

## Answer on Question#49287 - Physics - Other

A car needs a hydraulic jack. The car rests on a piston with a circular cross section where the radius of the circle is 0.5 m. A person has to apply a force of 16N to the smaller piston which has a radius of 2cm. What is the mass of the car?

### Solution:

According to the principle of transmission of fluid-pressure the pressure under the smaller piston is equal to the pressure under the bigger piston. Since the pressure under the smaller piston is  $P = \frac{F}{\pi r^2}$  ( $F = 16$  N is the force applied by person,  $\pi r^2$  is the area of the smaller piston, where  $r = 2$  cm is its radius), the weight of the car is

$$M \cdot g = P \cdot \pi R^2$$

where  $M$  is the mass of the car,  $R = 0.5$  m is the radius of the bigger piston,  $g$  is gravitational acceleration. Hence we obtain (assuming that  $g = 10 \frac{\text{m}}{\text{s}^2}$ )

$$M = \frac{F R^2}{g r^2} = 1000 \text{ kg}$$

Answer: 1000 kg.