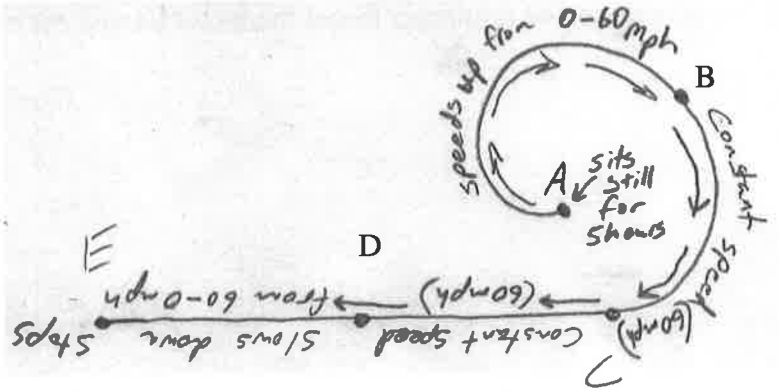
More Practice, Newton's 1st and 2nd Laws:

1. An object falling through air accelerates until it reaches what is known as its *terminal velocity.* After reaching terminal velocity, the object falls at a constant speed. Circle the answer that correctly completes the following sentence. When you jump out of a plane, before you reach terminal velocity…
   a. your weight equals air resistance. [✓ b. your weight is greater than air resistance.]
   c. air resistance is greater than your weight. c. air resistance is equal to your mass.

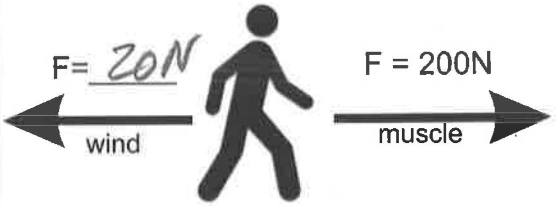
The diagram below shows the path followed by a car. It also explains what is happening to the car's speed as the car is traveling. For each of the segments of the car's path, tell whether (by circling) the forces acting on the car are balanced (no net force) or unbalanced.

2. At point A : [✓ Balanced] Unbalanced
3. Between A & B : Balanced [✓ Unbalanced]
4. Between B & C : Balanced [✓ Unbalanced]
5. Between C & D : [✓ Balanced] Unbalanced
6. Between D & E : Balanced [✓ Unbalanced]

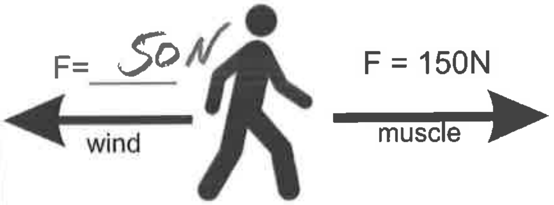


7. A ball is sitting motionless on the ground. Earth's gravitational pull accelerates objects at 9.8m/s^2. What do you know about the **NET FORCE** acting on the ball?
   $F_{net} = 0N$

8. Fill in the missing forces in the diagrams below.



a = 3m/s/s
mass = 60kg
Net Force = 180N



a = 2m/s/s
mass = 50kg
Net Force = 100N

9. (I) What is the weight of a 76-kg astronaut (*a*) on Earth, (*b*) on the Moon ($g = 1.7\ \text{m/s}^2$), (*c*) on Mars ($g = 3.7\ \text{m/s}^2$), (*d*) in outer space traveling with constant velocity?

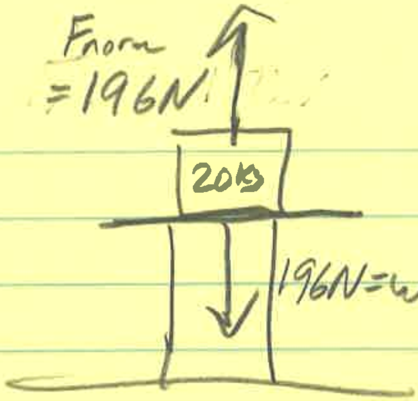
a) $w = mg \Rightarrow 76kg(9.8m/s^2) = \boxed{745N}$

b) $w = 76kg(1.7m/s^2) = \boxed{129N}$

c) $w = 76kg(3.7m/s^2) = \boxed{281N}$

d) No weight
$w = m(0)$

10. a)

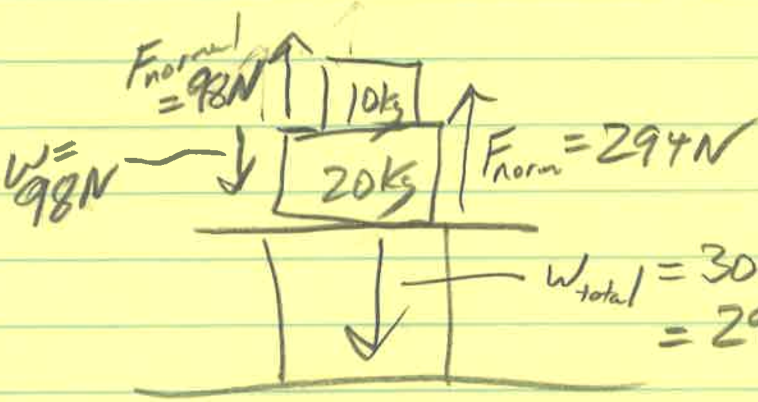


$F = ma$

$w = mg = 20kg(9.8m/s^2)$

$W = 196N\downarrow$

b)



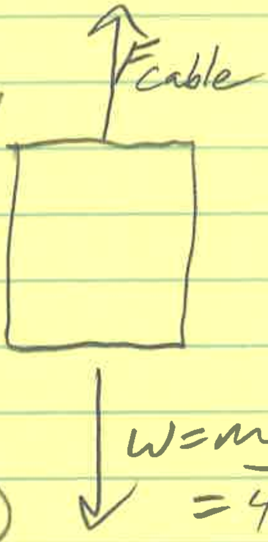
$W_{total} = 30kg(9.8m/s^2)$

$= 294N$

---

11. Max force for upward accel.

Min force for downward accel.



$W = mg = 4850kg(9.8m/s)$

$= 47,530N$

Max:

upward accel = 0.0680g

$= 0.068(9.8m/s^2)$

$a = 0.666 m/s^2$

$F_{net} = ma$ $\qquad$ $F_{net} = F_{cable} - W_{elevator}$

$F_{cable} - 47,530N = 4850kg(0.666m/s^2)$

$\boxed{F_{cable} = 50,760N}$

11.

Min Force when $a = -0.666 \, m/s^2$

$$F_{cable} - 47{,}530N = 4850kg(-0.666 \, m/s^2)$$

$$\boxed{F_{cable} = 44{,}300N}$$

Min

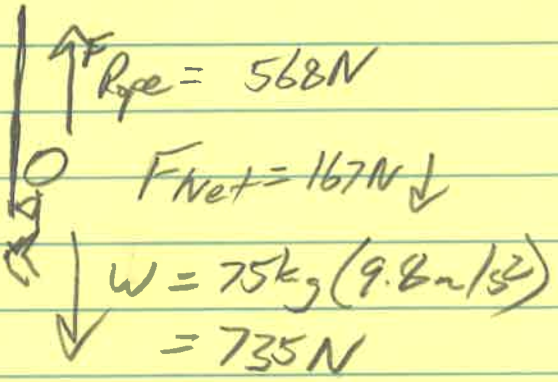
---

12. He needs to only exert a force of $F = ma = 58kg(9.8 \, m/s^2) = 568N$ on the rope.

So, the net force on the theif must be

$735N - 568N = 167N$

Downward

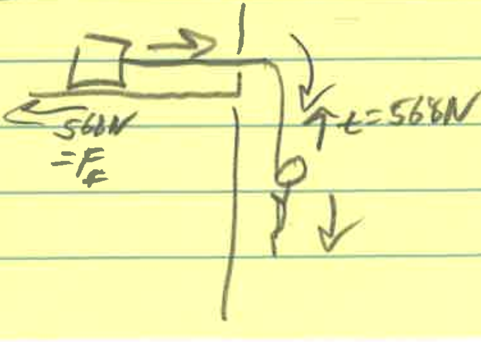


He must accelerate downward according to $F = ma$

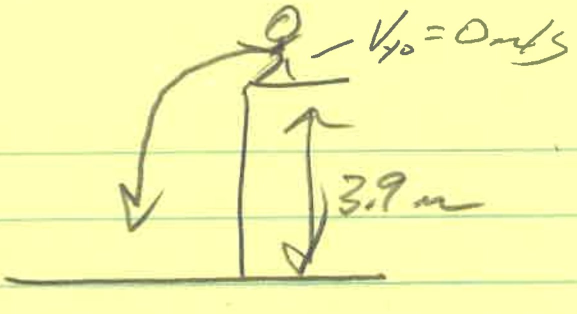
$$167N = 75kg(a)$$

$$a = 2.23 \, m/s^2$$

He needs to tie the rope to an object with a 568N force of friction



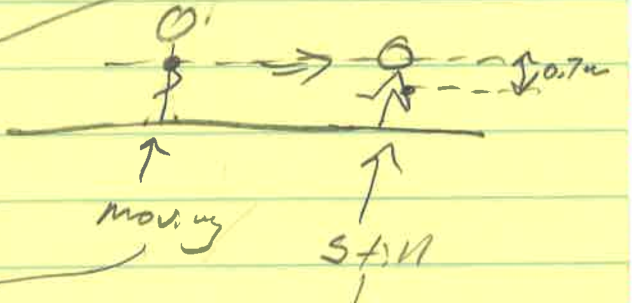
13,



a) $V_y^2 = V_{y_0}^2 + 2a(\Delta y)$

$V_y^2 = 2(-9.8 m/s^2)(-3.9 m)$

$\boxed{V_y = -8.74 m/s}$



b) $$\underset{?}{F} = \underset{42kg}{m}\,\underset{\text{we need accel.}}{a}.$$

$V_y^2 = V_{y_0}^2 + 2a(\Delta y)$

$0 m/s = (-8.74 m/s)^2 + 2a(-0.7 m)$

$a = 54.6 m/s^2$

$F_{Ave} = Ma = 42kg(54.6 m/s^2) = \boxed{2,290 N}$

14, $F = \underset{20g = 0.02kg}{m}\,a$

$a = \frac{\Delta V}{\Delta t} = \frac{0.35 m/s - 0.25 m/s}{0.1 s} = 1 m/s^2$

$F = (0.02 kg)(1 m/s^2) = \boxed{0.02N}$