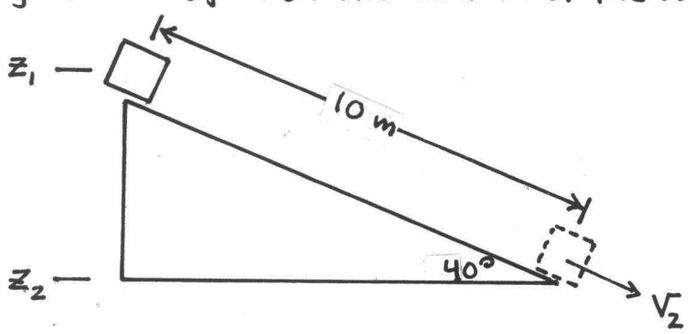
PROBLEM 2.16

KNOWN: Beginning from rest, and object of known mass slides down an inclined plane. The length of the ramp is given.

FIND: Determine the velocity of the object at the bottom of the ramp.

SCHEMATIC & GIVEN DATA:

$m = 200$ kg
$g = 9.81$ m/s^2
$V_1 = 0$



ENGR. MODEL: (1) The mass is a closed system. (2) There is no friction between the mass and the ramp, and air resistance is negligible. (3) The acceleration of gravity is constant.

ANALYSIS: By assumption (2), the only force acting on the system is the force of gravity. Thus, Eq. 2.11 applies

$$\textcircled{1} \qquad \frac{1}{2}m(V_2^2 - \cancel{V_1^2}^{0}) + mg(z_2 - z_1) = 0$$

Solving for V_2

$$V_2 = \sqrt{2g(z_1 - z_2)}$$

From trigonometric relationships

$$z_1 - z_2 = (10\text{ m})\sin 40°$$

Thus

$$V_2 = \sqrt{2(9.81\text{ m/s}^2)(10\text{ m})\sin 40°}$$

$$= 11.23\text{ m/s} \longleftarrow V_2$$

1. Even though the object travels along an inclined path, the vertical distance appears in this expression.

PROBLEM 2.17

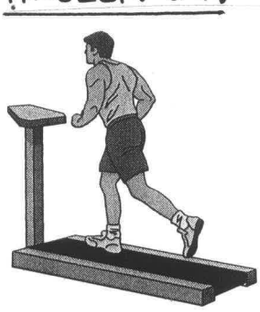


Fig. P2.17

- Exercise value = 620 kcal
- Calorie value, 1 cup of vanilla ice cream = 264 kcal (Internet)

To break even calorie-wise, Jack may have

$$\frac{620\text{ kcal}}{264\text{ kcal/cup}} = 2.35\text{ cups}$$