

PRESSURE MEASUREMENT /30

Name _____

Hour _____

Pressure is a measurement that is derived from (comes from) two other measurements— area and weight. **Pressure** can be thought of **as how hard an object pushes down on the surface** it is sitting on. If an object is very heavy, and the area of the bottom is quite small, that object will exert a lot of pressure on the surface that it sits on. On the other hand, if that same heavy object has a very large surface to spread out its weight, the pressure will be much less.

EXPERIMENT ONE (pressure using Metric)

Obtain a 2x4 and lay it flat on your desk like the diagram below:



SCIENTIFIC QUESTION: When placed against your forearm, which surface will make the 2x4 feel the heaviest? (the top, the front or the side?)

HYPOTHESIS: (1pt) I think _____

1. Were you correct? Which made it feel heaviest--the top, front, or side?
2. Did the 2x4 change its mass (the amount of molecules) every time you moved it?

Now actually calculate the pressure exerted by each of the areas of the 2x4. When you fill in the data chart, be sure to label your numbers with N for weight, cm² for area, and N/cm² for pressure.

Scientists use the formula:

$$\text{PRESSURE} = \frac{\text{WEIGHT (in newtons)}}{\text{AREA (in cm}^2\text{)}} \quad \text{or} \quad p = w/a$$

	Weight	Area	Pressure
Front			
Top			
Side			

3. **CONCLUSION:** (2pts) (restate the scientific question and use evidence to prove your point!)

EXPERIMENT TWO (pressure using English)

4. A man sitting in a chair weighs 200 pounds. All 4 of the chair legs are sharing that weight, so how much does each hold?

**1 square
inch**

5. If the bottom surface area of each chair leg is 1 inch squared, how much pressure is on one chair leg? (use the formula and don't forget a label for your answer-2pts)
6. If you were to build a new chair, how could you reduce the pressure that one chair leg puts on the floor?
7. How could you increase the pressure that one chair leg puts on the floor?

EXPERIMENT THREE (thought experiment)

Think of the bottom surface area of a shoe with a wide heel. Think of the bottom surface area of a shoe with a tiny heel. (high heel shoes)

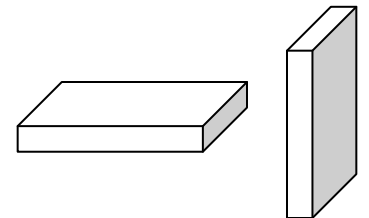
8. On which type of shoe is the person's weight more concentrated? (regular or high heels)?
9. Which shoe would hurt more if you got stepped on?
10. Dennis, the guy on the left, weighs 980 N. The surface area of his heel is 49cm^2 . What is the pressure if one of his heels steps on your toe? (2pts)
11. Percy, the guy on the right, also weighs 980 N. The surface area of his wife's high heel is 4cm^2 . What is the pressure if one of his heels steps on your toe? (2pts)



"She says I won't understand her until I've walked a mile in her shoes."

EXPERIMENT FOUR

EXPERIMENTAL QUESTION: In which position will a textbook exert more pressure on the table? (upright or flat?)



12. **HYPOTHESIS:** I think _____

13. **DATA:** (make a chart)

14. **CONCLUSION/ARGUMENT:** (restate the experimental question, and don't forget to provide evidence-2pts)

15. Define pressure

16. What is the formula for pressure?