

3-1 Pressure & Temp Problems Worksheet

Use the formula $Pressure = \frac{Force}{Area}$ to solve the following problems. Remember: the metric unit for Force is the Newton (N) and the English unit of force is the Pound (lb); the metric unit for Area is the square meter (m²) and the English unit is square inch (in²) or square foot (ft²)

Include the following steps in all problems: 1) **Write the known** values with units 2) **State the Unknown** Value (What your trying to find) 3) **Write the Law** 4) **Solve the Law Algebraically** (DO NOT PLUG #'S IN YET) 5) **Plug #'s with units** 6) Calculate and present your answer

EXAMPLE: The air pressure on a nice day is 15 lbs/in². What force does the top of a soda can experience from the atmosphere if the can has a surface area of 5 in²?

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate
P = 15 lb/in ² A = 5 in ² F = ? (Find F)	P = F/A	F = PA	F = PA = (15 lb/in²) (5in²) = 75 lbs

EXAMPLES FOR YOU TO COMPLTE-Calculating Pressure

1.) A box has a weight of 120 lbs and the bottom of the box is 12 in². What is the pressure the box exerts on the floor? (10 lbs/in²)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

2.) A bronze statue weighs 2400Newtons and has a base that is 4 meters by 1/2 meter. What is the pressure the statue exerts on the floor? (1200 N/m²)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

3.) The base of a box is 12 inches by 10 inches. It weighs 360 pounds. What is the pressure exerted on the floor by the box? (3 lbs/in²)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

If you are working on this at school have your work up to this point checked _____
If you are working on this at home continue.

Calculating Force

4.) What is the weight of an object that has a base which is 3 square inches and which exerts a pressure of 21 pounds per square inch? (**63 lbs**)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

5.) What does a car weigh if its tires cover an area of 4 square feet and each tire exerts a pressure of 1000 pounds per square foot on the ground? (**4000 lbs**)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

6.) To pop a balloon you stab it with a pencil. If the area of the pencil tip is $.001\text{in}^2$ and the pressure applied by the pencil to the balloon is 10 lbs/ in^2 , how hard (what force) must you push on the pencil to make the balloon pop? (**.01 lbs**)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

If you are working on this at school have your work up to this point checked _____
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Calculating Area

7.) A round tube weighs 30 lbs. If the tube is stood on end it pushes down on the floor with a pressure of 2 lbs/in^2 . How many square inches is the end of the tube? (**15 in²**)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

8.) The pressure a box pushes down on the floor is 50 lbs / in^2 . If the box weighs 400 lbs what is the area of the base of the box? (**8in²**)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

9.) A motorcycle weighs 1500 lbs. If the pressure the tires exert on the road is 150 lbs per square inch what is the area of the tires in contact with the road. (**10 in²**)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

If you are working on this at school have your work up to this point checked _____
If you are working on this at home continue.

In the next 3 problems it is up to you to determine what you are solving for.

10.) If the inside of a container has a surface area of 20 in^2 , what will be the pressure on each square inch of the container if 117.6 pounds of force are applied to the container? (*About 6 lb/in^2*)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

11.) A box that is $2 \text{ in} \times 2 \text{ in} \times 2 \text{ in}$ size would need to weigh how much in order to create a pressure of 32 lbs/in^2 on the floor. (*128 lbs*)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

12.) A woman walking in high heels can damage a hardwood floor by making small dimples in the floor since her weight is concentrated on such a small area (the tip of the high heel). If the woman weighs 100 lbs and the tip of the high heel is $1/15 \text{ in}^2$ what is the pressure exerted on the floor by her high heel? (*1500 lbs/in²*)

Knowns & Unknown	State the Law	Solve Algebraically	Plug in with units and Calculate

TEMPATURE CONVERSIONS WITH THE ABSOLUTE SCALE

C to Kelvin	Kelvin to C	F to Rankine	Rankine to F
$K = C + 273$	$C = K - 273$	$R = F + 460$	$F = R - 460$

C to F	F to C
$F = (9/5)C + 32$	$C = (5/9)(F - 32)$

TEMPERATURE CONVERSIONS

1. Mercury (Hg) melts at -38° Celsius and boils at 356° Celsius.
 - a. Calculate the melting point in Kelvin?
 - b. Calculate the boiling point in Kelvin?

2. Methane (CH_4) freezes at -297° Fahrenheit and boils at -258° Fahrenheit.
 - a. Calculate the freezing point in Rankine?
 - b. Calculate the boiling point in Rankine?