Name SOLUTIONS Date _____

70	**Friction Determination and More**
	Friction = $F_{(NORMAL)} \times u$ $\quad w = mg \quad g = 9.8\ m/s^2$ $F = ma \quad d=vt \quad v_f = v_i + at \quad d= v_it + (1/2)at^2$

1) An object has a normal force of 120 N. If $u = 0.2$, what is the force of friction?

$F_{NORM} = 120\ N$

$u = .2$

FRICTION = ?

$FRICTION = (120)(.2)$

$FRICTION = \boxed{24\ N}$

2) An object has a normal force of 70 N. If $u = 0.3$, what is the force of friction?

$F_{NORM} = 70\ N$

$u = .3$

FRICTION = ?

$FRICTION = (70)(.3)$

$FRICTION = \boxed{21\ N}$

3) An object has a force of friction of 90 N. If the normal force is 300 N, what is u?

$FRICTION = 90\ N$

$F_{NORM} = 300\ N$

$u = ?$

$FRICTION = F_{NORM}\, u$

$90 = 300\, u$

$\frac{90}{300} = u = \boxed{.3}$

4) An object has a force of friction of 120 N. If the normal force is 600 N, what is u?

$FRICTION = 120\ N$

$F_{NORM} = 600\ N$

$u = ?$

$120 = 600\, u$

$\frac{120}{600} = u = \boxed{.2}$

Friction = $F_{(NORMAL)} \times u$ $w = mg$ $g = 9.8\ m/s^2$ $F = ma$ $d=vt$ $v_f = v_i + at$ $d= v_it + (1/2)at^2$

5) An object has a friction force of 400 N. If $u = 0.25$, what is the normal force?

FRICTION = 400 N

$u = .25$

$F_{NORM} = ?$

$400 = F_{NORM}(.25)$

$\frac{400}{.25} = F_{NORM} = \boxed{1600\ N}$

6) An object has a friction force of 100 N. If $u = 0.35$, what is the normal force?

FRICTION = 100 N

$u = .35$

$F_{NORM} = ?$

$100 = F_{NORM}(.35)$

$\frac{100}{.35} = F_{NORM} = \boxed{285.7\ N}$

7) A 5 kg object has a u of 0.3. What is the force of friction acting on the object?

F_{NORM} = weight = mg

$F_{NORM} = (5)(9.8) = 49\ N$

$u = .3$

FRICTION = ?

FRICTION = $(F_{NORM})u$

FRICTION = $(49)(.3)$

FRICTION = $\boxed{14.7\ N}$

8) An object has a u of 0.25. The force of friction is 2205 N. What is the mass of the object?

$u = .25$

FRICTION = 2205 N

FRICTION = $F_{NORM}\ u$

$2205 = F_{NORM}(.25)$

$\frac{2205}{.25} = F_{NORM} = 8820\ N$

F_{NORM} = weight = mg

$8820 = m(9.8)$

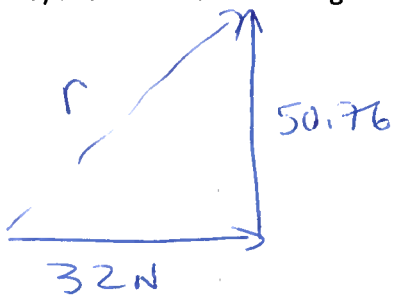
$8820 / 9.8 = m = \boxed{900\ kg}$

Answers: 1) 24 N 2) 21 N 3) 0.3 4) 0.2 5) 1600 N 6) 285.7 N 7) 14.7 N 8) 900 kg

Friction = $F_{(NORMAL)} \times \mu$ $w = mg$ $g = 9.8\ m/s^2$ $F = ma$ $d=vt$ $v_f = v_i + at$ $d= v_it + (1/2)at^2$

9) Two forces act on a 15 kg object. A 32 N force acts to the east and a 50.76 N force acts to the north.

a) Draw a head to tail diagram of these forces. Determine the resultant force.



$r^2 = 32^2 + 50.76^2$

$r = \sqrt{32^2 + 50.76^2}$

$r = \boxed{60N}$

b) The resultant force is also the net force. What is the acceleration of the mass?

$F = 60N$

$m = 15kg$

$a = ?$

$F = ma$

$60 = 15a$

$\frac{60}{15} = a = \boxed{4 m/s^2}$

c) Assume the object started at rest. How long will it take for the object to travel 30 m?

$V_i = 0 \frac{m}{s}$

$a = 4 \frac{m}{s^2}$

$d = 30m$

$t = ?$

$d = v_it + \frac{1}{2}at^2$

$30 = 0 + \frac{1}{2}(4)t^2$

$30 = 2t^2$

$\sqrt{\frac{30}{2}} = t = \boxed{3.9s}$

d) How fast will it be going at this point?

$V_i = 0 \frac{m}{s}$

$a = 4 m/s^2$

$t = 3.9s$

$V_f = ?$

$V_F = V_i + at$

$V_F = 0 + (4)(3.9)$

$V_F = \boxed{15.6 m/s}$

10) A teacher is attempting to teach class on a friction reduction machine (aka skateboard). The mass of the teacher and the FRM is 75 kg. The coefficient of friction between the machine and the floor is 0.05. The teacher begins to glide at 4 m/s. How long will it take for the teacher to come to a stop? Hint: While gliding, the applied force is zero.

$m = 75 kg$

$\mu = .05$

$V_i = 4 \frac{m}{s}$

$V_F = 0 \frac{m}{s}$

NET FORCE = APPLIED - FRICTION

NET FORCE = $0 - (F_{NORM})\mu$

NET FORCE = $(-) mg\mu$

NET FORCE = $(-)(75)(9.8)(.05)$

NET FORCE = $(-) 36.75$ N

$F = ma$

$-36.75 = 75a$

$\frac{-36.75}{75} = a = -.49 m/s^2$

$V_F = V_i + at$

$0 = 4 + (-.49)t$

$0 - 4 = -.49t$

$-4 = -.49t$

$\frac{-4}{-.49} = t = \boxed{8.2 s}$

Answers: 9a) 60 N b) 4 m/s^2 c) 3.9 s d) 15.6 m 10) 8.2 s