Name: **Key**   Date: _____

Forces and Motion Quiz

1) What is the net force acting on the box?

20 N ← [box] → 10 N
→ 5 N

20N Left / 10N + 5N Right
20N / ✓ f_net
      / 15N = **5N Left**

2) If the box has a mass of 5 kg, what is the acceleration of the box?

$\dfrac{F}{m \cdot a}$

$f_{net} = 5N \text{ Left}$ $M = 5 kg$ $f_{net} = ma \rightarrow 5N = 5kg \cdot a$ $a = \dfrac{5N}{5kg} = 1 m/s^2$

3) On Earth, a person has a mass of 30 kg. What is his weight?
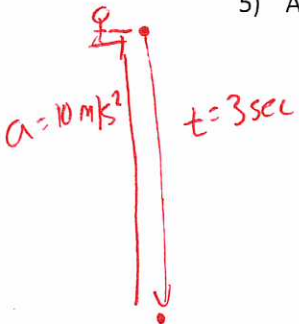
$F = ma$ $f_g = \text{weight} = m \cdot 10 m/s^2 \Rightarrow 30 kg \cdot 10 m/s^2 = 300 N$

4) If the person moved to another planet where gravity was less than on earth, his mass would

_____

↳ Mass doesn't change!!

(a.) Stays the same as on earth
b. Increase
c. Decrease

5) A ball is dropped off a cliff. It takes the ball 3 seconds to hit the ground.

$a = 10 m/s^2$ $t = 3 sec$

a. What is the ball's instantaneous velocity when it hits the ground?

$V = at \Rightarrow V = 10 m/s^2 \cdot 3s \rightarrow V = 30 m/s$

b. What is the average speed of the ball?

$V_{avg} = \dfrac{V_i + V_f}{2} \rightarrow V_{avg} = \dfrac{0 m/s + 30 m/s}{2} \rightarrow V_{avg} = \dfrac{30 m/s}{2} \rightarrow V_{avg} = 15 m/s$

c. What is the total distance traveled by the ball?

$d = \tfrac{1}{2}at^2 \rightarrow d = \tfrac{1}{2} 10 \cdot 3^2 \rightarrow d = 5 \cdot 9 \rightarrow d = 45 m$

6) Newton's 1st Law, an object at rest stays at rest and an object in motion stays in motion with the same speed and direction is similar to what concept? _____

a. Weight
(b. Inertia)
c. Acceleration
d. Electricity

7) A car's velocity decreases from 30 m/s to 15 m/s in 5 seconds.

a. Is the acceleration going to be positive or negative? Why?

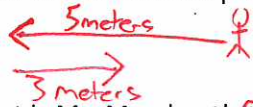$a = \dfrac{\Delta V}{t}$ Negative - the car is slowing down.

b. What is the car's acceleration?

$\dfrac{\Delta V}{a \cdot t}$

$a = \dfrac{\Delta V}{t} \rightarrow a = \dfrac{30 m/s - 15 m/s}{5s} \rightarrow a = \dfrac{-15 m/s}{5s} \rightarrow a = -3 m/s^2$

8) Mr. Marchant walks 5 meters to the left and then 3 meters to the right.

   a. Draw Mr. Marchant's path

   ← 5meters   Ƥ
   →
   3 meters

   b. What is Mr. Marchant's total distance traveled?
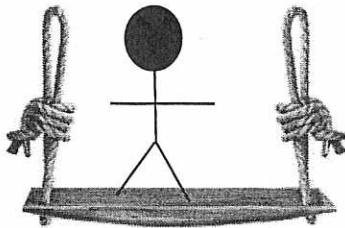
   5 meters + 3 meters = $\boxed{8\ meters}$

   c. What is Mr. Marchant's displacement?

   5 meters left + 3 meters right = $\boxed{2\ meters\ to\ the\ left}$

9) On a position versus time graph, a person's slope is 2. What is the velocity of that person?

   Slope = Velocity → 2 = 2 → $\boxed{V = 2}$

10) A man is standing on a swing held up by 2 cables. The man has a mass of 50 Kg.

    a. What is the man's weight?

    F = ma → W = ma → W = 50kg · 10 m/s² → $\boxed{W = 500\ N}$

    b. If one cable has a tension force of 400 N. What is the tension force in the other cable?

   400N ↑ ↑ = ? → 400 N + ? = 500 N → $\boxed{100\ N}$
    ↓
    500 N

11)

A
B
C
D
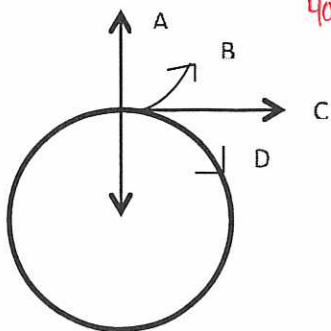
The picture below shows a "top-down" view of the path of a toy airplane attached to a string being spun in a circular path above someone's head.

a) The force that bends the object in a circular path is called? __Centripetal force__

b) If the string breaks while the plane is at the top of the circle, which direction will the plane fly in?__C__

c) Why does the plane move in that direction if the string breaks?

   a. Kinetic energy
   b. Inertia
   c. Impulse

12)

Friction = 4 N

M=1 kg

9N

Force on string = 9N
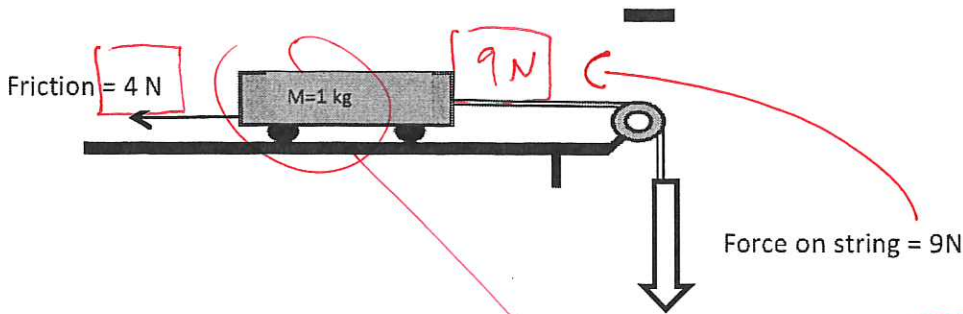
a. What is the net force on the cart? $\overleftarrow{4N} + \overrightarrow{9N} = \boxed{5N \text{ to the right}}$

$\dfrac{Fnet}{m \cdot a}$

b. What is the cart's acceleration?
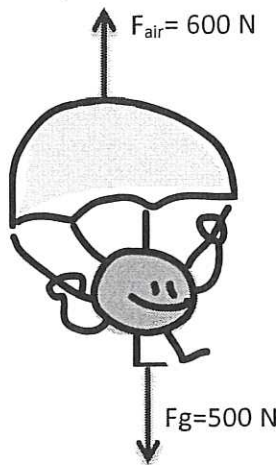$Fnet = ma \rightarrow 5N = 1kg\ a \rightarrow 5N/1kg = a \rightarrow \boxed{a = 5 m/s^2}$

c. If the cart has an initial velocity of 0 m/s, what will the cart's velocity be after 4 seconds?
$V = at \rightarrow V = 5m/s^2 \cdot 4 sec \rightarrow \boxed{V = 20 m/s}$

13) A ball is kicked into the air with an initial velocity of 25 m/s. What is the ball's total time in the air?

$\dfrac{V}{a \cdot t} \rightarrow t = \dfrac{\Delta V}{a} \rightarrow \Delta V = \dfrac{25 m/s + 25 m/s}{10 m/s^2} \rightarrow a = \dfrac{50 m/s}{10 m/s^2}$

Vi=25 m/s   Vf=-25 m/s

$\boxed{a = 5 sec}$
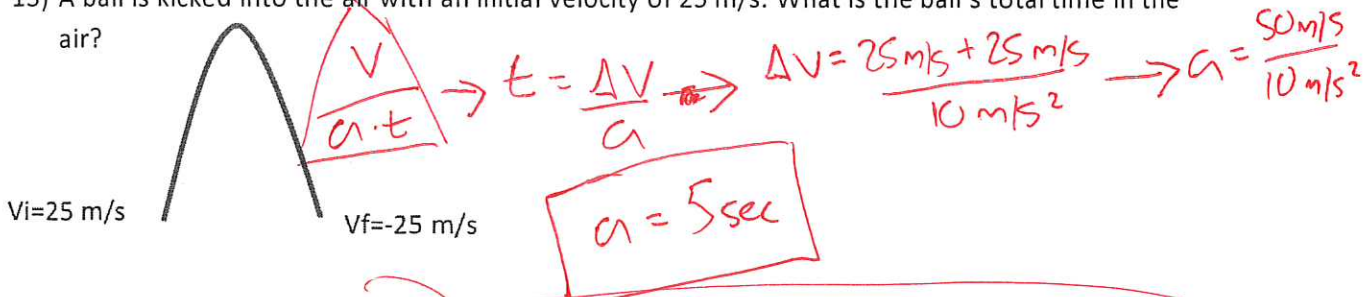
14) A sky diver has a mass of 50 kg.

F$_{air}$= 600 N

Fg=500 N

a) What is the skydiver's net force (Make sure to include the direction)?
↑ 600N
↓ 500N
$= \boxed{100 N \uparrow \text{ upward}}$

b) Is this force slowing him down or speeding him up?
Slowing him down

c) What is the skydiver's acceleration (Make sure to include if it is positive or negative)? $fnet = -100 N / M = 50 kg$
$\dfrac{fnet}{m \cdot a}$
$a = fnet/m \rightarrow a = -100N/50 kg \rightarrow \boxed{a = -2 m/s^2}$
$\boxed{a = -2 m/s^2}$

d) If the skydiver has an initial velocity of 20 m/s what is his velocity after falling for 4 seconds?
$Vf = Vi + at \rightarrow Vf = 20 m/s + -2 m/s^2 \cdot 4s$
$\begin{array}{c} 20 m/s - \\ -8 m/s = \\ \hline \boxed{12 m/s} \end{array}$