

improving Observations by Measuring

PROBLEM

How do observations made with and without measuring compare?

INTRODUCTION

Observation is one of the most important processes of science. Our senses do an astounding job of observing and discriminating small differences between stimuli. But our senses have limitations, so we use tools to improve the quality and consistency of our observations. For example, rather than depending only on their eyes, carpenters and builders use rulers to ensure that the sizes of the pieces of wood they cut are correct. In this laboratory investigation, you will note how measuring with a ruler effects the quality of your observations.

MATERIALS (per group)

Metric ruler

PROCEDURE

- Using a ruler, measure the length and width of this sheet of paper in centimeters. Line up the edge of the page with one of the marks since the left end of the ruler may not be the zero point. Each mark on a metric ruler is 1 millimeter or 0.1 centimeters. Based on the scale of the ruler in the diagram to the right, the line shown is 36 millimeters or 3.6 centimeters long. Record the length and width of this sheet of paper in your data table on the next page.
- Examine Figure 2 below showing three boxes, A, B, and C. Place a check mark in the appropriate place in the data table on the next page to indicate which box **appears** tallest or shortest, etc. Then measure the actual heights of the boxes in millimeters and record your results.
- Examine Figure 3 below showing two lines, A and B. Place a check mark in the appropriate place in the data table on the next page to indicate which line **appears** longest or shortest, etc. Then measure the actual lengths of the lines in millimeters and record your results.

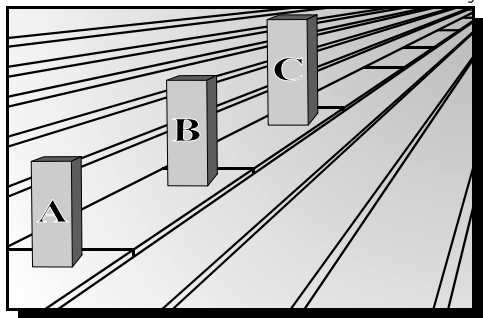


Figure 2. Which box looks tallest?

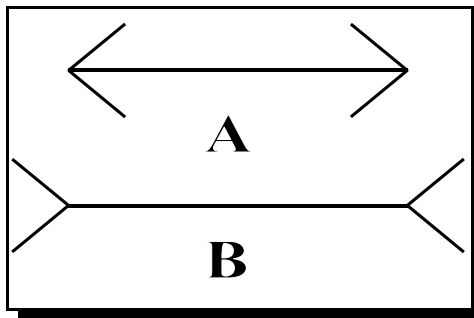


Figure 3. Which line looks longer?

- Figure 4, to the right shows a series of ten lines. Examine Figure 4 carefully, and place a check mark in the appropriate spot in the data table on the next page to indicate whether the lines **appear** parallel or not. Then measure the distances between the lines in millimeters at the extreme right and left ends of the lines. Record your results in the data table.

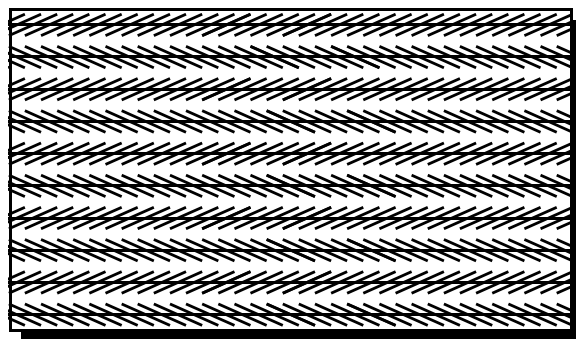


Figure 4. Do these lines look parallel?

OBSERVATIONS

Paper Size

Length	Height

Box Height

Box	Appearance: Check (✓) one			Actual Height (Measured)
	Tallest	Medium	Shortest	
A				
B				
C				

Line Length

Line	Appearance: Check (✓) one		Actual Length (Measured)
	Longest	Shortest	
A			
B			

Distance Between Lines

Row	Appearance: Check (✓) one		Actual Distance (Measured)	
	Parallel	Not Parallel	Left end	Right end
1 and 2				
2 and 3				
3 and 4				
4 and 5				
5 and 6				
6 and 7				
7 and 8				
8 and 9				
9 and 10				

CONCLUSIONS

1. How do observations made with and without measuring compare? _____

2. How do you explain the differences between the observations you made with a ruler and those you made without? _____

3. How does measurement improve observations? _____

