NAME(s)____

BALLS COLLIDE (HONORS)

1)Where to make them collide?

You are given two ramps at different slope facing one another. (A short ramp at a steep angle, and a long ramp at a shallower angle) You are given a ball. You will roll the ball down each ramp and make measurements. Then the balls will be taken away from you. Using only your information and formulas, predict where to put TWO balls, one on each ramp, so they will collide at the bottom (when let go at the same time). Have teacher verify results.

Hint: Get acceleration of each ramp first. Vi=0, $A=2D/T^2$.
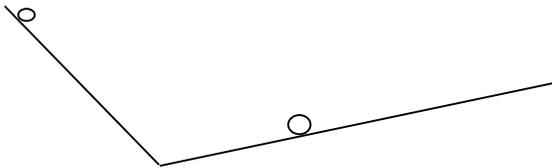
2)Where will they collide????

You are given one ball and a ramp. You will roll the ball down the ramp and make measurements. THEN, you will be given a second ball. BEFORE you are given the second ball, you will be asked to predict where a ball from the top and the middle of the ramp will collide along the floor, if at all. Show your work and calculations. (HINT: you can use algebra, calculus, or the good old graphing method. Assume that the ball after the ramp goes a constant speed D=VfT). Have teacher verify results

| t= 0 | t=t2 | t = t1 | t=tafter + td |
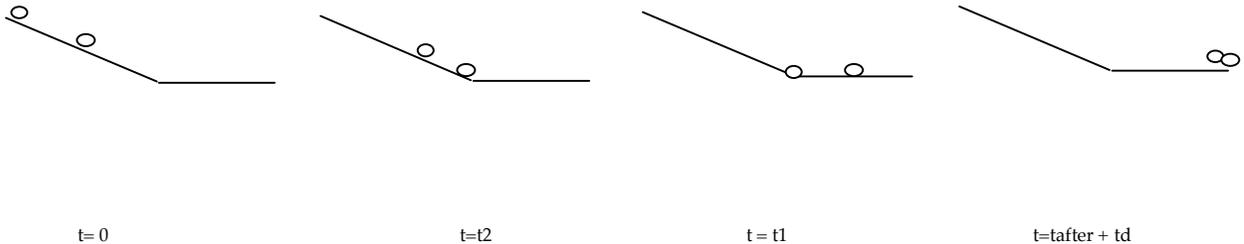
two equations, two unknowns, solve for distance after ramp, or time after ramp . **** Extra, use algebra to show that you never even needed to time anything!

MEASUREMENTS:

D1= TOTAL DISTANCE on ramp for Ball1

T1= Time for ball 1

**Calculations (in order):

A= Acceleration of ramp (both balls)

Vf1=Final velocity ball1 on ramp=velocity on floor ball1

D2= distance on ramp ball 2 (=1/2D1)

T2=time on ramp ball2

Vf2=Final velocity ball2 on ramp=velocity on floor ball2

TD=time difference…. =time ball 2 spent on floor before ball1 on floor Df2= distance ball 2 on floor before ball2

T= time ball1 on floor (1 unknown), D= distance ball1 on floor (2nd unknown)   2 equations and 2 unknowns! (T? and D? time and dis ball1 on floor)

NAME_____
BALLS COLLIDE (ACADEMIC)
Where to make them collide? (Same Place, Same Time)
You are given two ramps at different slope facing one another. (A short ramp at a steep angle, and a long ramp at a shallower angle) You are given a ball. You will roll the ball down each ramp and make measurements. Then the balls will be taken away from you. Using only your information and formulas, predict where to put TWO balls, one on each ramp let go at the same time, so they will collide at the bottom. Have teacher verify results

(Vi = 0)

SteepRAMP1   LENGTH (same each time)   TIME

		time avg=

$D=1/2AT^2$ $A1 = 2D/T^2$

(Vi = 0) start ball at top of ramp for this, just to calculate the acceleration for the shallow ramp.

ShallowRAMP2 LENGTH (same each time)   TIME

		time avg=

$D=1/2AT^2$ $A2 =2D/T^2$

To make them collide….. keep ramp 1 the same, fill in the dis, time, and calculate its acceleration. When they meet, the TIME will be the same, so for ramp 2, use the same time as ramp1, the acceleration you calculated from measurements, and get the new distance up ramp2. Check results!!!

SteepRamp1   ShallowRamp2

Distance1 up ramp_____   *Acceleration2_____ (from measurements) with original D,T

*Time1 down ramp_____   ---------→   *New Time1 down ramp _____ (same as ramp1=T1)

*Acceleration1_____(from measurements)   *NewDistance up ramp2_____ $D=1/2AT^2$

NAME_____
BALLS COLLIDE (ACADEMIC)
Where will they collide?

Where will they collide???? (Same Place Same time)
          You are given one ball and a ramp. You will roll the ball down the ramp and make measurements. THEN, you will be given a second ball. BEFORE you are given the second ball, you will be asked to predict where a ball from the top and the middle of the ramp will collide along the floor, if at all. Show your work and calculations. (HINT: you can use algebra, calculus, or the good old graphing method. Assume that the ball after the ramp goes a constant speed). Have teacher verify results

(Vi = 0)

SRAMP1	LENGTH (same each time)	TIME
		time avg=

$D = 1/2AT^2$ $Vf^2 = 2AD$ $D^{after} = Vf * T_{after}$
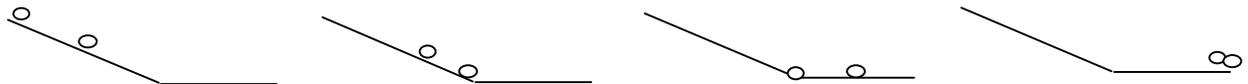
t= 0	t=t2	t = t1	t=tafter + td

* = calculations

BALL1:   BALL2:

Length of ramp:__ ___ D1   Length down ramp (half of ball one)__ _ D2 = 1/2D1

Time1 down ramp__ ___T1_   *Acceleration of ramp (same as ball1)__ __=A

*Acceleration of ramp__ __   *Time2 down ramp__ ___
        $D_1 = 1/2AT_1^2$ $D_2 = 1/2AT_2^2$
*Velocity1 at bottom of ramp__ –   *Velocity2 at bottom of ramp__ –
        $Vf_1^2 = 2AD_1$ $Vf_2^2 = 2AD_2 2$

                                                         *Time difference(Time along floor before ball1)

                                                                 TD= (T1 - T2)

Distance along floor=Velocity1 * Time after ramp   Distance along floor=Velocity2 *(Time after ramp + Time difference)

        D?   = V1 * T?   D?   = V2 (T?   + TD)

        two equations, two unknowns, solve for distance after ramp. D? and T? are the same for them to collide.