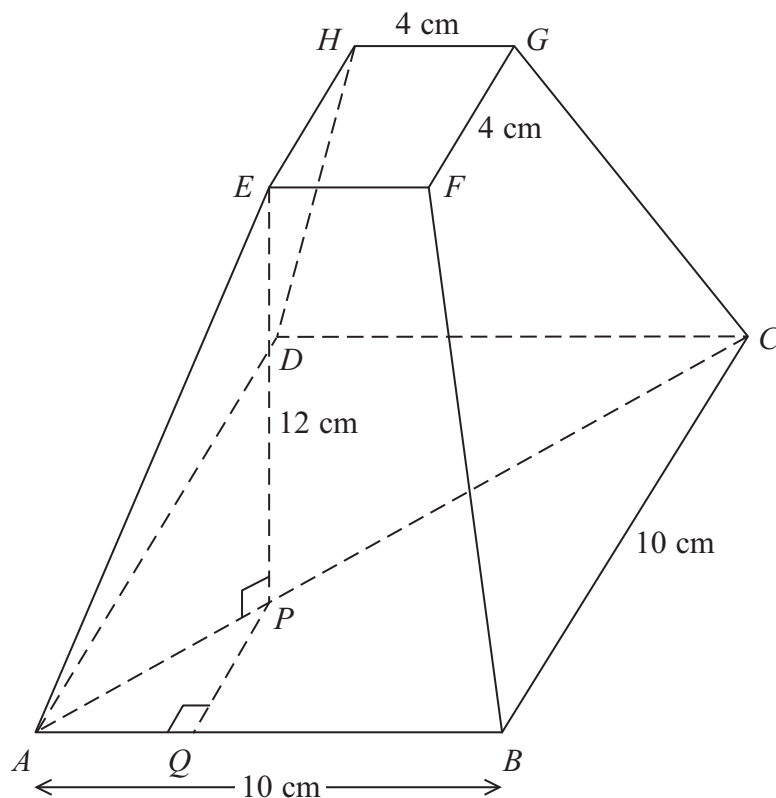**(Total for Question 10 is 15 marks)**

11

Figure 1

Figure 1 shows a truncated right pyramid. The base *ABCD* is a square with sides of length 10 cm. The top *EFGH* is a square with sides of length 4 cm. The base is parallel to the top and *AE = BF = CG = DH*.

The point *P* is on the line *AC* such that angle *APE* is a right-angle and *EP* = 12 cm.

(a) Find, in centimetres, the exact length of

   (i) *AC*   (ii) *EG*   (iii) *AP*

(6)

(b) Find, in centimetres to 3 significant figures, the length of *AE*.

(2)

(c) Find, in degrees to 1 decimal place, the angle between the line *AE* and the plane *ABCD*.

(2)

The point *Q* is on the line *AB*. Angle *AQP* is a right-angle.

(d) (i) Show that *PQ* = 3 cm.

   (ii) Write down, in centimetres, the length of *AQ*.

(2)

(e) Find, in degrees to 1 decimal place, the angle between the line *AE* and the line *AB*.

(2)

(f) Find, in degrees to 1 decimal place, the angle between the plane *ABFE* and the plane *ABCD*.

(3)

Question 11 continued

Question 11 continued

P 4 1 7 7 5 A 0 3 0 3 2

Question 11 continued

Question 11 continued

(Total for Question 11 is 17 marks)

TOTAL FOR PAPER IS 100 MARKS