6.

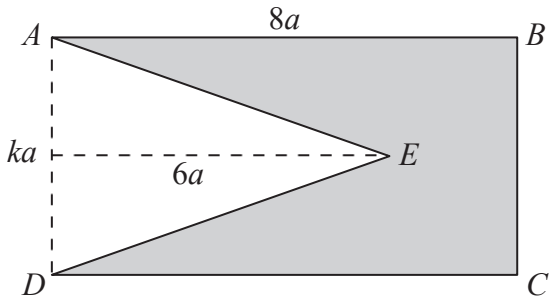


Figure 4

The uniform rectangular lamina $ABCD$ has $AB = 8a$ and $AD = ka$.

The isosceles triangle AED has $AE = DE$ and the perpendicular height of the triangle is $6a$.
The triangle AED is removed from the rectangle to form the template shown shaded in Figure 4.

The distance of the centre of mass of the template from AD is d.

(a) Show that $d = \frac{26}{5}a$.

(5)

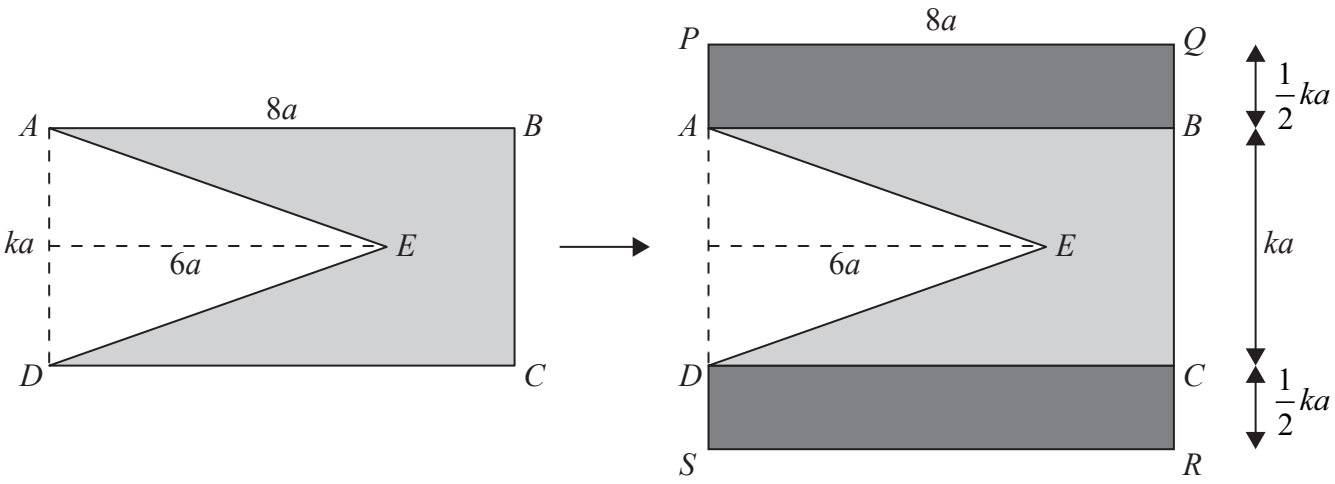


Figure 5

Two identical rectangular laminas, each with length $8a$ and width $\frac{1}{2}ka$, are attached to the template to form the model $PQRSDEA$ shown in Figure 5.

- the two rectangular laminas and the template all lie in the same plane
- the mass per unit area of rectangular lamina $PQBA$ is **three times** the mass per unit area of the template
- the mass per unit area of rectangular lamina $DCRS$ is **three times** the mass per unit area of the template

The model $PQRSDEA$ is freely suspended from P and hangs in equilibrium with PS at an angle of θ to the downward vertical.

(b) Find, in terms of k, the exact value of $\tan\theta$.

(6)

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