Activity 1 and Activity 2

Fan Cart Study

A Physics class is investigating the quantitative relationship between force, mass and acceleration. Their equipment includes low-friction track, battery-powered fan carts, a set of 500-gram masses, and a computer-interfaced motion detector. They hook two fan carts together using a paper clip so that their fan blades are separated by 35 cm. The rotating blades of the fans work together to propel the carts down the track. The fans can operate with two different power levels. The motion detector captures the motion in the form of a velocity-time graph. The computer software is used to determine the slope of the velocity-time graph, and thus the acceleration.

A lab group created a data collection plan. **Table 1** represents their plan. They will give the carts an initial push away from the detector. The fans will slow the cart down, change their direction, and speed them up in the oppositie direction. They will measure the acceleration in each trial.

Table 1

Trial	Power Level		Total Mass (grams) = carts + added mass =	Acceleration Value (m/s/s)
	Cart A	Cart B		
1	OFF	HIGH	1200	
2	OFF	LOW	1200	
3	HIGH	HIGH	1200	
4	LOW	LOW	1200	
5	LOW	HIGH	1200	
6*	HIGH	HIGH	1200	
7**	--	HIGH	600	
8**	--	HIGH	1100	
9**	--	HIGH	1600	

* = Blades of fan carts were separated by 55 cm.

** = Cart A was removed from the track for this trial.

Activity 3

Fan Cart Study

The lab group has performed their trials and collected acceleration values as shown in **Table 2**. The group has also successfully calibrated the various combinations of fan power levels so that each trial can be equated with a specific force value. See **Table 3**.

Table 2

Trial	Power Level		Total Mass (grams) = carts + added mass =	Acceleration Value (m/s/s)
	Cart A	Cart B		
1	OFF	HIGH	1200	0.32
2	OFF	LOW	1200	0.21
3	HIGH	HIGH	1200	0.61
4	LOW	LOW	1200	0.39
5	LOW	HIGH	1200	0.50
6*	HIGH	HIGH	1200	0.58
7**	--	HIGH	600	0.64
8**	--	HIGH	1100	0.35
9**	--	HIGH	1600	0.45

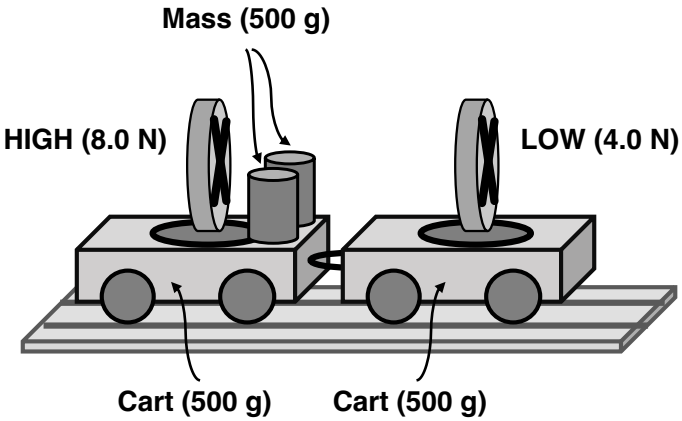
* = Blades of fan carts were separated by 55 cm.
** = Cart A was removed from the track for this trial.

Table 3

Trial	Power Level		Force (N)
	Cart A	Cart B	
1	OFF	HIGH	6.2
2	HIGH	HIGH	12.5
3	OFF	LOW	4.1
4	LOW	LOW	8.2

Activity 5

At the students' suggestion, the teacher researchd and found fan carts available from a different manufacturer for next year's classes. They have measured the amount of force provided by the fans on their two settings. And they have determined the mass of the fan carts. The results of their measurements are presented in **Figure 1**.



You will use this information to rank the acceleration values from smallest to largest for the four given conditions. Use a **1** for the lowest acceleration and a **4** for the highest acceleration.