Worksheet 7.1: **Work**

1. A 20.0 N pomegranate is lifted at a constant velocity from the floor to a height of 1.50 m. How much work is done on the object?

$$m = \frac{F_g}{g} = \frac{20.0N}{9.8 m/s^2} = 2.04 kg$$

$$W = \Delta E_p$$
$$= mg\Delta h$$
$$= (2.04 kg)(9.8 m/s^2)(1.50m)$$
$$= \boxed{30.0 J}$$

2. A 15.0 N potato is moved horizontally 3.00 m across a level floor using a horizontal force of 6.00 N. How much work is done on the potato?
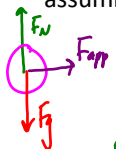
$$W = Fd = (6.00N)(3.00m)$$
$$= \boxed{18.0 J}$$

3. A 2.20 N pear is held 2.20 m above the floor for 10.0 s. How much work is done on the pear?

$$W = \Delta E = 0$$
or 0
$$W = F\overset{0}{d} = 0$$

4. A 10.0 kg pink grapefruit is accelerated horizontally from rest to a velocity of 11.0 m/s in 5.00 s by a horizontal force. How much work is done on the pink grapefruit assuming no friction?
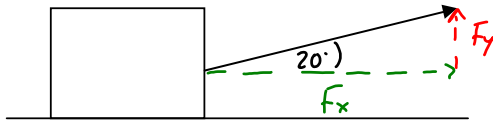
$$F_{app} = ma$$
$$= (10.0)(2.2)$$
$$= 22 N$$

$$a = \frac{V - V_0}{t} = \frac{11.0-0}{5.00}$$
$$= 2.2 m/s^2$$

$$d = \frac{1}{2}at^2 = \frac{1}{2}(2.2)(5)^2$$
$$= 27.5m$$

There has to be an easier way...

$$W = F_{app} d$$
$$= (22N)(27.5m) = \boxed{605 J}$$

5.

A 90.0 N box of papayas is pulled 10.0 m along a level surface by a rope. If the rope makes an angle of 20.0° with the surface, and the force in the rope is 75.0 N, how much work is done on the box?

$$W = F_x d$$
$$= F \cos 20° d$$
$$= (75.0N)\cos 20 (10.0m) = \boxed{705 J}$$

6. A 60.0 kg student runs at a constant velocity up a flight of stairs. If the height of the stairs is 3.2 m, what is the work done against gravity?

$$W = \Delta E = mgh = (60.0kg)(9.8 N/kg)(3.2m)$$
$$= \boxed{1900 J}$$

7. A 20.0 kg passionfruit is pulled horizontally 9.0 m along a level frictionless surface at a constant velocity. How much work is done on the passionfruit?

→ no F_f @ const v ←
means no F_{app}
∴ $W = F_{app} d = 0$

8.
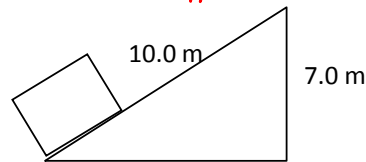
An 80.0 kg pumpkin is pushed up at a constant velocity along a frictionless incline as shown in the diagram. How much work is done on the pumpkin in moving it up the incline?

$$W = mgh = (80.0kg)(9.8 N/kg)(7.0m)$$
$$= \boxed{5500 J}$$

9. A 25.0 kg pickle is accelerated from rest through a distance of 6.0 m in 4.0 s across a level floor. If the friction force between the pickle and the floor is 3.8 N, what is the work done to move the object?
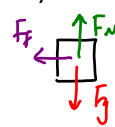
$$a = \frac{2d}{t^2} = \frac{2(6.0)}{(4.0)^2} = 0.75 m/s^2$$

$$F_{net} = F_{app} - F_f = ma$$

$$F_{app} = F_f + ma$$
$$= 3.8 N + (25.0kg)(0.75m/s^2) = 22.55N$$

$$W = F_{app} d$$
$$= (22.55N)(6.0m)$$
$$= \boxed{140 J}$$

10. A 1165 kg car traveling at 55 km/h is brought to a stop while skidding 38 m. Calculate the work done on the car by the friction forces.

$$F_{net} = F_f = ma$$
$$F_f = (1165kg)(-3.071 m/s^2)$$
$$= -3578$$

$$a = \frac{v^2 - v_0^2}{2d} = \frac{0^2 - 15.28^2}{2(38)}$$
$$= -3.071 m/s^2$$

$$W = F_f d = (-3578 N)(38m) = \boxed{-140\,000 J}$$

1) 30.0 J 2) 18.0 J 3) 0 J 4) 605 J 5) 705 J 6) 1900 J 7) 0 J 8) 5500 J 9) ~~185 J~~ 10) -1.4x10⁵ J
140 J