04/24/2021

SCIENCE 8 – PRESSURE CALCULATIONS WORKSHEET

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1) A football player is tackled by another player and lands with the combined weight of both players on his knee. If the combined weight of the players is 2400 N and the player's knee measures 0.1 m by 0.1 m, how much pressure is exerted on the turf when the player lands on his knee?

$P = \frac{F}{A} = \frac{2400N}{(0.1)(0.1)m^2} = 240{,}000\ Pa$

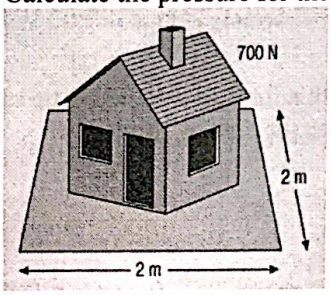
2) A forestry worker accidentally strikes a pipe with the end of a pickaxe while trying to dig a hole. If the pickaxe strikes with a force of 2000 N and the end of the pickaxe measures 0.02 m by 0.01 m, how much pressure is exerted on the pipe by the pickaxe?

$\frac{2000N}{(0.02)(0.01)m^2} = \frac{2\times10^3 N}{2\times10^{-4} m^2} = 10^7\ Pa$

3) A skateboarder lands on all four wheels after riding a railing. If the skateboarder has a weight of 900 N and the area on the bottom of a single wheel is 0.0001 m^2, what pressure does the skateboard put on the ground?

$P = \frac{F}{A} = \frac{9\times10^2 N}{4\times10^{-4} m^2} = \frac{0.9\times10^6 Pa}{4} = 2.25\times10^6 Pa$ ~~$= 9\times10^5\ Pa$~~

4) Calculate the pressure for the following situation:



$P = \frac{F}{A} = \frac{700N}{4m^3} = 1.75\ Pa$

5) A swordfish jumps out of the water and the tip of its pointy upper jaw strikes a wooden wall of a fishing boat with 7500 N of force. If the tip of the pointy jaw has an area of 0.0004 m^2, what pressure is placed on the part of the wooden wall that is struck by the jaw?

$P = \frac{F}{A} = \frac{7500}{0.0004 m^3} = \frac{7.5\times10^3}{4\times10^{-4}} = 1.875\times10^7\ Pa$

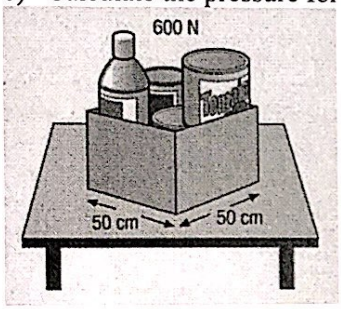
6) A brick delivery truck parks on a roadside scale that measures 4 m by 6 m. If the brick truck weighs 60,000 N, what pressure does the scale put on the spring below?

$P = \frac{F}{A} = \frac{6 \times 10^4}{2.4 \times 10} = 2.5 \times 10^3 = 2500\ Pa$

7) A ballet dancer does a pirouette on the tip of his toe. If the dancer has a weight of 580 N and the tip of his ballet shoe measures 0.02 m by 0.01 m, what pressure does his toe exert on the stage?

$P = \frac{F}{A} = \frac{580\ N}{(0.02)(0.01\ m^2)} = \frac{5.8 \times 10^2\ N}{2 \times 10^{-4}} = 2.9 \times 10^6\ Pa = 2\,900{,}000\ Pa$

8) Calculate the pressure for the following situation:



2500

$P = \frac{F}{A} = \frac{600\ N}{50 \times 10^{-2} \times 50 \times 10^{-2}\ m^2} = \frac{6 \times 10^2\ N}{2.5 \times 10^{-2}\ m^2}$

$= 2.4 \times 10^4\ Pa$

$= 2400\ Pa$

9) A poorly tied down blimp falls over in a field. If the blimp exerts a downward force of 4000 N over an area of 250 m^2, what pressure is put on the ground by the blimp?

$P = \frac{F}{A} = \frac{4000\ N}{250\ m^2} = \frac{4 \times 10^3\ N}{2.5 \times 10^2\ m^2} = 16\ Pa$

$25 \overline{)\ 4.0}$ 1.6, 25, 150, 150, 0

10) The tip of a hypodermic needle is pressed against someone's skin with a force of 2 N. If the tip of the needle has an area of 0.000 001 m^2, what is the pressure exerted on the skin by the needle?

$P = \frac{2\ N}{0.000,001\ m^2} = \frac{2\ N}{10^{-6}\ m^3} = 2 \times 10^6\ Pa = 2{,}000{,}000\ Pa$

~~4 wheels~~

11) A charity fundraiser fits 12 students into a small car. If the combined weight of the car and students is 1600 kg and the combined area of the wheels touching the ground is 0.08 m^2, what is the pressure placed on the ground by the car and students?

$g = 9.81$

$P = \frac{F}{A} = \frac{(1600)(9.81)}{0.08} = 196200\ Pa$

$\frac{6 \times 10^4}{3.2 \times 10^{-2}} = 5 \times 10^6\ Pa$