

# Higher, Lower; Faster, Slower?

## Student Data Page Activity 4B (MS) Part 3



### Activity Materials: (Per Group):

- 30 cm ramp made of cardboard
- Meter stick
- Table
- Ring stand
- *Pom-Pom Granny* Model from Part 1 of this activity
- Stopwatch
- 1 copy *Student Information Pages* (Per student)
- 1 copy *Student Data Pages* (Per Student)

### Procedure:

1. You will work in a group of four, so first, decide upon group roles. For this activity, there will be a *Builder*, *Reader*, *Driver*, and *Measure Master*. See the *task cards* for details on the duties of each group member. Roles are summarized below.
  - a. The *Builder* will gather the materials and organize the construction of your test ramp as shown in *Figure 1 Setting up the Test Ramp*. The Builder will also work the stopwatch.
  - b. The *Reader* will read all the instructions to the rest of the team, making sure that the rest of the team knows their jobs, and clarifying any questions that arise during the activity. The *Reader* will also make sure to check off each step as it is completed. In addition to that, the *Reader* gets to make sure that everyone stays on task and work effectively as a team.
  - c. The *Driver* will be responsible for running *Pom-Pom Granny* down the ramp and changing the height of the ramp between runs.

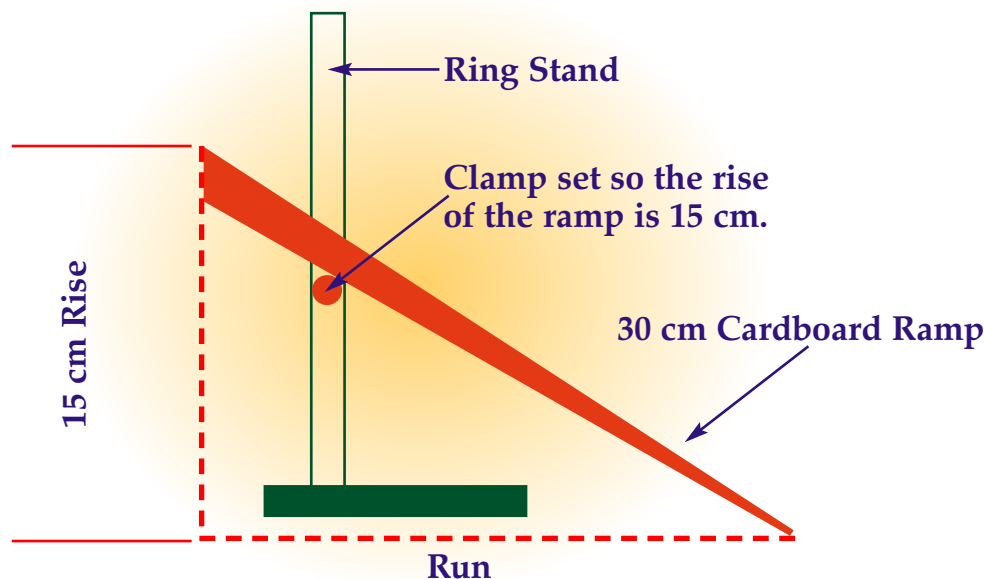


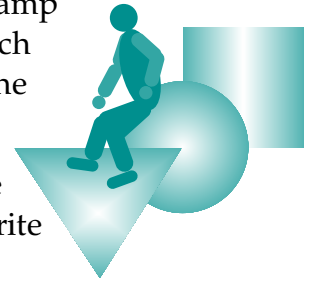
Figure 1 Setting up the Test Ramp



LESSON 4  
ACTIVITY 4B, PART 3  
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MO-BILITY

d. The *Measure Master* will measure of the length of the base of the ramp from the bottom of the ring stand to the end of the ramp before each run and will measure the distance *Pom-Pom Granny* travels from the base of the ramp for each test run.



- 2. In this activity, you will change the *rise* of your ramp to determine the effect on *Pom-Pom Granny's* velocity as she moves down the ramp. Write your hypothesis in **Table 1** on your *Student Data Page*.
- 3. For trial 1, *Measure Master* will measure of the length of the *run* as shown in *Figure 1*. Record the number in **Table 1** on your *Student Data Page* and then calculate the slope of the ramp using the formula in **Table 1**.
- 4. The *Driver* should then hold *Pom-Pom Granny* at the top of the ramp and release her *only* when the *Builder* starts the stopwatch and tells him or her to "go". The *Builder* will be measuring the time until *Pom-Pom Granny* stops. Record the time in seconds on the *Student Data Sheet* in **Table 2**.
- 5. The *Measure Master* will measure the distance from the bottom of the ramp to the back of *Pom-Pom Granny's* wheelchair and add the *ramp length* (30 cm) to the measured distance. *Each group member* will record the measurement of the distance on the *Student Data Sheet* in **Table 2**.
- 6. Calculate the *velocity* of *Pom-Pom Granny* using the formula on your *Student Data Sheet*.
- 7. Repeat steps 3-6 to complete Trial 2.
- 8. Now repeat steps 3-6 again but this time increase the height of the ramp by 3 cm for a total *rise* of 18cm.
- 9. This activity will be repeated by raising the height in 3 cm increments each time until a ramp height of 30cm is reached.

## Student Data

Identify the variables in this investigation:

*Independent Variable:* \_\_\_\_\_

*Dependent Variable:* \_\_\_\_\_

*Variables that need to be held constant:*

\_\_\_\_\_  
\_\_\_\_\_

*Hypothesis: (Be sure to explain)*

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Table 1 Calculating the Slope of a Ramp with Various *Rises*

Rise (cm)	Run (cm)	Slope (Rise/Run)	Simplest form of Slope (Rise/Run)

**Calculations:**

1. Calculate the slope of the ramp.



$$\text{Slope} = \text{Rise} : \text{Run} = \frac{\text{Rise}}{\text{Run}}$$




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2. Reduce the slope to its simplest form.

$$\text{Example } 2:10 = 1:5 \quad \frac{2}{10} \quad \frac{1}{5}$$




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### 3. Graphical Analysis

Use the graph paper below to make a graph of the *Rise (cm)* and the *Run (cm)*. Examine the relationship among *Rise*, *Run*, and *Slope* of a ramp.

Title \_\_\_\_\_

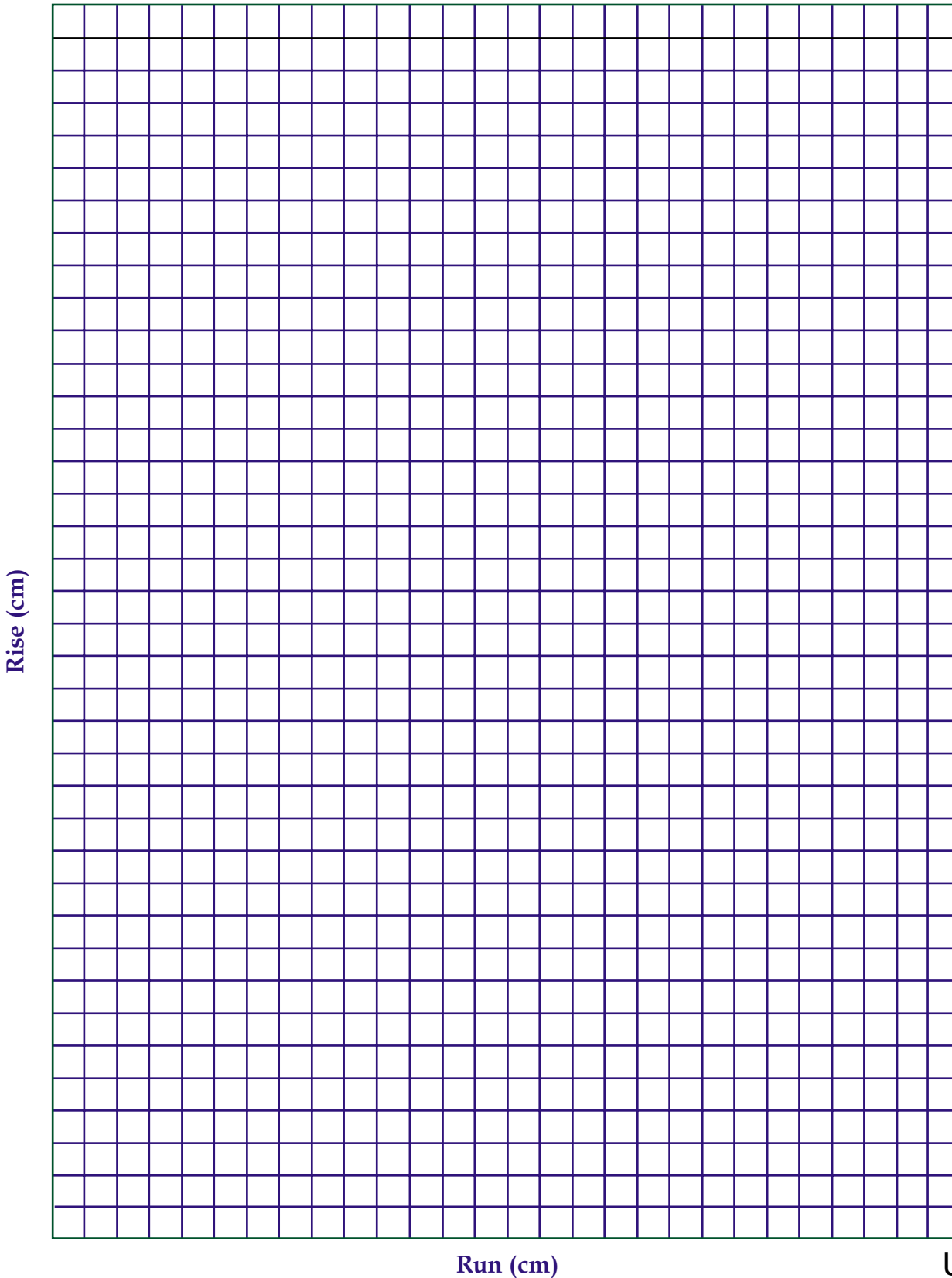




Table 2 The Effect of Ramp Height on Velocity of *Pom-Pom Granny*

Height (cm)	Trial 1			Trial 2			Average Velocity (cm/sec)
	Distance * (cm)	Time (Sec)	Velocity (cm/sec)	Distance * (cm)	Time (Sec)	Velocity (cm/sec)	
15							
18							
21							
24							
27							
30							

\* Be sure to add the Ramp Length (30 cm) to the distance traveled by *Pom-Pom Granny*.

4. Calculate the *velocity*.

$$\text{Velocity } \left( \frac{\text{cm}}{\text{sec}} \right) = \frac{\text{Distance (cm)}}{\text{Time (sec)}}$$




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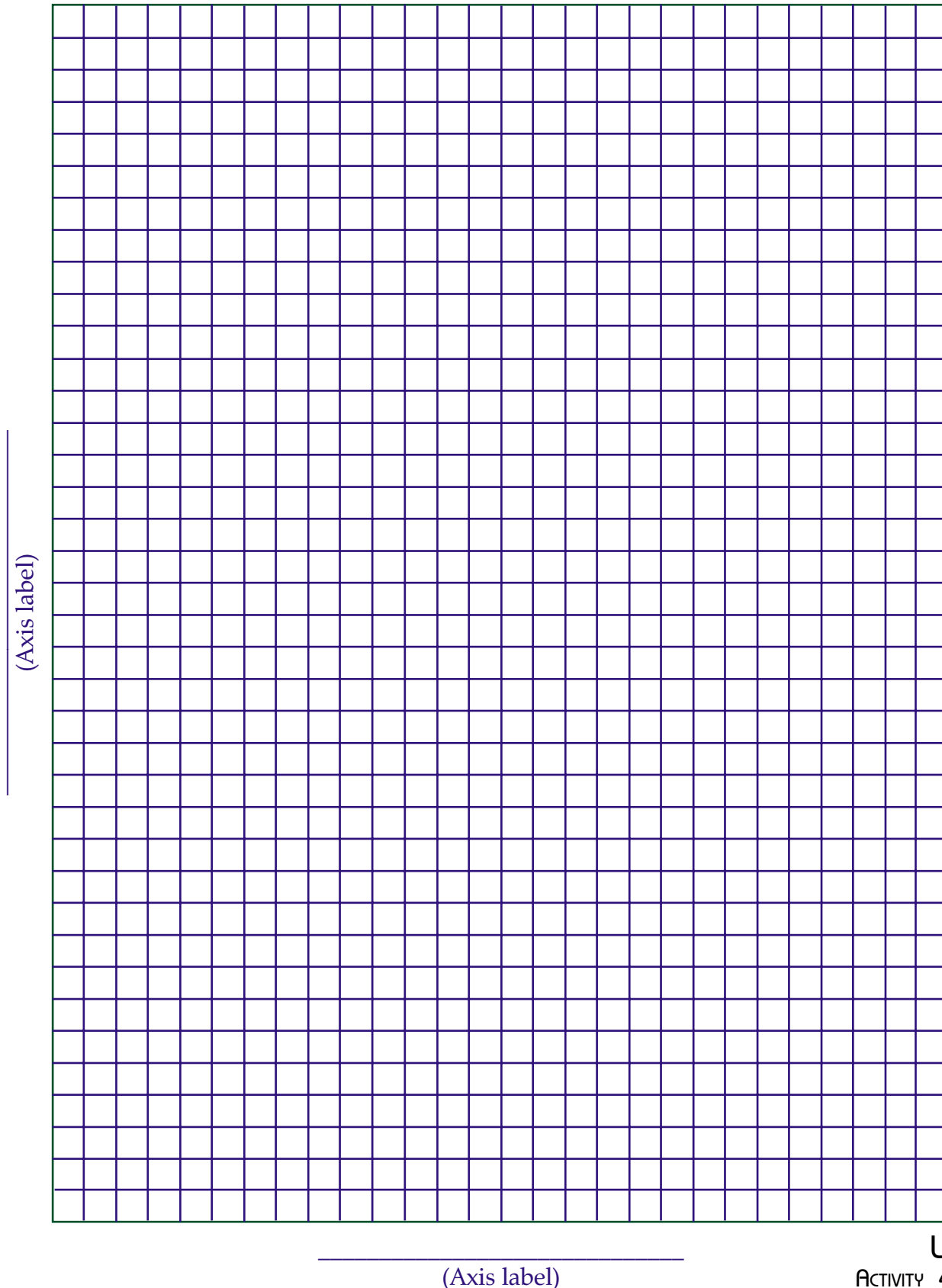
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### 5. Graphical Analysis

Use the graph paper below to make a graph of the *Velocity (cm/sec)* of *Pom-Pom Granny* and the *Rise (cm)* of the ramp. Examine the relationship between *rise* of a ramp and *velocity*.

Title \_\_\_\_\_



## Processing Out:



1. Look at the data in *Table 1* of this *Student Data Page*. Describe the relationship between the *slope* and the *rise* of a ramp.

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2. Look at the data in *Table 1* of this *Student Data Page*. Describe the relationship between the *run* and the *rise* of a ramp .

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3. Why do you think it is important to learn the relationship among *rise*, *run* and *slope*?

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4. What do you think would happen if someone goes down a ramp with a very steep slope?

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5. After examining the effect of the *rise* of a ramp on velocity, why do you think that the *Americans with Disabilities Act (ADA)* has guidelines for building ramps?

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