Two Dimensional Collisions Lab

Check momentum conservation in x and y

Name _____ Period _____ Date _____

Check total x and y momentum in four bouncing and sticking collisions.

About 15 to 20 minutes | buildphysics.com/?experiment=collision-2d

For every trial, use mA = 1.0 kg and mB = 2.0 kg. Leave Components on. Right and up are positive. The system is both disks; external forces are off.

Set Auto-pause after beside Run to 1.0 s for all four trials. Record each disk before Run and when it pauses. A missing component arrow means zero. Calculate both totals yourself before checking the app; allow small rounding differences. Reset between trials.

$$P_x = p_{Ax} + p_{Bx} \quad P_y = p_{Ay} + p_{By} \quad p_x = mv_x \quad p_y = mv_y$$

Trial 1 Simple mode Bounce Momentum

Choose Simple mode and Velocity. Set A's v_x to +3.0 m/s, with B at rest and A's y offset at +0.6 m. Then choose Bounce and Momentum. Add the signed p components in each column to find the totals.

Disk	p_x before (kg m/s)	p_x after (kg m/s)	p_y before (kg m/s)	p_y after (kg m/s)
A				
B				

Total	Before (kg m/s)	After (kg m/s)	Conserved yes or no
P_x			
P_y			

Trial 2 Simple mode Stick Velocity

Reset. Keep the same masses, starting motion, and offset. Choose Stick and Velocity. Read the v components below; multiply each by its disk's mass before adding the totals. Record the after values once the disks move together.

Disk	v_x before (m/s)	v_x after (m/s)	v_y before (m/s)	v_y after (m/s)
A				
B				

Total	Before (kg m/s)	After (kg m/s)	Conserved yes or no
P_x			
P_y			

Advanced mode setup

Choose Advanced mode. Keep mA = 1.0 kg and mB = 2.0 kg, with Components on. Keep the starting x positions; set A's y to +0.6 m and B's y to 0 m. Choose Velocity to enter A = (+3.0, +1.0) m/s and B = (−1.0, +1.0) m/s.

Use these settings for both trials below. Keep the signs when recording components. Calculate your totals before checking the app, just as on page 1.

Trial 3 Advanced mode Bounce Velocity

Choose Bounce and Velocity. Record the v components before and after the collision. Calculate each p component using its disk's mass, then add A and B to obtain each total.

Disk	v_x before (m/s)	v_x after (m/s)	v_y before (m/s)	v_y after (m/s)
A				
B				

Total	Before (kg m/s)	After (kg m/s)	Conserved yes or no
P_x			
P_y			

Trial 4 Advanced mode Stick Momentum

Reset and keep the same masses, positions, and starting velocities. Choose Stick and Momentum. Record the p components before and after the collision, then add them directly. The disks move together after sticking.

Disk	p_x before (kg m/s)	p_x after (kg m/s)	p_y before (kg m/s)	p_y after (kg m/s)
A				
B				

Total	Before (kg m/s)	After (kg m/s)	Conserved yes or no
P_x			
P_y			