$\mathbf{a}_{avg}=\Delta \mathbf{v}/\Delta t$	$\mathbf{F}_{net}=m\mathbf{a}$	$\mathbf{p}=m\mathbf{v}$
$\mathbf{v}=\mathbf{v}_0+\mathbf{a}t$	$F_g=GMm/r^2$	$W=\mathbf{F}\cdot\Delta\mathbf{s}$
$\Delta\mathbf{s}=\mathbf{v}_0 t+\frac{1}{2}\mathbf{a}t^2$	$F_c=mv^2/r$	$P_{avg}=\Delta W/\Delta t$
$V=IR$	$F_e=kq_1q_2/r^2$	$K=\frac{1}{2}mv^2$
$P=VI$	$\mathbf{F}=q\mathbf{v}\times\mathbf{B}$	$U_g=mgh$
$R_s=\Sigma R_i$	$\tau=\mathbf{r}\times\mathbf{F}$	$\Delta U=Q-W$
$1/R_p=\Sigma 1/R_i$	$n=c/v$	$v=\lambda f$
$\varepsilon_{avg}=-N\frac{\Delta\Phi}{\Delta t}$	$n_1\sin\theta_1=n_2\sin\theta_2$	$\frac{1}{f}=\frac{1}{d_o}+\frac{1}{d_i}$
$\Delta x=\Delta x_0/\gamma$	$E=mc^2$	$\Delta t=\Delta t_0\gamma$

Weekly Sheet for MS2/ HS1b PHYSICS

Michael Dixon (MD²) mdixon@parksideca.org

Week #8, Week of Tues(10/17) to Mon (10/24)

Topics/Content/Skills: Kinematics (Linear and Circular), Intro Dynamics, Review

Skills:

- Know Rotational analogues for linear motion… Mass= Moment of inertia(**I**), Velocity- Angular velocity (ω), Acceleration-angular acceleration (α), Force- Rotational force(Aka Torque- τ); $F_{net}=ma \rightarrow \tau_{net}=I\alpha$
- More Practice with Projectile motion.
- More review with Free body diagrams.

Vocabulary/Key Terms/Formulas:

Constant Acceleration, Kinematics(d_f eqn), Projectile motion, Components of forces, Vectors, Circular motion ($F_c= mv^2/r$;direction of A and V), Torque ($rxF= \tau$; Review), Impulse ($F\Delta t= \Delta P$)

Homework/Classwork: (All homework is due the next class day unless indicated.)

	In Class	Homework Due in this Class
Monday 10/17	FBD/Dynamics Review	**Hmwrk sheet #18** **EXTRA HELP SESSION>>>>>> MS1 & HS1a at Lunch esp. But also MS2 & HS1b**
Tuesday	**Inquiry based Lab- Pendulums** **Springs (if time)**	**Hmwrk Sheet #19**
Wednesday Not HS1		**Hmwrk sheet #20**
Thursday HS1 Double	**Quiz #4** **Khan Academy (HS1)**	**Hmwrk sheet #21 (and #20 (HS1))**
Friday	**No Class on Fridays**	**NA**
Monday 10/24	**Prezi Practice**	**#22**

Tests/Due Dates: **There will be a 35 min quiz (#4.5) on Thursday Oct. 20 The Last Quiz was cancelled… due to PSAT's**

Quiz Topics: *Vector Components, Circular motion, Kinematics, Projectile motion, Torque, Impulse, Atwood machines, **1-2 Step Algebra problems, STEM Review, Extra ordinary Review, Graphs of DVAJ, Basic Trigonometry.***

Special Events/News:

The Towers are coming… Look for Tower Design Competition coming soon…

There will be an Extra help session on Mondays at Lunch time. Those who need help or just want to get ahead are encouraged to come!

Name/ Grade:_______________/ Date:____________

Homework Sheet #19 Pendulum Lab Worksheet

PhET Pendulum Lab
http://phet.colorado.edu/sims/pendulum-lab/pendulum-lab_en.html

Run the above program, which will simulate the motion of a pendulum and allow you to change the variables of mass, length, and amplitude.
Also open an Excel spreadsheet to collect and analyze your data
1. How does the period of the pendulum depend on the amplitude of the swing?

Be sure to keep the mass and length constant

- Click on the button on the lower right which will activate the photogate timer
- Set the amplitude to 50_o and start the pendulum.
- Start the photogate timer – this will automatically stop itself when it has recorded the time for one complete swing (period)
- Enter the amplitude and period in excel **– be sure to label the top of each column and the correct units**
- Continue to take readings for 40_o, 30_o and so on down to 10_o
- High light the columns on your spreadsheet and insert a scatter plot of your results.
- **Choose a chart layout that will allow you to give the graph a title and label the axes with complete units**
- Click on the chart itself and look for the layout tab
- Open the trendline option and then open "more trendline options"
- Select linear trendline, and display equation and r_2 on graph
- Try other trendline options, (exponential, etc) until you find the one with **an r_2 value closest to 1**
- Save the table, graph and trendline information

2. How does the period depend on the mass?

- Create another data list in your excel spreadsheet, this time label the axes mass (kg) and period (s)
- Keep the amplitude constant at 30_o, and length constant at 2 m
- Gather data for 10 different masses, and enter results in your spreadsheet
- In the same manner as you did above, generate a scatter plot and label the axes
- As above, generate a trendline and find the equation and r_2 value and save
- 3. How does the period depend on the length?
- Keep the amplitude at 30_o, the mass at 1.00 kg, and gather data for 10 different lengths
- Enter your data in the spreadsheet, labeling axes appropriately
- Generate a scatter plot as above
- Analyze the graph as above.

Submit 2 documents to your instructor (mdixon@parksideca.org) via email

- **Excel** document that includes data sets, graphs and analysis for all three variables
- **Word** document that answers the following questions in complete sentences:

a. Which variable (length, amplitude, mass) has the greatest effect on the period of the pendulum? Defend your answer by discussing each graph

b. Which variable appears to have NO effect on period? Again, defend this answer by referring to your graph

Plus More Projectile review

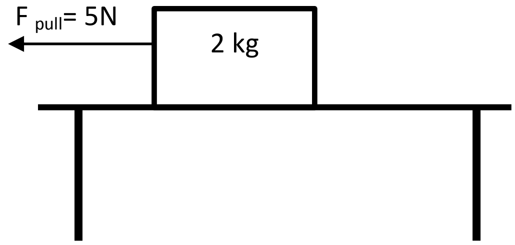
1. A Coconut is dropped out of a 2nd floor building (by Flo) from a height of 5m.
    a. **Draw a picture of what is happening:**
    b. About how many feet is 5m?________
    c. How long does it take the coconut to drop?__________
    d. How fast is it going when it hits the ground? (neglect air resistance)________________________
2. The same coconut is now thrown horizontally with horizontal velocity of 15m/s, out of the same window, 5m above the ground.
    a. **Draw a picture of what is happening:**
    b. How long does it take to hit the ground?_________
    c. What is it's final velocity in the vertical (y)direction?______
    d. How far away does the coconut land (in the x direction)?__________
3. Eddie throws the coconut back at Flo from where it landed in problem 2.
    a. **Draw a picture of what is going on**
    b. What is the magnitude of the total velocity he throws the banana?_______
    c. Using trig, find the angle at which he throws the banana:______
    d. Now let's assume the velocity and angle are what you have listed above. Flo misses the coconut, and the coconut goes through a window across the hall (all doors are open for this to happen, and the banana reaches the ground again. **Draw a picture of what happens.**

Name/ Grade:______________/ Date:____________

HMWRK #20
DYNAMICS SLIDING BOX PRACTICE…

For all these questions a box is being slid across a table.

1.



a. Draw the FBD of the box

b. Draw the FBD of the Table

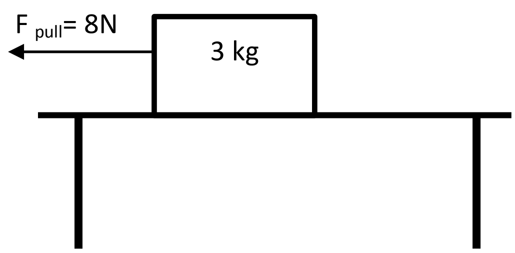
c. What is the weight of the box?__________

d. What is the Normal force of the box?________

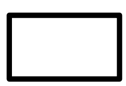
e. If the coefficient of static friction is 0.1, What is the maximum friction the box can have?___________ What is the net force?__________

f. Does the box move? Yes or no (circle 1). If it does move **what is the acceleration** (assume $\mu_s = \mu_k =$ 0.1) _____________

2.



a. Draw the FBD of the box



b. Draw the FBD of the Table

c. What is the weight of the box?__________

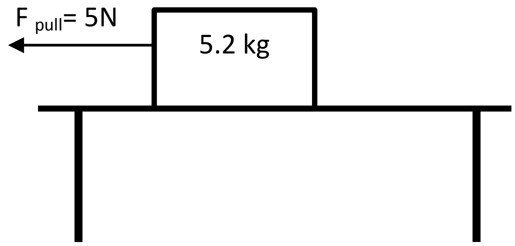
d. What is the Normal force of the box?________

e. If the coefficient of static friction is 0.3, What is the maximum friction the box can have?___________ Does the box move? Yes or no (circle 1).

f. If $\mu_s = \mu_k =$ 0.1 does it move? Yes or no (circle 1). _____________ What is the net force?__________

g. The box is 0.5m from the end of the table and it starts from rest. How long would it take to reach that distance if there was no friction?___________ How long would it take if μ_k= 0.1?__________

3.



a. Draw the FBD of the box

b. Draw the FBD of the Table

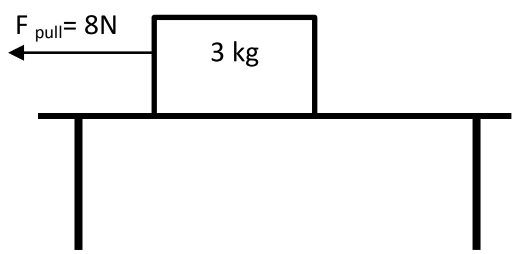
c. What is the weight of the box?__________

d. What is the Normal force of the box?________

e. If the coefficient of static friction is 0.1, What is the maximum friction the box can have?___________ What is the net force?__________

f. Does the box move? Yes or no (circle 1). If it does move **<u>what is the acceleration</u>** (assume μ_s= μ_k= 0.1) _____________

4.



a. What is the weight of the box?__________

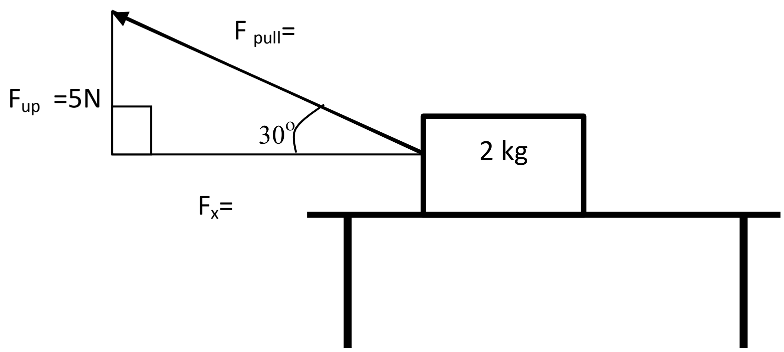
b. What is the Normal force of the box?________

c. If the coefficient of static friction is 0.3, What is the maximum friction the box can have?___________ Does the box move? Yes or no (circle 1).

d. If μ_s= μ_k= 0.1 does it move? Yes or no (circle 1). _____________

e. The box is 0.5m from the end of the table and it starts from rest. How long would it take to reach that distance if there was no friction?___________ How long would it take if μ_k= 0.1?__________

5.



a. Draw the FBD of the box

b. What is the weight of the box?__________

c. What is the Normal force of the box?________

d. F_{pull} = ___________

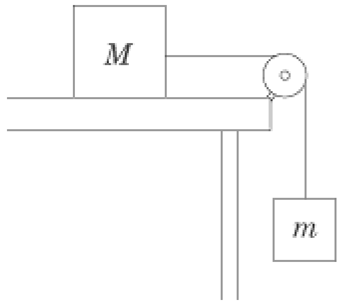
e. F_x= ____________

f. If the coefficient of static friction is 0.1, What is the maximum friction the box can have?___________ What is the net force?__________

g. Does the box move? Yes or no (circle 1). If it does move **what is the acceleration** (assume μ_s= μ_k= 0.1) _____________

Name/ Grade:________________/ Date:_____________

HMWRK #21
SPRINGS/PENDULUM PRACTICE…



1. Two masses, *m* and *M*, are connected to a pulley system attached to a table, as in the diagram above. What is the minimum value for the coefficient of static friction between mass *M* and the table if the pulley system does not move?

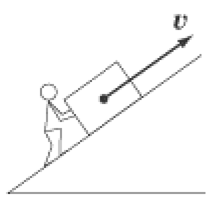
(A) m/M

(B) M/m

(C) $g\,(m/M)$

(D) $g\,(M/m)$

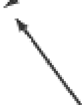
(E) $g(M - m)$

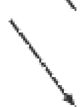


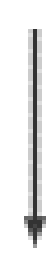
2. A mover pushes a box up an inclined plane, as shown in the figure above. Which of the following shows the direction of the normal force exerted by the plane on the box?

(A) 

(B) 

(C) 

(D) 

(E) 

3. Consider a block sliding down a frictionless inclined plane with acceleration *a*. If we double the mass of the block, what is its acceleration?

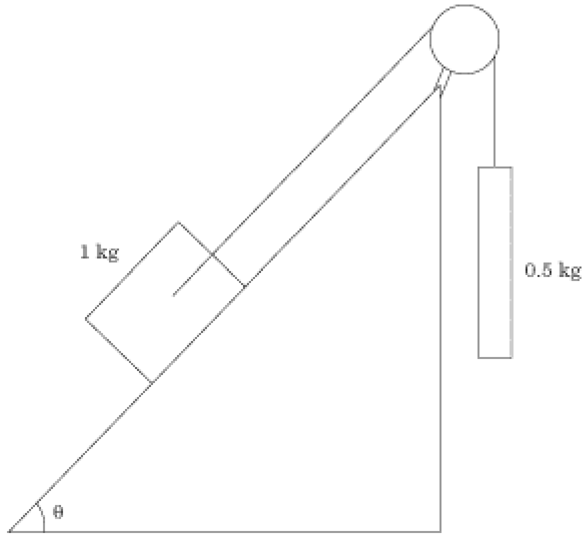
(A) $a/4$

(B) $a/2$

(C) a

(D) $2a$

(E) $4a$



4. A 1 kg mass on a frictionless inclined plane is connected by a pulley to a hanging 0.5 kg mass, as in the diagram above. At what angle will the system be in equilibrium? cos 30Âº = sin 60Âº = $\sqrt{3}$, cos 60Âº = sin 30Âº = 1/2, cos 45Âº = sin 45Âº = 1/$\sqrt{2}$.

(A) 0Âº

(B) –30Âº

(C) 30Âº

(D) 45Âº

(E) 60Âº

5. An object of mass *m* rests on a plane inclined at an angle of θ. What is the maximum value for the coefficient of static friction at which the object will slide down the incline?

(A) $\sin\theta - \cos\theta$

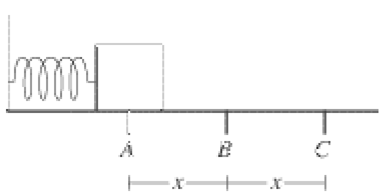
(B) $\cos\theta - \sin\theta$

(C) $mg\sin\theta$

(D) $\sin\theta/\cos\theta$

(E) $\sin\theta + \cos\theta$

6. A mass on a frictionless surface is attached to a spring. The spring is compressed from its equilibrium position, *B*, to point *A*, a distance *x* from *B*. Point *C* is also a distance *x* from *B*, but in the opposite direction. When the mass is released and allowed to oscillated freely, at what point or points is its velocity maximized?



(A) *A*

(B) *B*

(C) *C*

(D) Both *A* and *C*

(E) Both *A* and *B*

7. An object of mass 3 kg is attached to a spring of spring constant 50 N/m. How far is the equilibrium position of this spring system from the point where the spring exerts no force on the object?

(A) 0.15 m

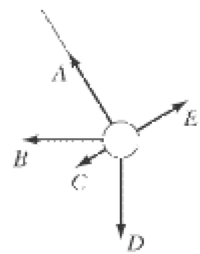
(B) 0.3 m

(C) 0.5 m

(D) 0.6 m

(E) 1.5 m

Questions 8–10 refer to a pendulum in its upward swing. That is, the velocity vector for the pendulum is pointing in the direction of *E*.



8. What is the direction of the force of gravity on the pendulum bob?

(A) *A*

(B) *B*

(C) *C*

(D) *D*

(E) *E*

9. What is the direction of the net force acting on the pendulum?

(A) *A*

(B) *B*

(C) *C*

(D) *D*

(E) *E*

10. If the pendulum string is suddenly cut, what is the direction of the velocity vector of the pendulum bob the moment it is released?

(A) *A*

(B) *B*

(C) *C*

(D) *D*

(E) *E*

Name/ Grade:________________/ Date:_____________

HMWRK #22
WRITE IT DO IT PRACTICE…

1. Describe to a 2nd grader the difference between Mass and Weight: ________________________

2. Describe to a 2nd grader what newton's 2nd Law means to you: (remember they might not know what net, Force, or Acceleration mean…)________________________

3. Describe to a 2nd grader how to find the acceleration in an Atwood machine: ________________________

4. **Pick 2 below and Write your own problem and solve:**
   a. **Atwood**
   b. **Projectile**
   c. **Pendulum**
   d. **Static**

5. ***TOWER DESIGN----WILL BE GRADED!***