1 Fig. 1.1 shows a simplified catapult used to hurl projectiles a long way.

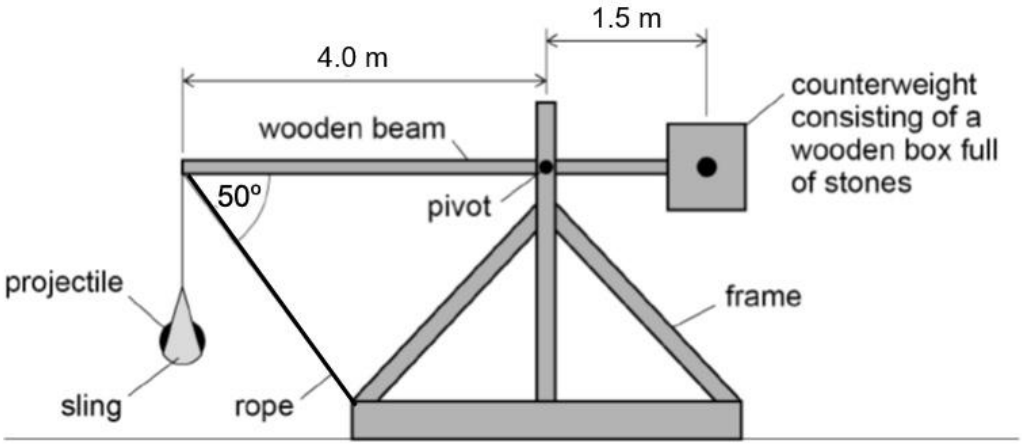

Fig. 1.1

The counterweight is a wooden box full of stones attached to one end of the beam. The projectile, usually a large rock, is in a sling hanging vertically from the other end of the beam. The weight of the sling is negligible.

(a) The catapult is designed so that the weight of the beam and the weight of the *empty* wooden box have no effect on the tension in the rope.

Suggest how the pivot position achieves this.

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..... [2]

(b) The stones in the counterweight have a total mass of 610 kg and the projectile weighs 250 N.

The beam is held horizontal by a rope attached to the frame.

Calculate the tension in the rope.

tension = ... N [3]

(iii) For equilibrium to be reached, there is another force *R* acting on the beam at the pivot.

1. Sketch and label this force *R* on Fig. 1.1. [1]

2. Calculate the magnitude of the force *R*.
You may assume that the weight of the beam and empty box is negligible compared to the other forces.

R = ... N [4]

[Total: 10]