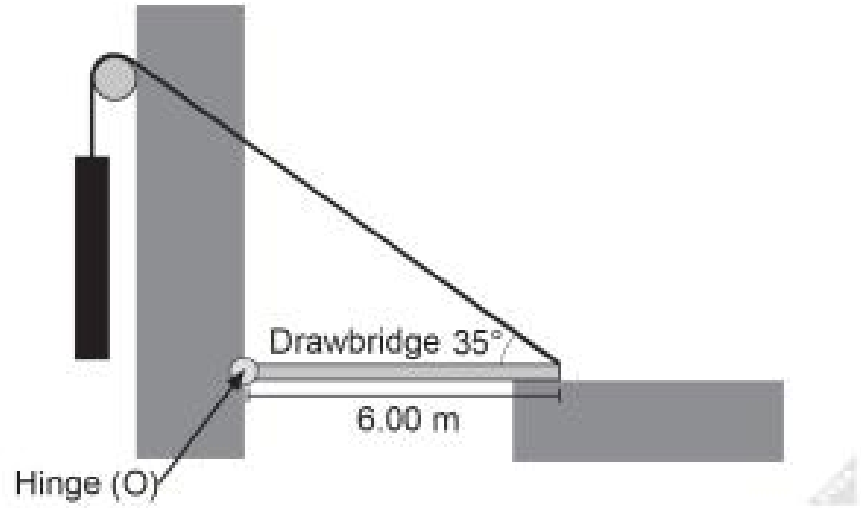
Question 18 **(14 marks)**



A castle has a 6.00 m long drawbridge with a mass of 500 kg over its moat. It is attached to a winch by an extremely strong rope at an angle 35.0° to the horizontal.

(a) Calculate the tension in the rope when the drawbridge is just lifted off the rest on the other side of the moat. (4 marks)

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(b) Calculate the reaction force of the hinge (O) on the drawbridge at this point. (5 marks)

The castle comes under attack. The people inside the castle begin to raise the drawbridge. When it is at an angle of 15.0° above horizontal, the angle between the drawbridge and the rope is 40.0°. At this moment, a 95.0 kg soldier being chased by the enemy jumps onto the very end of the drawbridge.

(c) Calculate the new tension in the rope as he hangs from the end. Assume the drawbridge is stationary at this time. (5 marks)

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