Constant velocity:

, $\vec{x}=\vec{v}\,t+\vec{x}_0$

Constant acceleration:

, $\vec{v}=\vec{a}\,t+\vec{v}_0$,

$\vec{x}=\frac{1}{2}\vec{a}\,t^2+\vec{v}_0 t+\vec{x}_0$,

$\vec{x}=\frac{1}{2}(\vec{v}+\vec{v}_0)t+\vec{x}_0$,

$v^2=2\vec{a}\Delta\vec{x}+v_0^2$

.

Weight:

$F_W=m\,g$

Newton's 2nd law:

$\vec{F}_{net}=m\vec{a}$

Newton's 3rd law:

$\vec{F}_{on\,B}^{by\,A}=-\vec{F}_{on\,A}^{by\,B}$

Friction:

$f_s\leq\mu_s F_N$, $f_k=\mu_k F_N$

Name________________________________

Physics 114

Ch 4 Test

Instructions:

Show your work.

Your work and answers should show units.

If you are going to use any of the equations above, write the equation(s) before you use them.

If the problem is posed with vectors, then any vector answer should be in vector form. A problem posed with only vector components may be put in component form.

Vector form means show magnitude and direction.

A model is an equation that is solved for the parameter being asked for by the problem and where the given parameters are represented as variables.

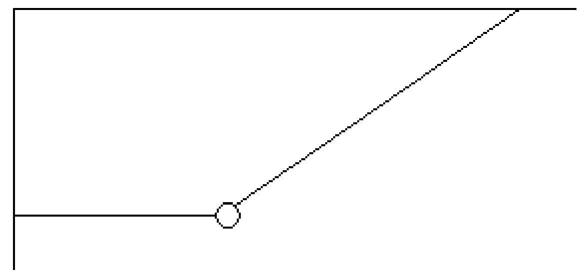
You need only solve problems with a model in those problems that ask for it.

If the answer to a problem is a vector, put the model in component form and the numerical answer in vector form.

Symbols for forces should have a mnemonic relationship to the kind of force being symbolized. For example it is fine to use F_N to represent a ***N***ormal force, but not a ***T***ension.

Vector variables must an arrow over them. E.g. $\vec{V}$

Put your calculator in degree mode.



1) In the figure above an object is attached to a ceiling and a wall with ropes. The rope attached to the wall is horizontal. The weight of the object is 105N. The tension in the line attached to the wall is 56N. Express the tension on the object by the rope attached to the ceiling as a vector.

The model for this problem in component form:_________________________________

Answer in vector form_______________________________

2) A 23kg box is on an elevator on planet Q. The elevator is accelerating downward at a rate of $2.5\,m/s^2$.

The normal force of the elevator floor against the box is 133.4N. What is the gravitational acceleration on planet Q?

The model for this problem:___________________________________

Answer_________________________________

3) A box is sitting on a board. One side of the board is raised until the box starts sliding. When it starts sliding the angle of the board from horizontal is $12.680383°$. The board is then held at that angle. The acceleration of the box down the board is $1.96\,m/s^2$.

a) What is the coefficient of static friction between the box and the board?

The model for this problem:___________________________________

Answer_________________________________

b) What is the coefficient of kinetic friction between the box and the board?

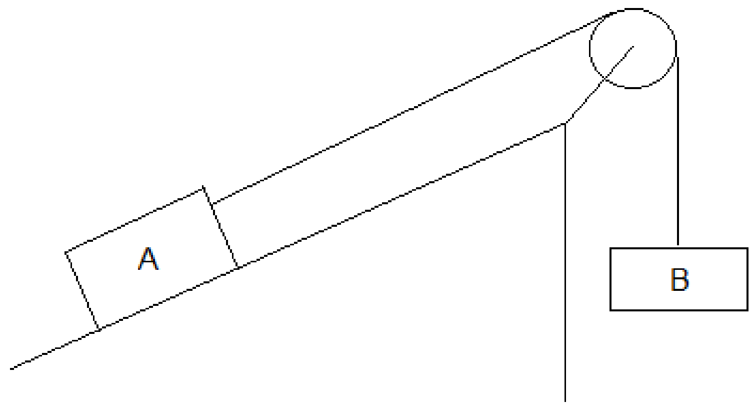
The model for this problem:___________________________________

Answer_________________________________

4) A box is sliding on a horizontal surface. The coefficient of kinetic friction between the box and the surface is 0.38. The box is moving to the right with a speed of +37.24m/s. It slides to a stop. For how much time does it slide?

The model for this problem:__________________________________

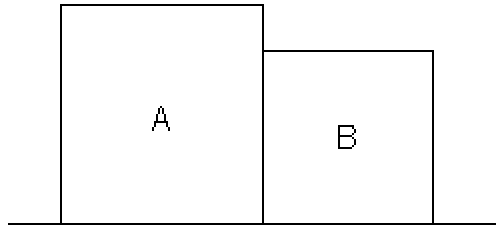
Answer________________________________



5) For the figure above there is no friction between block A and the ramp. The mass of block B is 7.3kg. The ramp is $16.977731°$ from horizontal. Block A is being pulled up the ramp with a constant velocity by a line that is parallel to the ramp. What is the mass of block A?

The model for this problem:__________________________________

Answer________________________________



6) The two boxes above are in contact. The direction of their initial velocity is to the right. The mass of box A is 18kg. The mass of box B is 10kg. They accelerate together with a magnitude of $3.43\,m/s^2$.

Box A pushes box B with a force of 17.64N. There is friction between the boxes and the floor.

a) Draw free body diagrams **below** for each block.

b) Write the net force equation for each free body diagram.

c) Solve the equations for the numerical value of the coefficients of kinetic friction between each of the boxes and the floor.

Answer: μ_{kA} = ______________________________ μ_{kB} = _________________________________