3. What is your mass in the MKS (metric) system of measurement?

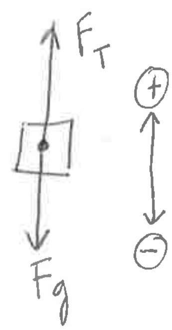
$1Kg = 2.2 lbs \quad 150\ lbs \times \frac{1Kg}{2.2\ lbs} = 68Kg$

4. Complete the chart below for your mass and weight (using the metric system) in various places.

	Earth $g=9.8\,m/s^2$	Moon ($g = 1.6\ m/s^2$)	Deep Space
Mass	68Kg	68Kg	68Kg
Weight	$F=mg$ or $W=mg$ $F=(68Kg)(9.8\frac{m}{s^2})$ $=666N$	$F=(68Kg)(1.6\frac{m}{s^2})=$ $=108.8N$	$g=0$ $0N$

5. A 5.0 kg bowling ball is hanging from a rope. Use $9.8\,m/s^2$

a) Calculate the tension in the rope when the bowling ball is at rest.



$\Sigma F = F_g + F_T = 0N$

$F_g = mg$

$0N - F_g = F_T = 49N$

$F_g = (5.0Kg)(-9.8\frac{m}{s^2}) = -49N$

b) What is the tension in the rope when the bowling ball is moving upwards at a constant speed?

$F_T = 49N$

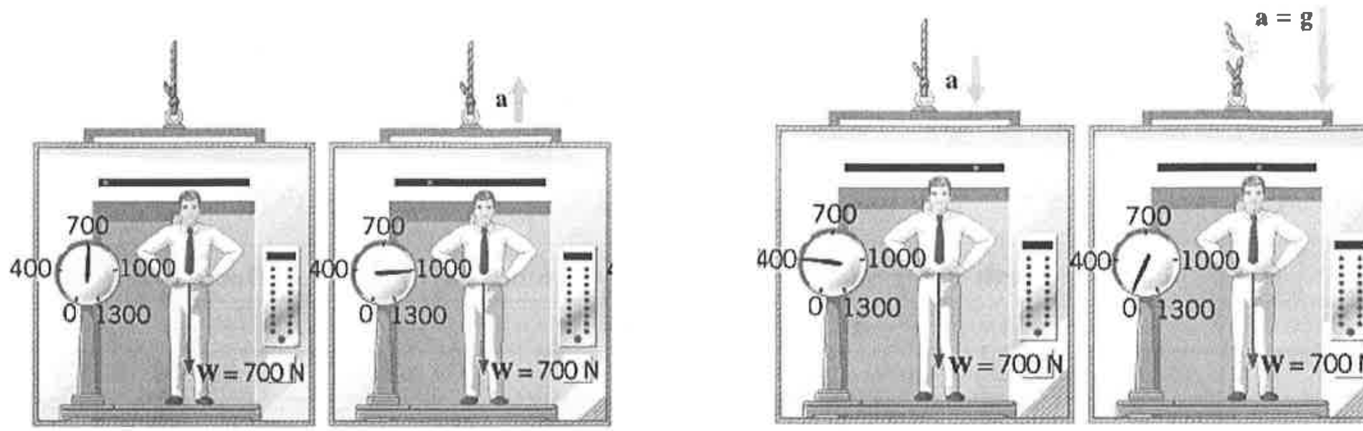
c) Calculate the tension in the rope when the bowling ball is accelerating upwards at 0.50 m/s². (+) $\vec{a}$

$\Sigma \vec{F} = m\vec{a} \quad \vec{F}_{NET} = m\vec{a}$

$\Sigma \vec{F} = F_T + F_g$

$F_T + F_g = ma$

$F_T = ma - F_g = (5.0Kg)(0.50\frac{m}{s^2}) - {}^{-}49N = 52N$



(a) No acceleration (v = constant) (b) Upward acceleration (c) Downward acceleration (d) Free-fall

6. When does the scale read the normal weight of the person? F_N = normal force

W = 700N at rest or when $\vec{v}$ is constant

7. When does the scale read higher than the normal weight of the person?

b) 1000N upward $\vec{a}$

8. When does the scale read less than the normal weight of the person?

c) 400N downward $\vec{a}$ or d) free fall when $a = g = 9.8\frac{m}{s^2}$

9. What does a scale reading actually measure?

F_N = normal force or force ⊥ to surface ⊕ ⊖

10. Determine the acceleration of the ~~elevator~~ in cases (b) and (c).

$a = \frac{\Sigma F}{m} = \frac{F_g + F_N}{m}$

(b) $F_N = 1000N$, $F_g = -700N$

$\frac{300N}{70kg} = +4.3\frac{m}{s^2}$

$g = 10\frac{m}{s^2}$ $m = F_g/g$ $700N / 10 m/s^2 \approx 70kg$

(c) $F_g = -700N$

$\frac{400N + -700N}{70kg} = -4.3 m/s^2$

11. The elevator descends, accelerating at -2.7 m/s2. What does the scale read?

$a = -2.7\frac{m}{s^2} = \frac{-700N + F_N}{70kg} = 510N$

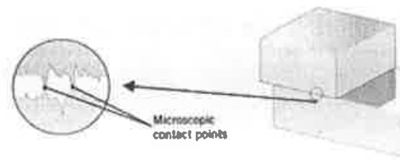
12. Suppose the cable snapped and the elevator fell freely. What would the scale read?

$F_N = \varnothing N$

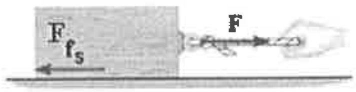
Normal force no longer acts upon person.

Friction

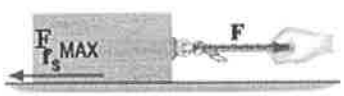
Cause of friction: electromagnetic force of attraction



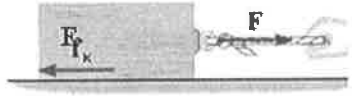
a) no movement



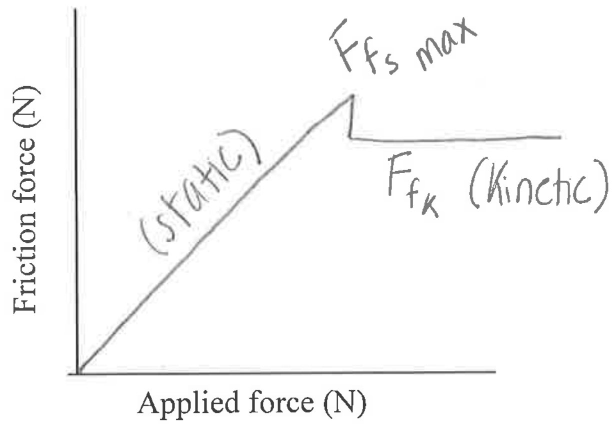
b) no movement



c) movement begins



d) while moving



Static Friction (F_{fs})

1) Force preventing surfaces from moving relative to each other.

2) Amount of static friction is not constant.

3) $F_{f_s} = F_A$ up to a maximum amount (F_{f_s}-max)

The object will move $F_A > F_{f_s}$ max

Kinetic Friction (F_{fk}) **(dynamic friction, sliding friction)**

1) Force resisting motion when surfaces are moving relative to each other.

2) Amount of kinetic friction remains constant while moving. It does not depend on the applied force.

3) Amount of kinetic friction is always less than maximum static friction. $F_{f_k} < F_{f_s}$ max