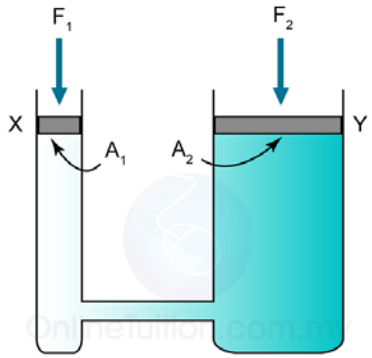
Pascal's Principle



$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

F_1 = Force exerted on the small piston
A_1 = area of the small piston
F_2 = Force exerted on the big piston
A_2 = area of the big piston

Example 1

In a hydraulic system the large piston has a cross-sectional area $A_2 = 200\ cm^2$ and the small piston has cross-sectional area $A_1 = 5\ cm^2$. If a force of 250 N is applied to the small piston, what is

a. the pressure exerted on the small piston
b. the force F, produced on the large piston?

[a. $50N/cm^2$; b. 10,000N]
[Step by step solution]

Example 2

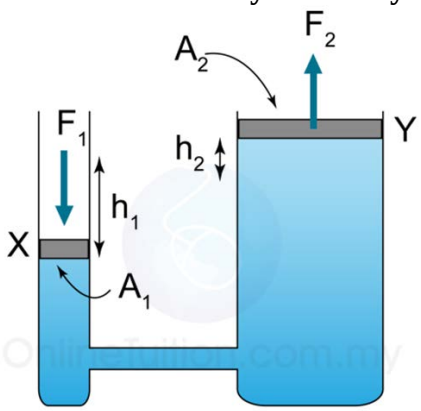
A hydraulic lift is to be used to lift a truck masses 5000 kg. If the diameter of the small piston and large piston of the lift is 5cm and 1 m respectively,

a. what gauge pressure in Pa must be applied to the oil?
b. What is the magnitude of the force required on the small piston to lift the truck?

[a. 15,900Pa; b. 125N]
[Step by step solution]

Pascal's Principle

Change of Oil Level in a Hydraulic System



In the diagram above, when piston-X is pressed down, piston-Y will be pushed up. The change of the piston levels of the 2 pistons is given by the following equation:

$$h_1 A_1 = h_2 A_2$$

Example 3

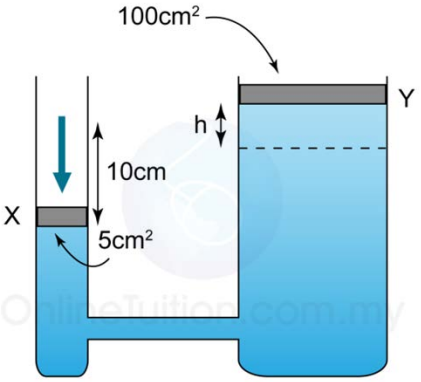


Figure to the left shows a hydraulic system. The area of surface X is 5 cm^2 and the area of surface Y is 100 cm^2. Piston X has been pushed down 10cm. what is the change of liquid level, h, at Piston Y?

[0.5cm]

[Step by step solution]