Answer on Question 61580, Physics, Other

Question:

A large man sits on a four-legged chair with his feet off the floor. The combined mass of the man and chair is $95.0\ kg$. If the chair legs are circular and have a radius of $0.5\ cm$ at the bottom, what pressure does each leg exert on the floor?

Solution:

By the definition of the pressure we have:

$$P = \frac{F}{A},$$

here, P is the pressure that each leg exert on the floor, F is the force acting on the floor, A is the total area of the four legs.

The force acting on the floor is the weight of the man and chair:

$$F = W = mg,$$

here, m is the combined mass of the man and chair, g is the acceleration due to gravity.

We can find the total area of the four legs from the formula:

$$A = N\pi r^2,$$

here, N is the number of the chair legs, r is the radius of the chair leg.

Finally, substituting F and A into the formula, we get:

$$P = \frac{F}{A} = \frac{mg}{N\pi r^2} = \frac{95\ kg \cdot 9.8\ \frac{m}{s^2}}{4 \cdot \pi \cdot (0.005\ m)^2} = 2.96 \cdot 10^6\ Pa.$$

Answer:

The pressure that each leg exert on the floor is $P = 2.96 \cdot 10^6\ Pa.$