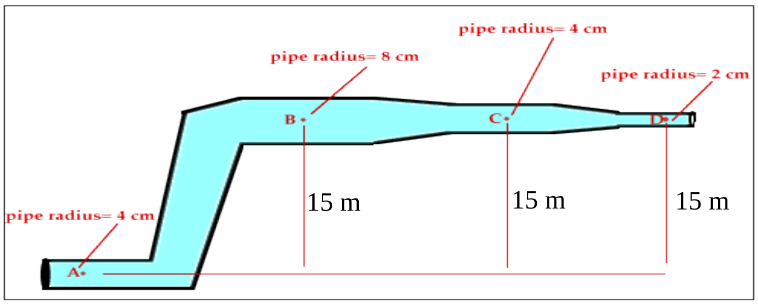
4. An ideal fluid flows through a long horizontal circular pipe. In one region of the pipe, it has radius R. The pipe then widens to radius 2R. What is the ratio of the fluids speed in the region of radius R to the speed of the fluid in region with radius 2R
A) ¼ B) ½ C) 1 D) 2 E) 4

7. A hydraulic press allows large masses to be lifted with small forces as a result of which principle?
A) Pascal's
B) Bernoulli's
C) Archimedes'
D) Huygens'
E) Newton's

<u>Questions 27-28:</u> Refer to the diagram below and use 10 m/s^2 for *g* and 100,000 N/m^2 for 1 atm.



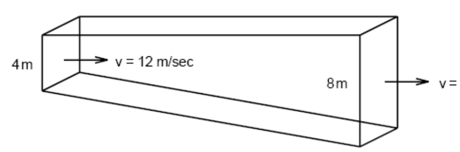
27. The pressure at A is 9.5 atm and the water velocity is 10 m/s. What is the water velocity at point C?
(a) 2.5 m/s (b) 5 m/s (c) 10 m/s (d) 20 m/s (e) 40 m/s

28. The pressure at C is
(a) 0 N/m^2 (b) 100,000 N/m^2 (c) 150,000 N/m^2 (d) 800,000 N/m^2 (e) 1,100,000 N/m^2

33. The idea that the velocity of a fluid is high when pressure is low and that the velocity of a fluid is low when the pressure is high embodies a principle attributed to
(a) Torricelli (b) Pascal (c) Galileo (d) Archimedes (e) Bernoulli

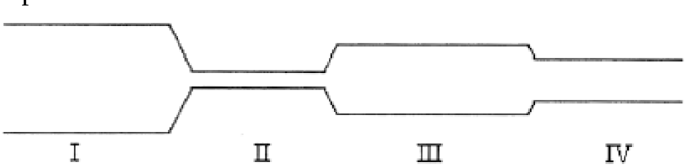
39. The buoyant force on an object is equal to the weight of the water displaced by a submerged object. This is a principle attributed to
(a) Torricelli (b) Pascal (c) Galileo (d) Archimedes (e) Bernoulli

42. A river gradually deepens, from a depth of 4 m to a depth of 8 m as shown. The width, W, of the river does not change. At the depth of 4 m, the river's speed is 12 m/sec. Its velocity at the 8 m depth is



(a) 12 m/sec (b) 24 m/sec (c) 6 m/sec (d) 8 m/sec (e) 16 m/sec

1. A fluid is forced through a pipe of changing cross section as shown. In which section would the pressure of the fluid be a minimum?

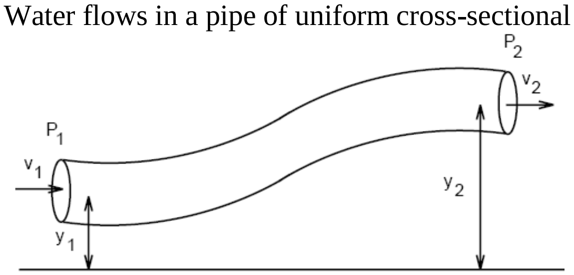


A) I B) II C) III D) IV E) all section have the same pressure.

2. A 500 N weight sits on the small piston of a hydraulic machine. The small piston has an area of 2 cm^2 . If the large piston has an area of 40 cm^2, how much weight can the large piston support?
A) 25 N
B) 500 N
C) 10000 N
D) 40000 N

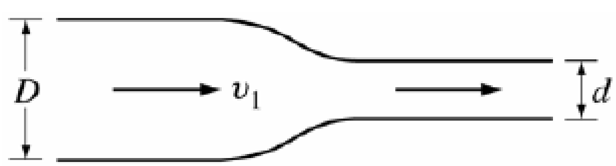
3. Liquid flows through a 4 cm diameter pipe at 1.0 m/s. There is a 2 cm diameter restriction in the line. What is the velocity in this restriction?
A) 0.25 m/s B) 0.50 m/s C) 2 m/s D) 4 m/s

8. Water flows in a pipe of uniform cross-sectional area A.



The pipe changes height from y_1 = 2 meters to y_2 = 3 meters. Since the areas are the same, we can say $v_1 = v_2$. Which of the following is true?
(a) $P_1 = P_2 + \rho g(y_2 - y_1)$
(b) $P_1 = P_2$
(c) $P_1 = 0$
(d) $P_2 = 0$
(e) $\rho_1 > \rho_2$

10. Water flows through the pipe shown. At the larger end, the pipe has diameter *D* and the speed of the water is v_1 .



What is the speed of the water at the smaller end, where the pipe has diameter *d* ?

$(A)\ v_1$ $(B)\ \frac{d}{D}v_1$ $(C)\ \frac{D}{d}v_1$ $(D)\ \frac{d^2}{D^2}v_1$ $(E)\ \frac{D^2}{d^2}v_1$

2007B4.

The large container shown in the cross section is filled with a liquid of density 1.1×10^3 kg/m^3. A small
hole of area 2.5×10^{-6} m^2 is opened in the side of the container a distance *h* below the liquid surface, which
allows a stream of liquid to flow through the hole and into a beaker placed to the right of the container. At the
same time, liquid is also added to the container at an appropriate rate so that *h* remains constant. The amount of
liquid collected in the beaker in 2.0 minutes is 7.2×10^{-4} m^3.

(a) Calculate the volume rate of flow of liquid from the hole in m3 s.

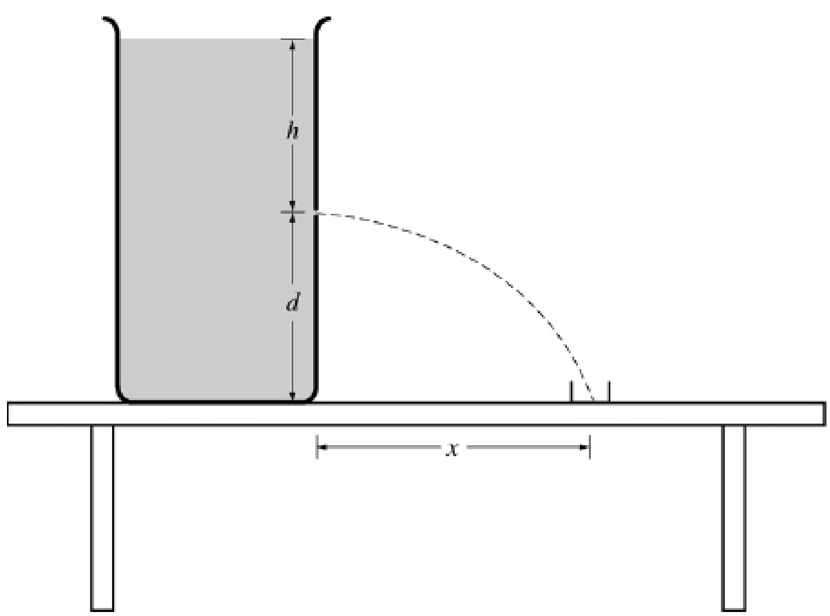
(b) Calculate the speed of the liquid as it exits from the hole.

(c) Calculate the height *h* of liquid needed above the hole to cause the speed you determined in part (b).

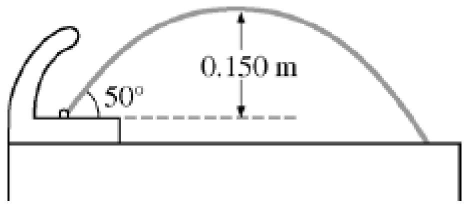
(d) Suppose that there is now less liquid in the container so that the height *h* is reduced to *h*/2. In relation to the
collection beaker, where will the liquid hit the tabletop?

____ Left of the beaker ____ In the beaker ____ Right of the beaker

Justify your answer.

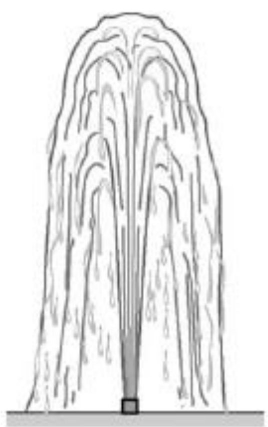


2008B4.



A drinking fountain projects water at an initial angle of 50° above the horizontal, and the water reaches a
maximum height of 0.150 m above the point of exit. Assume air resistance is negligible.
(a) Calculate the speed at which the water leaves the fountain.
(b) The radius of the fountain's exit hole is 4.00×10^{-3} m. Calculate the volume rate of flow of the water.
(c) The fountain is fed by a pipe that at one point has a radius of 7.00×10^{-3} m and is 3.00 m below the fountain's opening. The density of water is 1.0×10^{3} kg/m^3. Calculate the gauge pressure in the feeder pipe at this point.

B2008B4.



A fountain with an opening of radius 0.015 m shoots a stream of water vertically from ground level at 6.0 m/s.
The density of water is 1000 kg/m^3.
(a) Calculate the volume rate of flow of water.
(b) The fountain is fed by a pipe that at one point has a radius of 0.025 m and is 2.5 m below the fountain's
opening. Calculate the absolute pressure in the pipe at this point.
(c) The fountain owner wants to launch the water 4.0 m into the air with the same volume flow rate. A nozzle
can be attached to change the size of the opening. Calculate the radius needed on this new nozzle.