4.

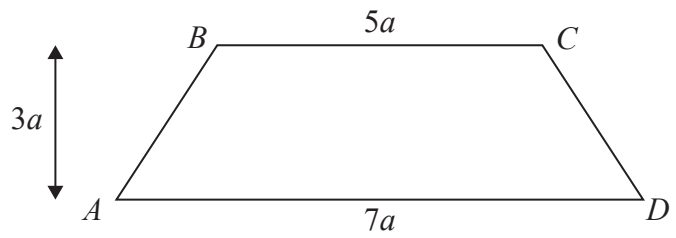


Figure 2

The uniform lamina $ABCD$ shown in Figure 2 is in the shape of an isosceles trapezium.

- BC is parallel to AD and angle BAD is equal to angle ADC
- $BC = 5a$ and $AD = 7a$
- the perpendicular distance between BC and AD is $3a$
- the distance of the centre of mass of $ABCD$ from AD is d

(a) Show that $d = \frac{17}{12}a$

(5)

The uniform lamina $PQRS$ is a rectangle with $PQ = 5a$ and $QR = 9a$.

The lamina $ABCD$ in Figure 2 is used to cut a hole in $PQRS$ to form the template shown shaded in Figure 3.

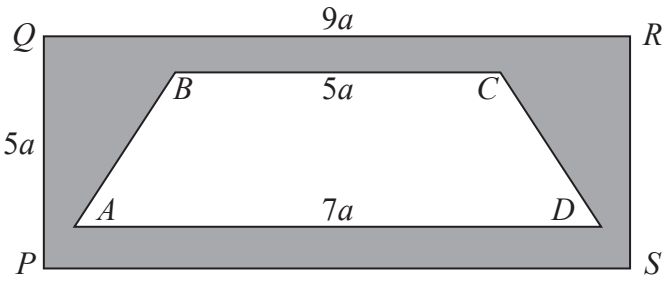


Figure 3

- PS is parallel to AD
- the perpendicular distance between PS and AD is a
- the perpendicular distance of A from PQ is a

The template is freely suspended from P and hangs in equilibrium with PS at an angle of $\theta°$ to the downward vertical.

(b) Find the value of θ

(7)

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Question 4 continued

(Total for Question 4 is 12 marks)