Report Sheet

Conservation of Momentum

Trial 1 explosion, equal mass

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	Sum
initial	blue car	0.25	0	0	0.0
	red car	0.25	0	0	
final	blue car	0.25			
	red car	0.25			

Percent difference:

Trial 2 explosion, unequal mass

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	Sum
initial	blue car	0.50	0	0	0.0
	red car	0.25	0	0	
final	blue car	0.50			
	red car	0.25			

Percent difference:

Trial 3 collision, equal mass, one car at rest

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	sum
initial	blue car	0.25	0	0	
	red car	0.25			
final	blue car	0.25			
	red car	0.25	0	0	

Percent difference:

Trial 4 collision, unequal mass, lighter car at rest

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	sum
initial	blue car	0.25	0	0	
	red car	0.50			
final	blue car	0.25			
	red car	0.50			

Percent difference:

Trial 5 collision, unequal mass, heavier car at rest

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	sum
initial	blue car	0.50	0	0	
	red car	0.25			
final	blue car	0.50			
	red car	0.25			

Percent difference:

Trial 6 inelastic collision, equal mass

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	sum
initial	blue car	0.25			
	red car	0.25	0	0	
final	blue and red cars	0.50			

Percent difference:

Trial 7 inelastic collision, lighter car at rest

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	sum
initial	blue car	0.25			
	red car	0.25	0	0	
final	blue and red cars	0.50			

Percent difference:

Trial 8 inelastic collision, heavier car at rest

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	sum
initial	blue car	0.25			
	red car	0.50	0	0	
final	blue and red cars	0.75			

Percent difference:

Trial 9 collision, equal mass

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	sum
initial	blue car	0.25			
	red car	0.25			
final	blue car	0.25			
	red car	0.25			

Percent difference:

Trial 10 collision, unequal mass

		mass (kg)	velocity (m/s)	momentum (kg-m/s)	sum
initial	blue car	0.25			
	red car	0.50			
final	blue car	0.25			
	red car	0.50			

Percent difference:

Questions

1) Given the individual calculations on percent difference, what would appear to be a reasonable percent difference for this experiment?

2) In data analysis, there is a condition known as 'the problem of small denominators'. You may have noticed that the percent error was noticeably larger when the initial and final momenta were small in magnitude. Why was that?

3) You should have noticed that for Trial 3, a perfectly elastic collision between two cars of equal mass with one car at rest, the first car came to a complete stop. Given that perfectly elastic collisions conserve both momentum *and* kinetic energy, why is this fact both reasonable and necessary?

4) How does this experiment demonstrate that the vector direction of momentum – represented here as a plus or minus sign – is *very* important when considering momentum conservation? For example, by how much might the percent difference change if you forgot to make a velocity of a car and therefore the momentum negative when it was supposed to be in one of your trials?