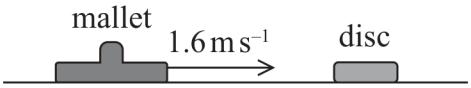
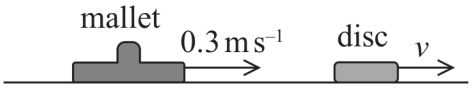
18 A game is played where each player must use a 'mallet' to hit a disc across a table into the opponent's goal.

One player accidentally lets go of a mallet. The mallet travels at a speed of $1.6\,m\,s^{-1}$ and collides with a stationary disc.

After the collision, the mallet continues in the same direction at a lower speed of $0.3\,m\,s^{-1}$. The disc moves in the same direction as the mallet with a velocity v, as shown.



before collision



after collision

(a) Calculate a value for v.
Assume that frictional forces are negligible.

mass of disc = 0.035 kg
mass of mallet = 0.17 kg

(3)

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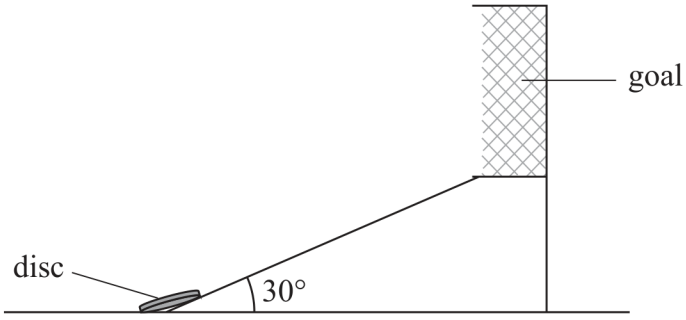
v = ...

(b) To reach the goal, the disc must move up a ramp which is at an angle of 30° to the horizontal.



The velocity of the disc at the bottom of the ramp is $5.0\,m\,s^{-1}$. The disc moves up the ramp and work is done by the disc against the frictional force. The disc moves a distance of 6.5 cm up the ramp before moving back down.

Determine the frictional force acting on the disc.

(6)

Frictional force = ...

(Total for Question 18 = 9 marks)