Key

Name _____ Date _____ Period ____

Pressure 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 (m^2) and the English unit is square inch (in^2) or square foot (ft^2)

Solve for Pressure

1.) A box has a weight of 120 lbs and the bottom of the box is 12 in^2. What is the pressure the box exerts on the floor?

$P = \frac{120lb}{12in^2} = 10.Psi \times \frac{1atm}{14.7PSI} \times \frac{101325Pa}{1atm} = 69,000 Pa$

2.) A bronze statue weighs 2400Newtons and has a base that is 4 meters by ½ meter. What is the pressure the statue exerts on the floor?

$a = 4 \times .5 = 2m^2$

$P = \frac{2400N}{2m^2} = 1200 Pa$

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?

$a = 12in \times 10in = 120in^2$

$P = \frac{360 lb}{120 in^2} = 3.0 lb/in^2 \times \frac{1atm}{14.7psi} \times \frac{101325Pa}{1atm} =$

$21,000 Pa$

Solve for Force (weight)

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?

$P = \frac{F}{A}$ $A = \frac{F}{P}$ $21psi = \frac{F}{3in^2} = 63lb \times \frac{4.45N}{1lb} = 280N$

$F = P \times A$

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?

TOTAL $P = 4000 psi$

$4000 psf = \frac{F}{4 ft^2}$

$F = 16,000 pounds \times \frac{4.45N}{1lb} = 71000N$

6.) To pop a balloon you stab it with a pencil. If the area of the pencil tip is .001in^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?

$10\ psi = \frac{F}{.001 in^2}$ $\quad F = .01\ lb \times \frac{4.45N}{1lb} =$

.045 N

Solve for 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?

$2psi = \frac{30\ lb}{a}$ $\quad 15in^2$

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?

$50\ psi = \frac{400\ lb}{a}$ $\quad a = 8in^2$

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 tire in contact with the road. (hint: there are two tires)

$150psi = \frac{1500\ lb}{a}$

$a = 10in^2 / 2$ $\quad = 5.0in^2$

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?

$P = \frac{117.6\ lb}{20\ in^2} = 5.88psi \times \frac{1atm}{14.7ps} \times \frac{101325\ Pa}{1atm} =$

40,500 Pa

11.) A box that is 2in x 2in x 2in size would need to weigh how much in order to create a pressure of 32lbs/in^2 on the floor.

$32psi = \frac{F}{4in^2}$ $\quad F = 128\ lb \times \frac{4.45N}{1lb} =$ 570N

12.) A woman walking in high heals 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 heal). If the woman weighs 100 lbs and the tip of the high heal is 1/15 in^2 what is the pressure exerted on the floor by her high heal?

$P = \frac{100.\ lb}{\frac{1}{15}\ in^2} = 1500ps \times \frac{1atm}{14.7psi} \times \frac{101325\ Pa}{1atm} =$

10,300,000 Pa