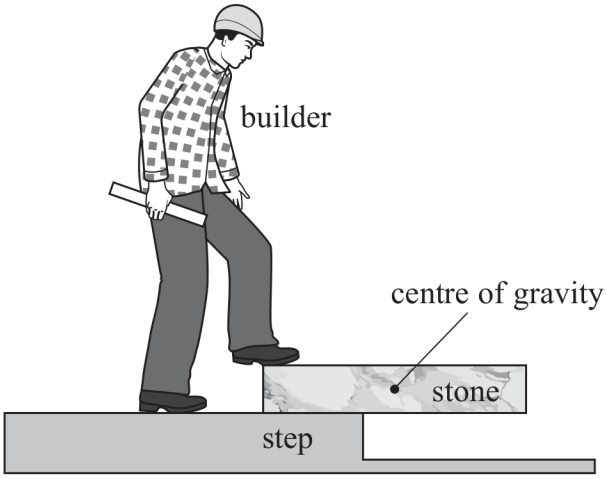
13 A builder is making a path using uniform rectangular stones. A stone is resting horizontally on a step and is held in equilibrium by the builder's foot.

The centre of gravity of the stone is at its centre, as shown.



(a) (i) State what is meant by equilibrium.

(2)

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.....

.....

.....

.....

(ii) State what is meant by the centre of gravity of an object.

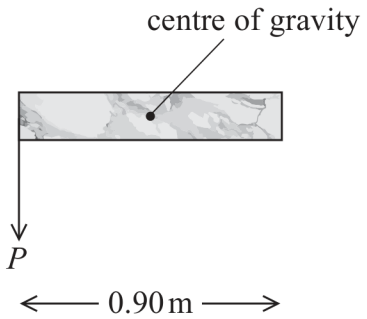
(1)

.....

.....

(b) The builder applies the minimum force P that will keep the stone in equilibrium.

(i) The position and direction of P are shown on the diagram below.

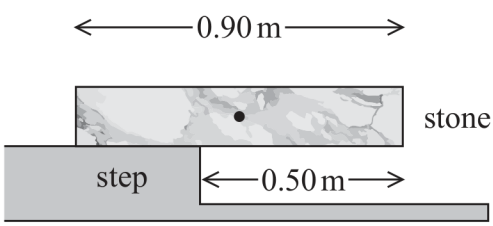


Complete the diagram above by adding labelled arrows to show the positions and directions of the other forces acting on the stone.

(2)

(ii) The stone has a weight of 415 N and a length of 0.90 m.

The length of the stone beyond the edge of the step is 0.50 m, as shown below.



The centre of gravity is at the centre of the stone.

Calculate the magnitude of P.

(3)

Magnitude of P = ...

(Total for Question 13 = 8 marks)