9/23

Two Hockey Players

puck $v = 6\ m/s$

$t = 3\ s$

$s = ?$

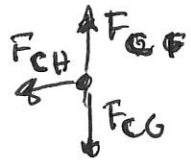
$s(t) = s_0 + Vt$

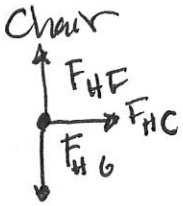
$s_0 = 0$

$s(t) = 6 \cdot 3 = 18\ m$

Problem set and Quiz Recap

- Remember that third Law Pairs act on different objects





Force Pairs

F_{CH}, F_{HC} (Force on Ms. Caroline due to chair, Force on chair due to Ms. Caroline)

F_{Cf}, F_{fC} (Force on Ms. Caroline due to the floor, Force on the Floor due to Ms. Caroline

F_{CG}, F_{GC} (Force on Ms. Caroline due to the Earth (Gravity), Force on the Earth Due to Ms. Caroline)

! and they confirm, Earth's and the Floors FBD are not pictured

- When doing 3rd Law Pair calculations, remember to set the force pair forces equal to each other (with one being negative). If you are asked to solve for acceleration remember $-m_1 a_1 = m_2 a_2$ & just divide by the mass of the object you want to find the acceleration of

- Universal Gravitation → $F_G = \frac{GMm}{r^2}$

$G = 6.67 \times 10^{-11}$

M = mass of one object (like a planet)

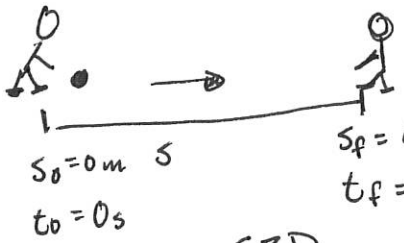
m = mass of the other object (like the astronaut)

r = distance between objects

for planets this is the radius of the planet

9/23

Kinematic Problem #1 - Rolling Ball



Ball Rolls between 2 students
(Note: I don't have the numbers for a specific class so the #'s may differ from yours)

How fast Did the Ball Go? What is the Velocity?

X
$a = 0$
$x_0 = ?$
$v_f = ?$
$s_0 = 0$
$s_f = 4$
$t_0 = 0$
$t_f = 2$

no x dir. Forces → same throughout constant velocity

FBD
F_N
F_g
Y, x

$$s(t) = s_0 + v_0 t + \frac{1}{2} a t^2$$

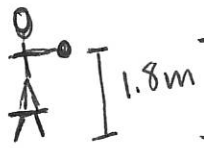
* evaluate at t_f

$$s(t_f) = s_f = s_0 + v_0 t_f + \frac{1}{2} a t_f^2$$

$$4 = 0 + v_0 \cdot 2 + \underbrace{\frac{1}{2} \cdot 0 \cdot (2)^2}_{0}$$

$$\frac{4}{2} = \frac{2 v_0}{2} \rightarrow 2 = v_0$$

Kinematic Problem #2 - Falling Ball



$s_0 = 1.8, t_0 = 0$
$s_f = 0, t_f = 0.44s$

Ball is dropped by a student standing on a stool.

What is the acceleration?

X
$a = ?$
$v_0 = 0$ m/s
$v_f = ?$
$s_0 = 0$ m
$s_f = 1.8$ m
$t_0 = 0s$
$t_f = 0.44s$

FBD
Y, x
F_g

if we knew the mass of the ball, we could use $F = ma$ to find the acceleration but instead we will use

$$s(t) = s_0 + v_0 t + \frac{1}{2} a t^2$$

Evaluate at t_f

$$s(t_f) = s_f = s_0 + v_0 t_f + \frac{1}{2} a t_f^2$$

$$1.8 = 0 + 0 \cdot 0.44 + \frac{1}{2} \cdot a \cdot (0.44)^2$$

$$1.8 = \frac{1}{2} \cdot a \cdot (0.44)^2$$

$$\frac{1.8}{0.1} = \frac{0.1 a}{0.1} \rightarrow a = 18 m/s^2$$

wow 200% off!