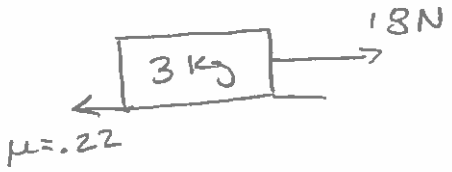
Acceleration of System (Applied Forces)

P07. A 3.00kg crate is being pulled by a horizontal force of 18.0N across a horizontal surface. The coefficient of friction between the surface and the crate is 0.22. What is the acceleration of the crate?

A) 2.16 m/s²
B) 3.84 m/s²
C) 5.28 m/s²
D) 6.00 m/s²
E) 8.16 m/s²



$$a = \frac{\Sigma F}{m} = \frac{18 - \mu mg}{3} = \frac{18 - (.22)(3)(9.8)}{3} = 3.84$$

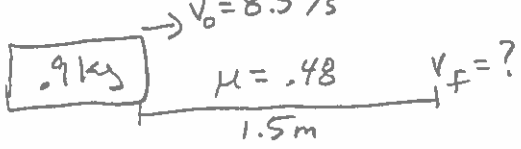
P13. A mass of 900.0g is sliding across a frictionless horizontal floor when it encounters a 1.50m stretch of "sticky" floor on which the coefficient of friction is 0.480. If the initial velocity of the mass is 8.50m/s, what is the velocity of the mass after it goes across the sticky part of the floor?

A) 3.76 m/s
B) 5.11 m/s
C) 5.70 m/s
D) 6.23 m/s
E) 7.62 m/s

$$a = \frac{\Sigma F}{m} = \frac{-\mu mg}{m} = .48(9.8) = 4.7\ m/s^2$$

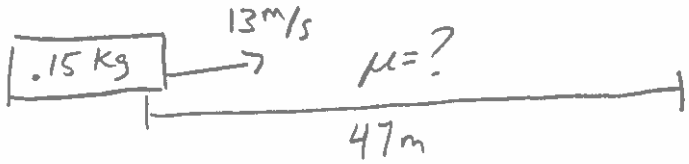
$$v_f^2 = v_0^2 + 2ax$$

$$v_f = \sqrt{(8.5)^2 + 2(-4.7)(1.5)} = 7.62\ m/s$$



P11. A hockey puck with a mass of 150.0 g slides horizontally across ice. The initial velocity of the puck is 13.0 m/s. If the puck comes to a stop after sliding 47.0 m, what is the coefficient of friction between the puck and the ice?

A) 0.0570
B) 0.0920
C) 0.180
D) 0.270
E) 0.370



$$v_f^2 = v_0^2 + 2ax$$

$$a = \frac{v_f^2 - v_0^2}{2x} = \frac{0^2 - 13^2}{2(47)} = -1.79\ m/s^2$$

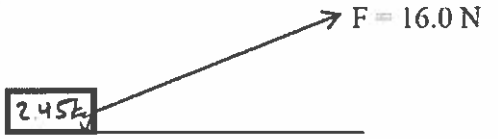
$$a = \frac{\Sigma F}{m} = \frac{-\mu mg}{m} \qquad a = \mu g$$

$$-1.79 = \mu(9.8)$$

$$\mu = .18$$

Acceleration of System (Applied Forces)

minus if pulled up
plus if pushed down



$f = \mu N$

$f = \mu(mg - F\sin(\theta))$

P07. A 2.45-kg wooden block is pulled across the floor by a cord as shown. The coefficient of sliding friction between the floor and the block is 0.385. The cord makes an angle of 20.6° with the horizontal. Find the acceleration of the block.

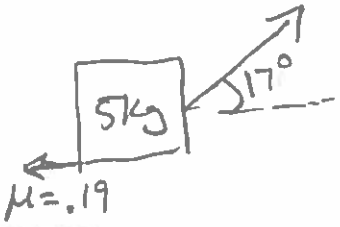
A) 2.62 m/s^2
B) 2.77 m/s^2
C) 2.92 m/s^2
D) 3.07 m/s^2
E) 3.22 m/s^2

$$a = \frac{\Sigma F}{m} = \frac{F\cos(\theta) - \mu(mg - F\sin(\theta))}{m}$$

$$a = \frac{16\cos(20.6) - .385(2.45(9.8) - 16\sin(20.6))}{2.45}$$

$a = 3.22\ m/s^2$

P06. A box with a mass of 5.00 kg is being dragged across the floor by a force that is angled at 17.0° above the horizontal. The coefficient of friction between the box and the floor is 0.190. If the box accelerates at a rate of 1.79 m/s^2, what is the magnitude of the force pulling the box?



A) 8.95 N
B) 9.36 N
C) 18.1 N
D) 19.1 N
E) 20.3 N

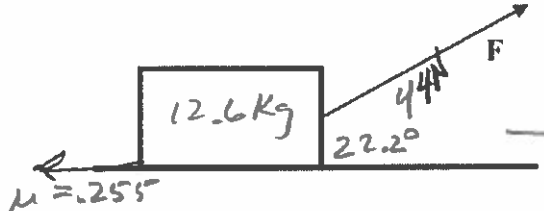
$$1.79 = \frac{F\cos(17) - .19(5(9.8) - F\sin(17))}{5}$$

$8.95 = .9563F - 9.31 + .0556F$

$+9.31 \quad +9.31$

$18.26 = 1.0119F$

$F = 18.05\ N$



P7. A 12.6 kg box is resting on the top of a table as shown. The coefficient of sliding friction between the table top's surface and the box is 0.255. A 44.0 N pulling force is applied at an angle of 22.2° above the horizontal. Find the acceleration of the box.

A) 0.771 m/s^2
B) 1.07 m/s^2
C) 1.37 m/s^2
D) 1.67 m/s^2
E) 1.97 m/s^2

$$a = \frac{44\cos(22.2) - .255(12.6(9.8) - 44\sin(22.2))}{12.6}$$

$a = 1.07\ m/s^2$