Answer on Question #42925, Physics, Mechanics | Kinematics | Dynamics

A wooden chest is pulled across a level ship's deck by a force of 2.20E2 N. If the chest accelerates at 0.488 m/s² and coefficient of friction between the object and the deck is 0.310, what is the mass of the wooden chest?

Solution:

The equation of motion is

$$F - F_{fr} = ma,$$

where force is F = 2.20E2 N, force of friction is F_{fr} = μN (N = mg, μ = 0.310 is the coefficient of kinetic friction), the acceleration is a = 0.488 m/s².

Thus,

$$F - \mu mg = ma$$

$$m = \frac{F}{a + \mu g}$$

$$m = \frac{220}{0.488 + 0.310 \cdot 9.81} = 62.3 \text{ kg}$$

Answer: $m = 62.3$ kg.