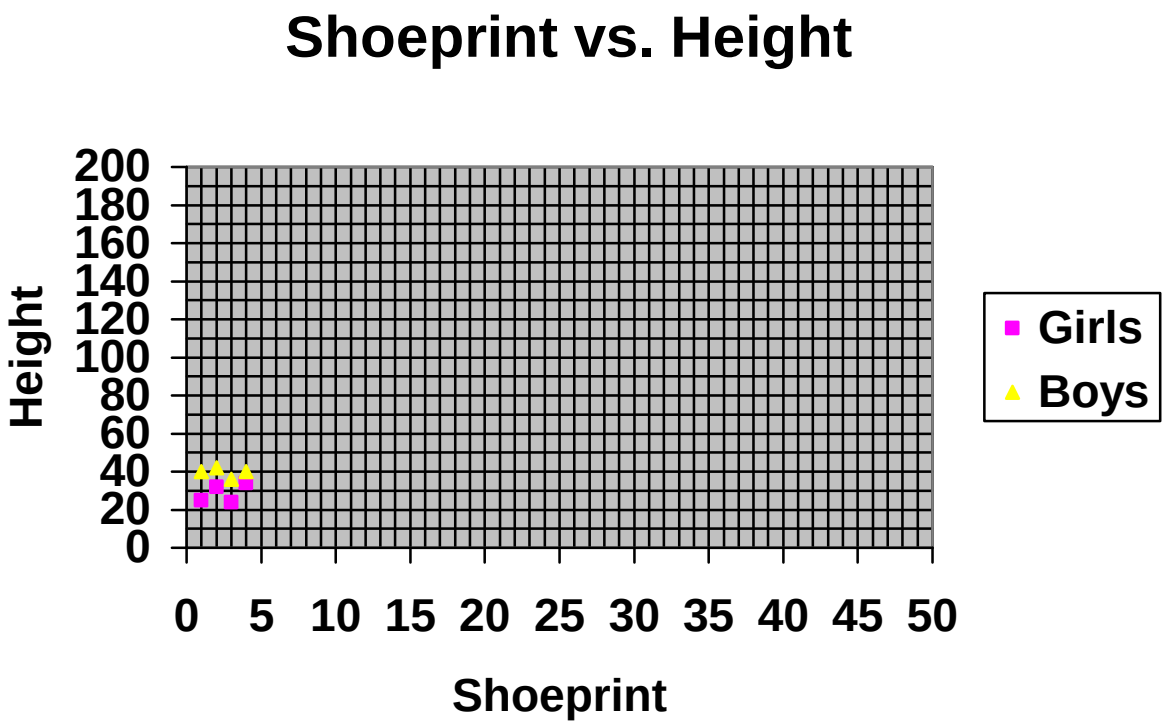
Math Labs

Height Versus Shoeprint Size

1. Set up meter stick stations around the classroom.
2. Each student should measure his or her height to the nearest centimeter.
3. Students should then measure their shoeprint to the nearest centimeter. (Another option is to measure footprints to look at the difference in ratios formed by the footprint and shoeprint measurements.)
4. As a whole-class activity, create a graph to organize the information. Label the x-axis "shoeprint" using a scale of 1 cm per grid line. Label the y-axis "height" and use a scale of 10 cm per grid line.
5. Have each student plot his or her shoeprint and height. Choose different colors for boys and girls.
6. Have students look at the slope of the line formed, using two points that appear to best fit the information as a whole. Establish an equation for the line (y=mx+b) to determine the correlation between shoeprint size and height. (For example, 1 cm growth in shoeprint equals 3.5 cm growth in height.)
7. This can be done by creating a scatter plot using Microsoft Excel* or entering the data into a graphing calculator to do a linear regression to fine the line of best fit, a straight line that best represents the data on the scatter plot.



8. Now, using the class data, have students measure the shoeprints found at the scene of the crime and make predictions about the suspects. They should be able to predict the height of the suspect, and if the suspect is male or female. Pose questions such as: If your suspect is a male 180 cm tall, what size shoeprint would you expect to find? What if your suspect is a 160 cm female?

9. This is also a good place to introduce measurement conversions, converting from feet/inches to meters/centimeters.

Blood Drop Volume

1. In this lab, groups determine how much blood is on the napkin that was in the waste basket.
2. Distribute materials to groups: a 100 ml beaker of red tempera paint, paper towel, eye dropper or pipette.
3. On the paper towel, have them drop one drop, two drops (one top of each other)… up to six drops of "blood."
4. Have them measure the diameter of each of the droplets. If the circle formed by the drops is less circular and more elliptical, they can measure the length and width and average the values. Create a graph with x as the number of drops and y as the diameter of the circle formed by the drops. Predict the line of best fit for the data or use a graphing calculator to find the line of best fit.
5. Now, have students measure the blood droplet found on the napkin from the crime scene and compare it to the line of best fit to determine how much blood is on the napkin.
6. Explain that this analysis can help students determine the nature of the crime. Based on the amount of blood, students can hypothesize as to what may have cause the blood loss, for example a weapon involved in the crime, a cut from something, and so forth.

Blood Drop Angle of Impact

1. This test is done to measure the origin of the blood.
2. Distribute 100 ml beakers of red tempera paint to each group.
3. Have students use a dropper to drop blood samples from four different heights (12, 24, 36, and 72 inches) onto four different white cards.
4. For each of the samples dropped, have them measure the diameter of the blood drop. They should also observe the edge pattern of the drop (for example: smooth, jagged, etc.).
5. Now have them measure the diameter of the sample, compare it to the results from the experiment, and then estimate the height of the blood drop.
6. They should then measure the width at the widest point of the drop and the height at the longest point of the drop.
7. Then, have them divide the width by the length and take the inverse sine of that answer to determine the angle of impact in degrees.
8. This helps them determine where the blood was dropped from and what type of injury it was from.