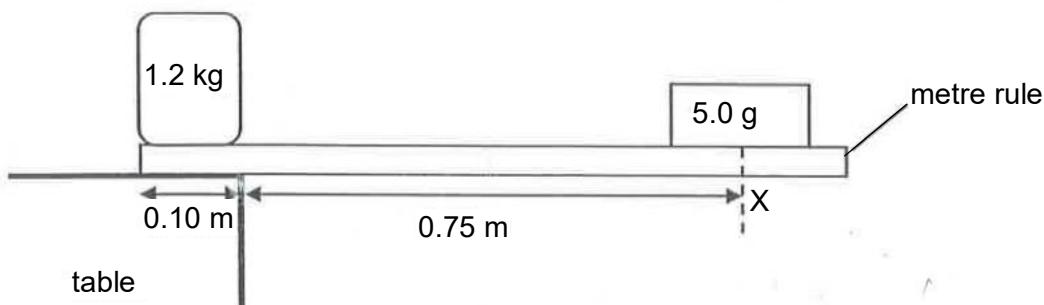


- 3 A student attempts to build a cantilever structure in a school laboratory. Using a rigid uniform metre rule of mass 0.11 kg, a uniform block of mass 1.2 kg and several uniform 5.0 g masses, he sets up the cantilever structure shown in Fig. 3.1.



**Fig. 3.1**

- (a) (i) Define the moment of a force.

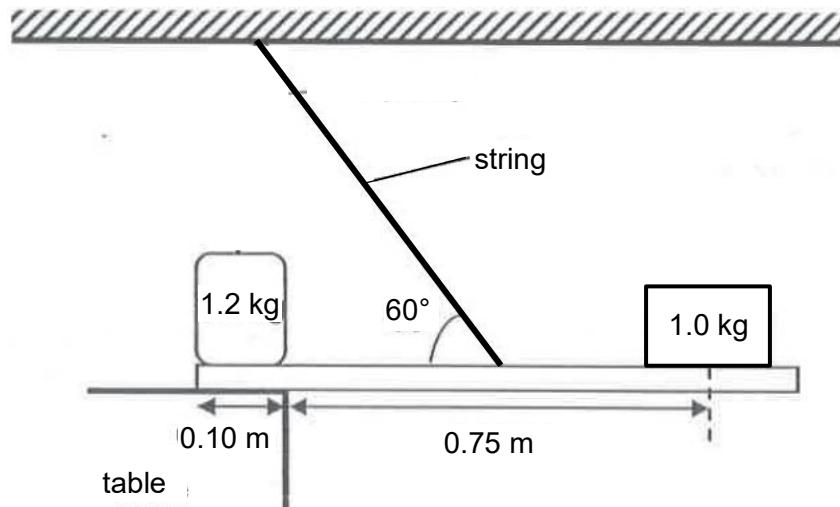
..... [1]

- (ii) Determine the maximum number of 5.0 g masses that he can stack at point X before the structure topples.

number of masses = ..... [2]

- (b) Fig. 3.2 shows the student modifying the structure by adding a string with one end attached to the ceiling and the other end to the centre of the metre rule. Assume that the table surface is rough and no slipping occurs.

He then replaces the 5.0 g mass by a load of 1.0 kg.



**Fig. 3.2**

- (i) On Fig. 3.2, draw an arrow to indicate the tension acting in the string for the system to be in equilibrium. Label the tension  $T$ . [1]
- (ii) Determine the tension acting in the string if the ruler is just about to topple.

tension = ..... N [2]