FLINN SCIENTIFIC

Name_____

PSWORKS Marble Ramp Worksheet

Part 1. Forces and Gravity

Diameter of the marble: _____

Marble Ramp Angle	Trial No.	Transit Time between Photogates 1 and 2	Transit Time of Photogate 1	Transit Time of Photogate 2
	1			
	2			
	3			
	4			
	5			
	Average			
	1			
	2			
	3			
	4			
	5			
	Average			
	1			
	2			
	3			
	4			
	5			
	Average			

Calculations and Post-Lab Questions *(Use a separate sheet of paper to answer the following questions.)*

1. Calculate the average values for the Transit Time between Photogates 1 and 2 for each Marble Ramp Angle. Record these results in the data table.
2. Calculate the average speed of the marble as it passes through each photogate by dividing the diameter of the marble (in cm) by the average Transit Time (in seconds) through the individual photogate. Calculate the average speeds (in cm/s) through Photogates 1 and 2 for each Marble Ramp Angle.
3. Calculate the average acceleration of the marble as it travels down the Marble Ramp. Subtract the average (calculated) speed at Photogate 2 by the average (calculated) speed at Photogate 1, and then divide this value by the average Transit Time between Photogates 1 and 2. Calculate the average acceleration (in cm/s^2) for each Marble Ramp Angle.
4. How does the angle of the inclined plane affect the acceleration of the marble? Explain.
5. On graph paper, plot the acceleration calculated for each angle on the *y*-axis versus the sin θ on the *x*-axis. Draw a straight best-fit line through the data points, including the origin (0, 0). Then, calculate the slope of the best-fit line by dividing the "rise" by the "run."
6. Since the marble rolls down a track, or rail, a correction factor is needed to account for the rotation. Multiply the calculated value of the slope of the best-fit line by 1.5. This new value is the experimentally determined value for the acceleration due to gravity. How does the value compare to the true value of 981 cm/s^2?

PSWORKS Marble Ramp Worksheet, continued

Part 2. Projectile Motion

Height of the edge of the Marble Ramp to the floor: _____

Marble Ramp Angle: _____

Marble Release Point	Marble Release Height	Marble Flight Distance					
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average

Calculations and Post-Lab Questions *(Use a separate sheet of paper to answer the following questions.)*

1. Calculate the average flight distance for each experiment. Enter the results in the data table.
2. Use Equation 7 and the average flight distance to calculate the initial launch speed of the marble for each trial.
3. Use a modified Equation 15 to calculate the theoretical launch speed of the marble for each trial. Since the marble rolls down a track, or rail, the multiplication factor is 4/3, instead of 10/7.
4. Compare the theoretical and calculated launch speed values.
5. If the curve at the bottom of the ramp were curved upward instead of horizontal, how would this affect the flight distance? Would the experimental launch speed of the marble be higher or lower than the theoretical value as a result of this setup error? Explain.