Answer on Question #62208-Physics – Mechanics | Relativity

While curling, you push a rock for 1.70 m and release it when it has a speed of 1.70 m/s. It continues to slide at constant speed for 0.700 s and then hits a rough patch of ice. It finally comes to rest 9.20 m from where it was released.

What was the curling rock's magnitude of acceleration after it hit the patch of rough ice?

Solution

The distance from the place where a rock was released to final position is

$$D = d_1 + d_2 = vt_1 + vt_2 - \frac{at_2^2}{2}.$$

$$v - 0 = at_2 \to t_2 = \frac{v}{a}.$$

$$D = vt_1 + v\left(\frac{v}{a}\right) - \frac{a\left(\frac{v}{a}\right)^2}{2} = vt_1 + \frac{v^2}{2a}.$$

$$\frac{v^2}{2a} = D - vt_1$$

$$a = \frac{v^2}{2(D - vt_1)} = \frac{1.7^2}{2(9.2 - 1.7 \cdot 0.7)} = 0.180\frac{m}{s^2}.$$

Answer: $\mathbf{0.180}\frac{\boldsymbol{m}}{\boldsymbol{s^2}}$.