Perspective Lab

You will need: a yardstick or meter stick

Someone who is walking away seems to get smaller. This is called *perspective*. In this lab, you will find a formula to describe that phenomenon.

1. Find a partner.

You will do this experiment twice, so that each person can measure the other.

2. The walker should walk away from the measurer, counting distance in foot lengths. Meanwhile, the measurer should hold the meter stick **vertically at arm's length**, and measure the *apparent* height of the walker, feet to head. Get eight measurements, with equally spaced distances, starting when the walker is far enough to be measurable on the meter stick. The walker will enter the data into a table:

Distance (foot lengths)	Apparent Height (cm or in)

3. Graph the data.

4. Analyze the numbers, looking for a pattern. Is it a linear relationship? Is there a constant sum or product pattern? (Because of inevitable measurement errors, any patterns will be approximate.)

5. Find an approximate formula for the apparent height as a function of distance. You can check how accurate it is by graphing.

Perspective Lab Follow-Up

1. Look at the data from the experiment where you measured a classmate at different distances. Approximately how far would your partner have to stand in order for his apparent height to be 2 centimeters (or 1 inch)? (Hint: start by summarizing what you found out in that experiment, including how you found the constant of variation. Then explain how you solved this problem.)

This is a simplified drawing of the experiment. Capitals represent points, lower case letters represent lengths.
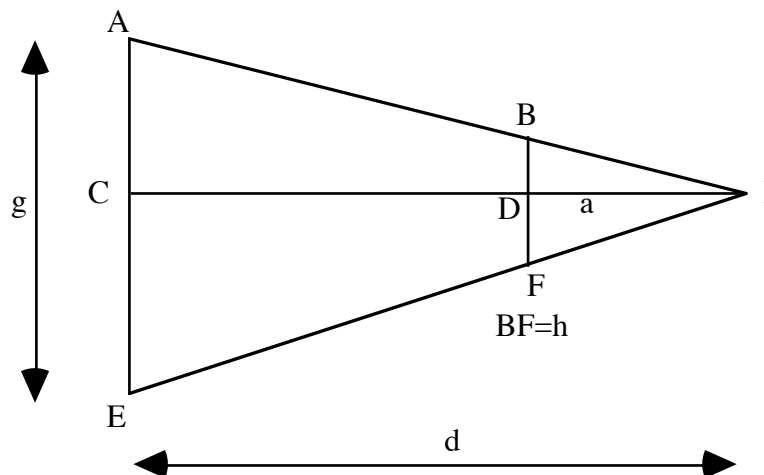
2. Describe the drawing, making sure you answer these questions:
    a. What line segment represents your partner?
    b. What line segment represents part of the meter stick?
    c. Where is your eye?
    d. What letter stands for the length of your arm?
    e. What letter stands for your partner's real height?
    f. What letter stands for your partner's apparent height?
    g. What letter stands for the distance between you and your partner?

3. Explain why ΔIBF and ΔIAE are similar. (Hint: which lines are parallel?) Likewise, show that ΔIBD and ΔIAC are similar.

4. Show that the scaling factors in these pairs of similar triangles are the same.

5. Write an equation relating the four lower case letters mentioned.
    a. Which represent constants?
    b. Which represent variables?
    c. Is this consistent with what you discovered in the Perspective Lab?

6. **Bonus:** If you use the same method to measure a 210-meter high building, and find that its apparent height is 7 cm, how far is the building?

7. **Bonus:** If the front pillar illustrated in this print is 15 meters away, how far is the back pillar on the left?