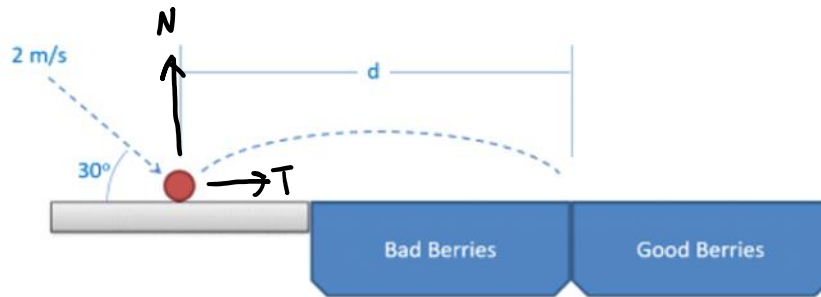


## Problem 4

In an alternate cranberry sorter machine, cranberries are launched at a horizontal metal plate with an initial velocity of 2 m/s downwards at a 30-degree angle as shown below. The cranberries then bounce off the plate into one of two baskets, a closer one for bad cranberries and a farther one for good cranberries. If the cranberries are supposed to have a coefficient of restitution of 0.8 or greater, how far away should the edge of the good cranberry bucket be?



Before impact

$$V_{ti} = 2 \cos(30) = 1.73 \text{ m/s}$$

$$V_{ni} = -2 \sin(30) = -1 \text{ m/s}$$

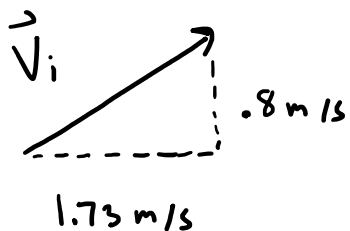
impact

$$V_{tf} = V_{ti} = 1.73 \text{ m/s}$$

$$e = .8 = -\frac{V_{nf}}{V_{ni}} \rightarrow V_{nf} = .8 \text{ m/s}$$

↑  
-1 m/s

# Projectile motion



$$\ddot{x}(t) = 0$$

$$\ddot{y}(t) = -9.81$$

$$\dot{x}(t) = 1.73$$

$$\dot{y}(t) = -9.81t + .8$$

$$x(t) = 1.73t$$

$$y(t) = -\frac{9.81}{2}t^2 + .8t$$

$$y(t) = 0 = -\frac{9.81}{2}t^2 + .8t \rightarrow t = 0, t = .163$$

$$x(t) = 1.73(t) = .282 \text{ m}$$

$$d = 28.2 \text{ cm}$$