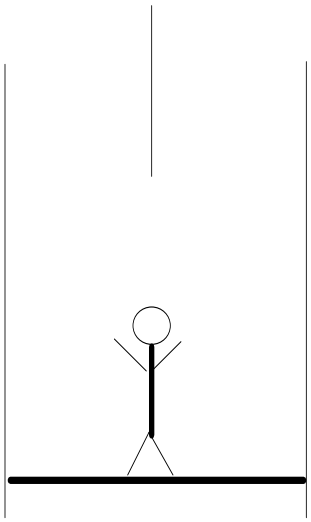
Name_____

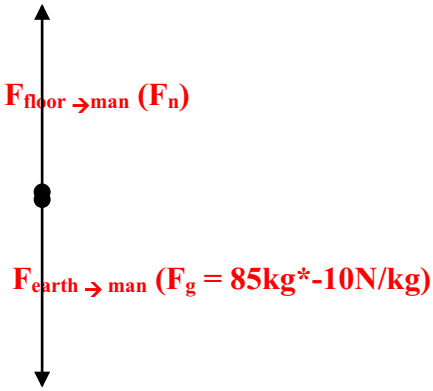
Date _____ Pd____

UNIT V: Worksheet 1

1. An elevator is moving up at a constant velocity of 2.5 m/s, as illustrated in the diagram below: The man has a mass of 85. kg.



a. Construct a force diagram for the man.



b. What force does the floor exert on the man?

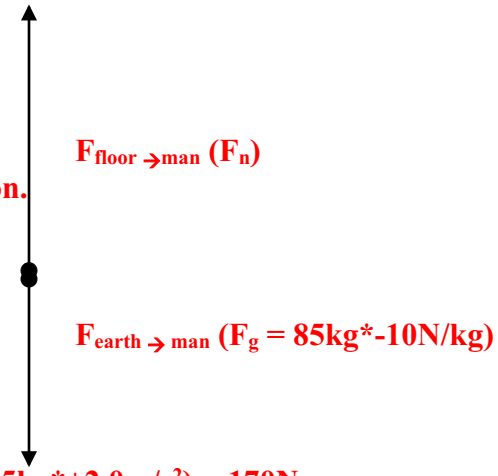
CV : F_{net-x} = 0N (no forces acting in x-direction)

CV: F_{net-y} = 0N = F_g +F_n = (-850N) + F_n **F_n = +850N**

2. The elevator now accelerates upward at 2.0 m/s^2.

a. Construct a force diagram for the man.

F_n > F_g because of positive acceleration in positive direction.



b. What force does the floor now exert on the man?

CV : F_{net-x} = 0N (no forces acting in x-direction)

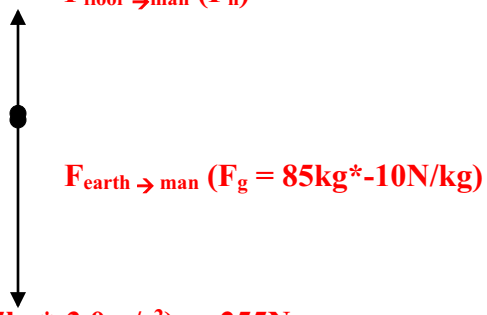
UA: F_{net-y} > 0N = F_g +F_n = (-850N) + F_n **F_{net-y}= (85kg*+2.0m/s^2) = 170N**

F_n = +1020N (also called apparent weight)
Man feels heavier.

3. Upon reaching the top of the building, the elevator accelerates downward at 3.0 m/s^2.
   a. Construct a force diagram for the man.

   b. What force does the floor now exert on the man?

$F_n < F_g$ because of man is speeding up in negative direction.



b. What force does the floor now exert on the man?

CV : F_{net-x} = 0N (no forces acting in x-direction)

UA: $F_{net-y} < 0N = F_g + F_n = (-850N) + F_n$

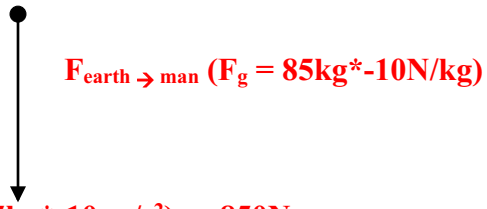
$F_{net-y} = (85kg*-3.0m/s^2) = -255N$

F_n = -595N (also called apparent weight)
Man feels lighter.

4. While descending in the elevator, the cable suddenly breaks. What is the force of the floor on the man?

***$F_{floor \rightarrow man}$ (F_n) no longer present**

$F_n < F_g$ because of man is speeding up in negative direction.



b. What force does the floor now exert on the man?

CV : F_{net-x} = 0N (no forces acting in x-direction)

UA: $F_{net-y} < 0N = F_g + F_n = (-850N) + F_n$

$F_{net-y} = (85kg*-10.m/s^2) = -850N$

F_n = 0N (also called apparent weight)
Man feels weightless.

5. Consider the situation where a person that has a mass of 68 kg is descending in an elevator at a constant velocity of +4.0 m/s. At some time "t", the elevator starts to slow to a stop at the rate of 2.0 m/s^2.

   a. Construct, **in the margin to the right**, a qualitative motion map indicating the relative positions, velocities and accelerations of the elevator as it descends.

   b. Construct **quantitative** force diagrams (include magnitudes) for the person in the elevator as it descends at (a) constant speed and (b) during its period of acceleration.

   c. If the person in the elevator were standing on a bathroom scale calibrated in newtons, what would the scale read while the elevator was (a) descending at constant speed and (b) while slowing to a stop? Please explain your answers.