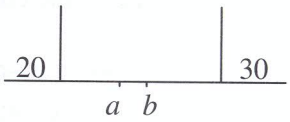
2009

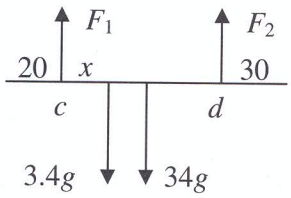
7. **(a)** A uniform rod of length 2 m and of mass 34 kg, is suspended by two vertical strings.



One string is attached to a point 20 cm from one end and can just support a mass of 17 kg without breaking; the second string is attached 30 cm from the other end and can just support a mass of 20.74 kg without breaking.

A mass of 3.4 kg is now attached to the rod.

Find the length of the section *ab* of the rod within which the 3.4 kg mass can be attached without breaking either string.



Take moments about c :

$$F_2(1.5) = 3.4g(x) + 34g(0.8)$$

$$20.74g(1.5) = 3.4g(x) + 34g(0.8)$$

$$\Rightarrow x = 1.15 \text{ m}$$

Take moments about d :

$$F_1(1.5) = 3.4g(1.5 - x) + 34g(0.7)$$

$$17g(1.5) = 3.4g(1.5 - x) + 34g(0.7)$$

$$\Rightarrow x = 1 \text{ m}$$

$$\Rightarrow |ab| = 0.15 \text{ m or } 15 \text{ cm}$$

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