

The JETS Challenge

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Challenge 70 – The Curling Challenge

Problem:

The Sackville Curling Club has measured the coefficient of friction for a 40 pound Olympic curling stone on 14°F ice as $\mu = 0.0168$. A curling rink is 30 meters from the release point to the center of the house. To guide the direction of the stone, the sweepers must go into action when the velocity slows to exactly 1.2 m/s. The equation is:

$$V^2 = V_o^2 + 2 \cdot \mu \cdot g \cdot (X - X_o)$$

where V is the velocity at any given point (m/s)

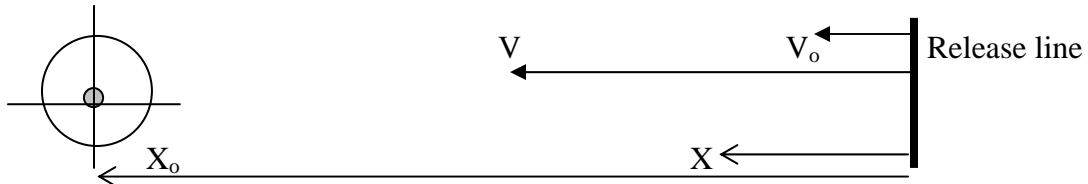
V_o is the initial velocity (m/s)

μ is the coefficient of friction

g is local gravity (9.81 m/s^2)

X is the distance from the release point (meters) and

X_o is the distance between the release point and the stopping point (meters).



If the release velocity is 3.1 m/s, how far down the ice from the release point must the sweepers start to end up 1 meter in front of the center of the house?

Solution:

$$V_o = 3.1 \text{ m/s}$$

$$\mu = 0.0168$$

$$g = 9.81 \text{ m/s}^2$$

find X

$$X_o = 29 \text{ m}$$

$$V^2 = V_o^2 + 2 \times \mu \times g \times (X - X_o)$$

$$(1.2 \text{ m/s})^2 = (3.1 \text{ m/s})^2 + 2(0.0168)(9.81 \text{ m/s}^2)(X - 29 \text{ m})$$

$$1.44 \text{ m}^2/\text{s}^2 = 9.61 \text{ m}^2/\text{s}^2 + 0.329616 \text{ m/s}^2 (X - 29 \text{ m})$$

$$1.44 \text{ m}^2/\text{s}^2 = 9.61 \text{ m}^2/\text{s}^2 + 0.329616 \text{ m/s}^2 X - 9.558864 \text{ m}^2/\text{s}^2$$

$$1.44 \text{ m}^2 = 0.051136 \text{ m}^2/\text{s}^2 + 0.329616 \text{ m/s}^2 X$$

$$1.388864 \text{ m}^2/\text{s}^2 = 0.329616 \text{ m/s}^2 X$$

$$X = 4.21 \text{ m}$$

$$29 \text{ m} - 4.21 \text{ m} = 24.79 \text{ m} = \text{answer}$$