

### Question #58105, Physics / Mechanics | Relativity

8 A boy intends to move an  $m$ -kg crate across the floor by applying a constant force  $P$  newtons on it. The coefficient of friction between the floor and the crate is  $\mu$ . Which of these is the best option for his task?

Pull the crate with  $P$  applied horizontally

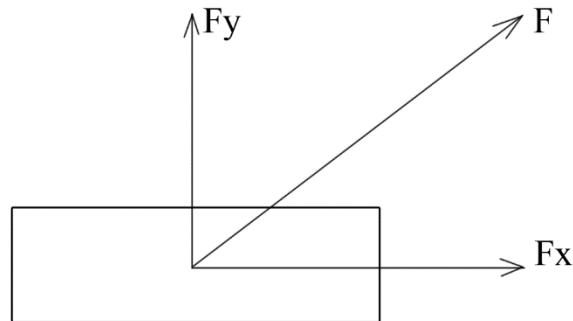
Push the crate with  $P$  inclined at an angle above the horizontal

Pull the crate with  $P$  inclined at an angle above the horizontal

Pull the crate with  $P$  inclined an angle below the horizontal

#### Solution:

The best option is "Pull the crate with  $P$  inclined at an angle above the horizontal" because in this case the vertical component of the applied force is directed upward, and therefore friction is reduced.



9 A boat propelled so as to travel with a speed of  $0.50\text{m/s}$  in still water, moves directly (in a straight line) across a river that is  $60\text{m}$  wide. The river flows with a speed of  $0.30\text{m/s}$ . How long in seconds does it take the boat to cross the river?

36

120

150

200

#### Solution:

$V$  is the boat's velocity relative to the water. Its component  $V_x$  compensates flow speed  $V_f$ , therefore the boat is crossing the river with the speed  $V_y$ .

$$V = \sqrt{V_x^2 + V_y^2};$$

$$V_y = \sqrt{V^2 - V_x^2}$$

Since  $V_x = V_f$ ; thus

$$V_y = \sqrt{0.5^2 - 0.3^2} = 0.4 \text{ m/s}$$

Time to cross the river:

$$t = \frac{d}{V_y};$$

$$t = \frac{60}{0.4} = 150 \text{ s}$$

**Answer:** 150 s