Force and Motion 2

Name: ____________

Date: ____________

Read Me: Provide some support for each answer, but it does not have to be an official Physics Fact.

- Copy the new facts into your Physics Facts booklet
- Do the following from your textbook:
  - p.127 Conceptual Question #6
  - p.128 #13
  - p.129 #31 Also answer these questions for this problem:
    - During what time interval is the force on the object constant? 2s to 4s
    - During what time interval is the acceleration of the object constant? 2s to 4s
  - p.129 #33

p.127 CQ#6

$\boxed{A} \rightarrow F \qquad a_{Ax} = 5\ m/s^2$

$\boxed{B} \rightarrow F \qquad a_{Bx} = 3\ m/s^2$

$\boxed{C} \rightarrow F \qquad a_{Cx} = 8\ m/s^2$

$$a_{sx} = \frac{\Sigma F_{on\,sx}}{m_s}$$

The forces are all the same, so let's call it F. Then:

$$a_{Ax} = \frac{F}{m_A}$$

$$a_{Bx} = \frac{F}{m_B}$$

$$a_{Cx} = \frac{F}{m_C}$$

a. To compare mass, since mass is in the denominator, the greater the mass, the smaller the resulting acceleration. Since B has the smallest accel, it must have the largest mass. $\boxed{B}$

b. The smallest mass will be the one with the greatest acceleration, so it is $\boxed{C}$.

c. To find the ratio of masses, I use my equations, and set them equal after I solve for F:

$$a_{Ax} = \frac{F}{m_A} \qquad a_{Bx} = \frac{F}{m_B}$$

$$a_{Ax} m_A = F \qquad a_{Bx} m_B = F$$

So, $a_{Ax} m_A = a_{Bx} m_B$

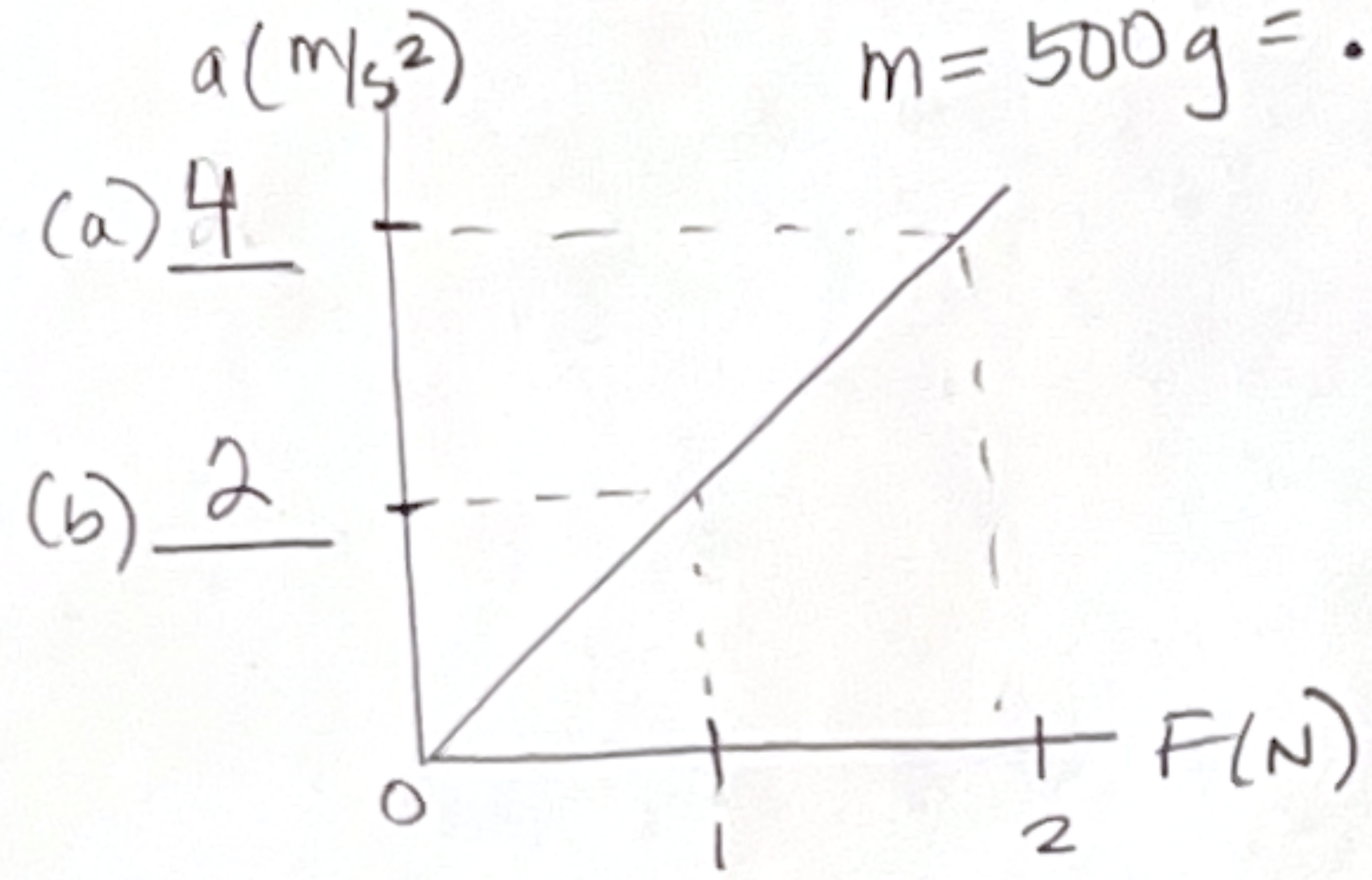
$$\frac{m_A}{m_B} = \frac{a_{Bx}}{a_{Ax}}$$

$$\frac{m_A}{m_B} = \frac{3\ m/s^2}{5\ m/s^2}$$

$$\boxed{\frac{m_A}{m_B} = \frac{3}{5}}$$

p. 128 #13

$m = 500g = .5 kg$



$$a_{sx} = \frac{\Sigma F_{ons\,x}}{m_s}$$

So, when F is 1N,

$$a_{sx} = \frac{(1N)}{.5kg}$$

$$a_{sx} = \boxed{2\ m/s^2}$$

When F is 2N,

$$a_{sx} = \frac{(2N)}{.5kg}$$

$$a_{sx} = \boxed{4\ m/s^2}$$

p. 129 #33

Constant F, so $\Sigma F_{ons\,x} = F$

$a_{sx} = 8.0\ m/s^2$

a. double the force, find a_{sx}:

$a_{sx1} = \frac{F}{m_s}$ ← situation 1

$a_{sx2} = \frac{2F}{m_s}$ ← situation 2

$a_{sx2} = 2\left(\frac{F}{m_s}\right)$

$a_{sx2} = 2\,a_{sx1}$ ← situation 2 related to situation 1

$a_{sx2} = 2(8.0\ m/s^2)$

$= 16\ m/s^2$

b. Double the mass:

$a_{sx} = \frac{F}{m_s}$

factor of change $= \frac{(1)}{(2)}$

$= \frac{1}{2}$

So the new accel. is $4\ m/s^2$

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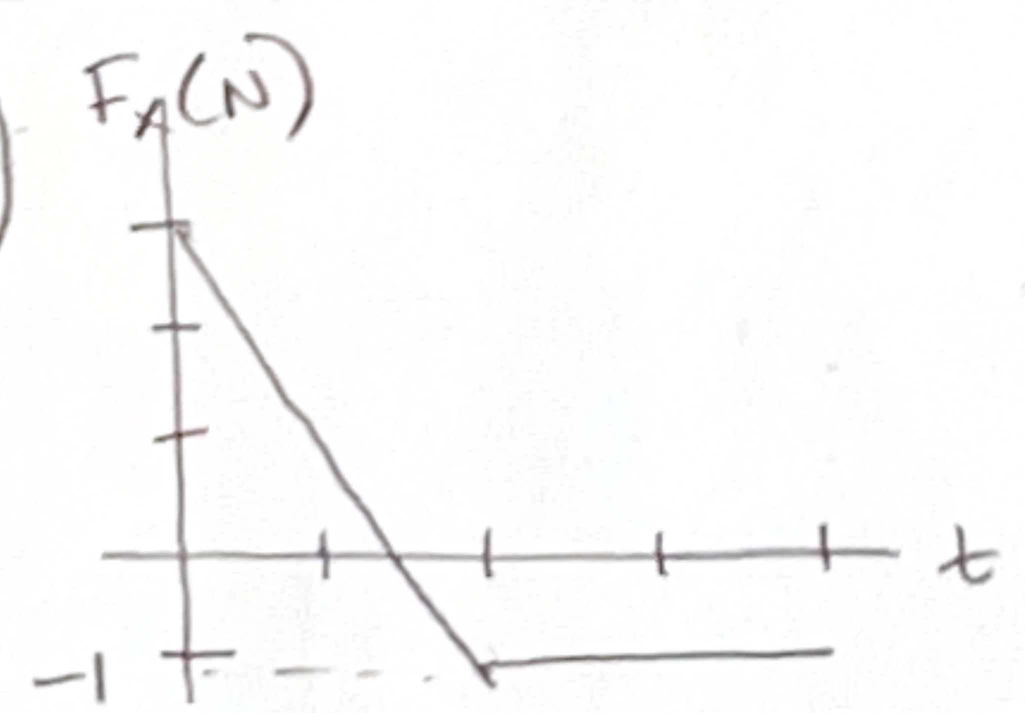
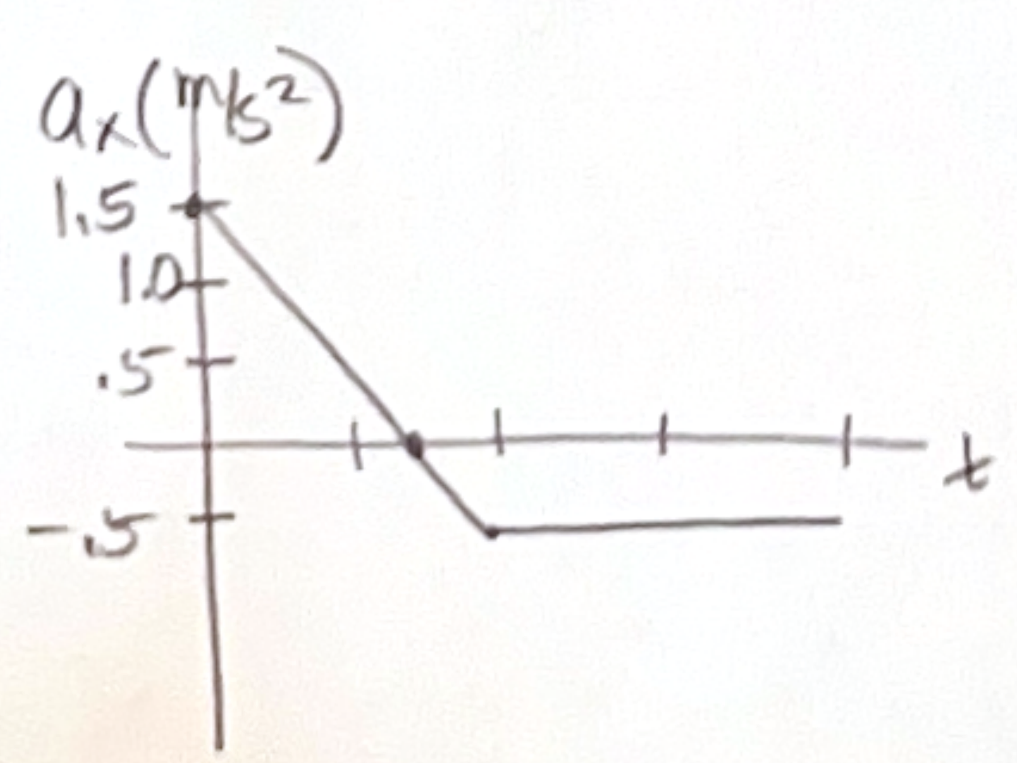
p. 129 #31





From 2s to 4s,

Force is constant, so accel is constant, since $a_{sx} = \frac{\Sigma F_{on\,s\,x}}{m_s}$

$$a_{sx} = \frac{(-1N)}{2kg} = -.5\ m/s^2$$

From t=0 to t=2s

Force is changing, so accel is changing. But at any instant, it is true that $a_{sx} = \frac{\Sigma F_{ons\,x}}{m_s}$. The accel is directly proportional to the sum of the forces.

At $t=0$, $a_{sx} = \frac{3N}{2kg} = 1.5\ m/s^2$

At $t=1.5$, $a_{sx} = \frac{0N}{2kg} = 0\ m/s^2$

p.129 #33, cont'd

c. double F and m: $a_{sx} = \frac{F}{m_s}$

factor of change $= \frac{(2)}{(2)}$

$= 1$

So no change, $a_{sx} = \boxed{8.0 \, m/s^2}$

d. double F, halve m:

$a_{sx} = \frac{F}{m_s}$

factor of change $= \frac{(2)}{(\frac{1}{2})}$

$= 4$

so, $a_{sx} = 4(8 \, m/s^2)$

$= \boxed{32 \, m/s^2}$