

1D-dynamics examples

Example 1

A 100 kg block is attached to a rope. Find the tension in the rope if

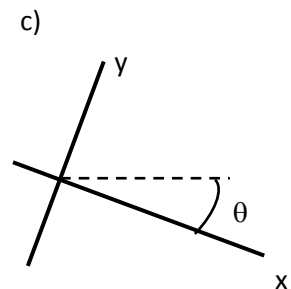
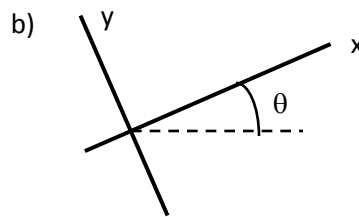
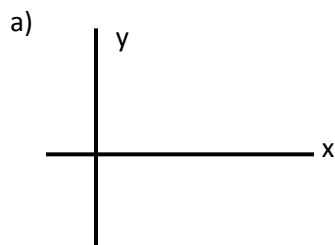
- The block is stationary
- The block moves up with a 2 m/s constant speed
- The block moves down with a 1.5 m/s^2 acceleration.

Take $g = 9.8 \text{ m/s}^2$.



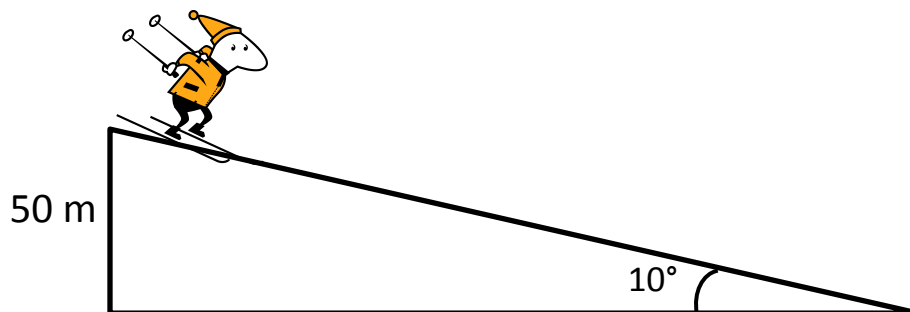
Example 2

What are the components W_x and W_y of the weight \vec{W} of some mass m in the three following coordinates systems:



Example 3

A 75 kg skier starts down a 50-m high, 10° slope on frictionless skis. What is the speed of the skier at the bottom of the slope?

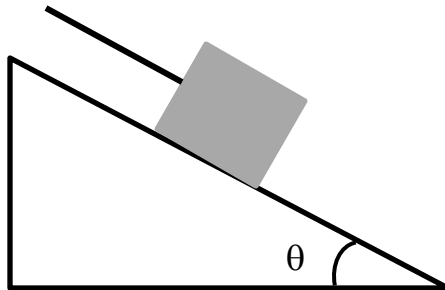


Example 4

Burglars are trying to haul a 1000-kg safe up a frictionless ramp to their getaway truck. Find the tension in the rope pulling the safe if

- the safe is at rest on the incline
- the safe is moving up the incline at 1 m/s
- the safe is accelerating up the incline at 1 m/s^2

Check the limits $\theta = 0^\circ$ and $\theta = 90^\circ$.



Example 5

Same as example 4, but take $\theta = 20^\circ$ and assume that the burglars push with a horizontal force equal to 4000 N. Find the acceleration \vec{a} of the safe.

Example 6

A 50-kg student rides in an elevator. The normal force applied on the student by the elevator is 600 N (this is called the apparent weight). If the normal force is applied for 3s, how far does the elevator move in that period of time? Does the elevator move up or down?