PIPES AND CISTERNS

IMPORTANT FACTS AND FORMULAE

Inlet : A pipe connected with a tank or a certain or a reservoir, that fills it, is known as an inlet.

Outlet : A pipe connected with a tank or a cistern or a reservoir, emptying it, is known as an outlet.

I. If a pipe can fill a tank in x hours, then :
part filled in 1 hour = 1 / x.

II. If a pipe can fill a tank in y hours, then :
part emptied in 1 hour = 1 / y.

III. If a pipe can fill a tank in x hours and another pipe can empty the full tank in y hours

(where y > x), then on opening both the pipes, the net part filled in 1 hour = (1/x - 1/y).

IV. If a pipe can fill a tank in x hours and another pipe can empty the full tank in y hours

(where x > y), then on opening both the pipes, the net part emptied in 1 hour = (1/y - 1/x).

A pump can fill a tank with a water in 2 hours. Because of a leak, it took 2x1/3 hours to fill the tank. The leak can drain all the water of the tank in
14 hrs
Sol.
Work done by the leak in 1 hour = (1/2 - 3/7) = 1/14.
Leak will empty the tank in 14 hrs.

A leak in the bottom of a tank can empty the full tank in 8 hours. An inlet pipe fills water at the rate of 6 litres a minute. When the tank is full, the inlet is opened and due to the leak, the tank is empty in 12 hours. How many litres does the cistern hold?
8640
Sol.
Work done by the inlet in 1 hour = (1/8 - 1/12) = 1/24.
Work done by the inlet in 1 hour = (1/24 x 1/60) = 1/1440.
Volume of 1/1440 part = 6 litres.
Volume of whole = (1440 x 6) litres = 8640 litres.

12 buckets of water fill a tank when the capacity of each tank is 13.5 litres. How many buckets will be needed to fill the same tank, if the capacity of each bucket is 9 litres?
18
Sol.
Capacity of each bucket = 9 litres.
Number of buckets needed = (162/9) = 18.

A cistern can be filled by a tap in 4 hours while it can be emptied by another tap in 9 hours. If both the taps are opened simultaneously, then after how much time will the cistern get filled?
7.2 hrs

Sol.
Net part filled in 1 hour = (1/4 - 1/9)= 5/36.
The cistern will be filled in 36/5 hrs i.e. 7.2 hrs.

Pipe A can fill a tank in 5 hours, pipe B in 10 hours and pipe C in 30 hours. If all the pipes are open, in how many hours will the tank be filled?
3
Sol.
Part filled by (A + B + C) in 1 hour = (1/5 + 1/10 + 1/30) = 1/3.
All the three pipes together will fill the tank in 3 hours.

Two taps A and B can fill a tank in 5 hours and 20 hours respectively. If both the taps are open due to a leakage, it took 30 minutes more to fill the tank. If the tank is full, how long will it take for the leakage alone to empty the tank?
36 hrs
Sol.
Part filled by (A + B) in 1 hour = [1/5 + 1/20] = 1/4.
So, A and B together can fill the tank in 4 hours.
Work done by the leak in 1 hour = (1/4 - 2/9) = 1/36.
Leak will empty the tank in 36 hrs.