Answer on Question #50117 – Physics – Mechanics | Kinematics | Dynamics

Pressure and force
A pneumatic ram has a chamber piston diameter of 150 mm and is subjected to a variable source of pressure for actuation. What pressure will be required to produce an actuation force of 2 kN (consider the cylinder to be friction less)

Solution:
$F = 2kN = 2000\ N - actuation\ force;$
$d = 150\ mm = 0.15\ m - piston\ diameter;$

Pressure is defined as force per unit area.

$$p = \frac{Force}{Area} = \frac{F}{A} = \frac{5kg\ \cdot 9.8\frac{N}{kg}}{10^{-4}\ m^2} = 490\ kPa \quad (1)$$

$$A = \frac{\pi d^2}{4} \quad (2)$$

$(2) in (1)$:

$$p = \frac{F}{\frac{\pi d^2}{4}} = \frac{4F}{\pi d^2} = \frac{4 \cdot 2000\ N}{3.14\ \cdot (0.15\ m)^2} = 113.2\ kPa.$$

Answer: pressure is equal to $p = 113.2\ kPa.$