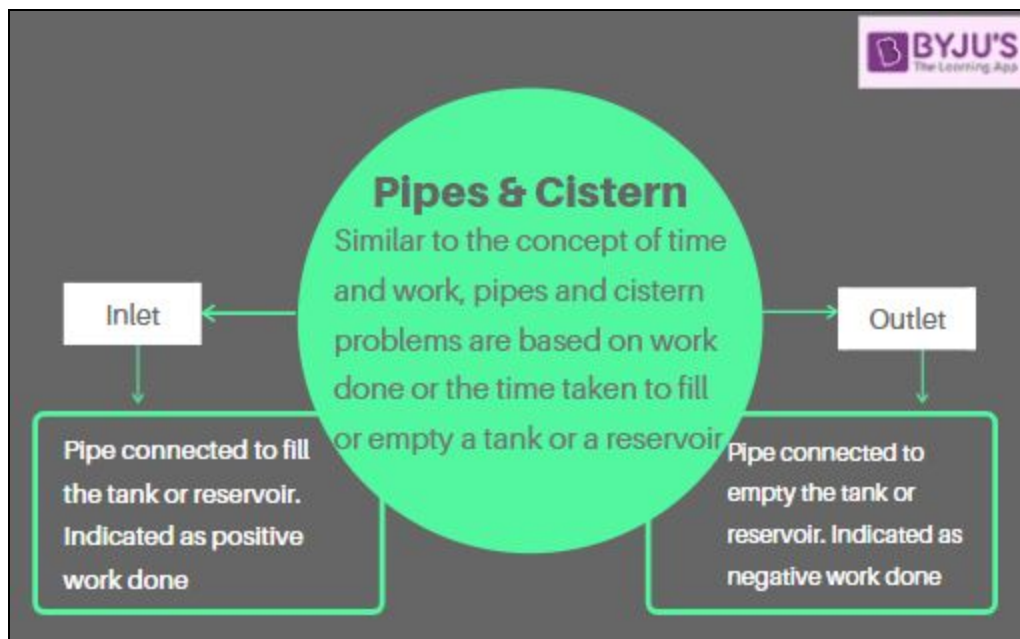


Pipes & Cistern Concept & Questions

Words problems based on pipes and cistern is a common topic from which questions are asked in the quantitative aptitude sections for various competitive exams conducted in the country, including banks, SSC, RRB, Insurance and others.

Candidates who are preparing themselves for the upcoming **Government exams** must know that the syllabus for the competitive exams is vast and for a candidate to crack these examinations, they need to devote sufficient time for preparation of every topic under the syllabus.

Pipes and Cistern – Topic and Concept



Pipes and cistern is another format of time and work-based questions. Questions like the time taken to fill or empty a tank, the amount of work done for the same and similar type of questions may be asked. There are two major things which a candidate needs to know about such questions:

- **Inlet:** An inlet is a pipe which is connected to fill a tank with water. This is the positive type of work done
- **Outlet:** An outlet is a pipe which is connected to empty the tank of water. This indicates a negative type of work done. It may also be referred to as 'leak' in the question

To solve questions based on the pipe and cistern, it is important that a candidate is aware of the above mentioned two terms as the questions asked may not be direct and may involve the usage of such terms.

Important Formula on Pipes and Cistern

Given below are a few important formulas which shall help you solve the pipes and cistern based questions quicker and more efficiently:

- If x hours are required to fill up a tank, then part filled in 1 hr = $1/x$
- If y hours are required to empty the tank, then part emptied in 1 hour = $1/y$
- If a pipe can fill a tank in x hours and can empty the same tank in y hours. When both the pipes are opened at the same time, then the net part of the tank filled in 1 hr = $\{(xy) / (y-x)\}$, provided $y > x$
- If a pipe can fill a tank in x hours and can empty the same tank in y hours. When both the pipes are opened at the same time, then the net part of the tank filled in 1 hr = $\{(xy) / (x-y)\}$, provided $x > y$
- Net work done = (Sum of work done by Inlets) – (Sum of work done by Outlets)
- One inlet can fill the tank in x hr and the other inlet can fill the same tank in y hrs, if both the inlets are opened at the same time, the time taken to fill the whole tank = $\{(xy) / (y+x)\}$
- If two pipes take x and y hours respectively to fill a tank of water and a third pipe is opened which takes z hours to empty the tank, then the time taken to fill the tank = $\{1 / (1/x)+(1/y)+(1/z)\}$ and the net part of the tank filled in 1 hr = $(1/x)+(1/y)-(1/z)$

Tips and Tricks to Solve Questions

Since the competitive exams are all about time management, candidates must look for shortcut tricks which shall help them solve questions quicker and save some time.

Given below are a few tips which shall help candidates solve the word problems based on pipes and cistern easily and quickly:

- One must be familiar with terms like inlet, outlet, leak, filling a tank, emptying a tank and the formulas related to the same. Only then can a candidate answer these questions without getting confused
- If you are unable to crack the question, then ensure that you do not spend too much time on a single question
- Memorize the formulas and practise as much as possible to understand the concept better

Pipes and Cistern – Sample Questions

It is suggested that candidates must solve more and more questions to be able to understand the concept better and also to answer the questions quickly and efficiently.

Given below are a few sample questions for the reference of candidates.

Q 1. It takes 6 hours for three pipes, X, Y and Z to fill a tank. When the three worked together for 2 hours, Z was closed and, X and Y filled the remaining tank in 7 hours. How many hours would it take Z alone to fill the tank?

1. 15 hours
2. 23 hours
3. 12 hours
4. 14 hours
5. 21 hours

Answer: (4) 14 hours

Solution:

Part of the tank which was filled in 2 hours = $2/6 = \frac{1}{3}$

The part of the tank remaining to be filled = $1 - \frac{1}{3} = \frac{2}{3}$

Work done by X and Y together in 7 hours = $\frac{2}{3}$

Work done by X and Y together in 1 hour = $[(\frac{2}{3}) / 7] = 2/21$

Work done by Z in 1 hour = $\{[(X+Y+X)'s\ 1\ hour's\ work] - [(X+Y)'s\ 1\ hour's\ work]\}$
 $= (\frac{1}{6}) - (2/21) = 1/14$

Therefore, it would take Z alone 14 hours to fill in the tank

Q 2. It takes two pipes A and B, running together, to fill a tank in 6 minutes. It takes A 5 minutes less than B to fill the tank, then what will be the time taken by B alone to fill the tank?

1. 10 minutes
2. 15 minutes
3. 20 minutes
4. 25 minutes
5. 8 minutes

Answer: (2) 15 minutes

Solution:

Let the time taken by pipe A to fill the tank be x minutes

Time is taken by pipe B to fill the tank = x+5 minutes

So, $1/x + 1/(x+5) = 1/6$

$\Rightarrow x = 10$

Thus, time taken by B alone to fill the tank is 10+5, i.e., 15 minutes

Q 3. If two pipes can fill a tank in 24 and 20 minutes respectively and another pipe can empty 3 gallons of water per minute from that tank. When all the three pipes are working together, it takes 15 minutes to fill the tank. What is the capacity of the tank?

1. 100 gallons
2. 150 gallons
3. 125 gallons
4. 130 gallons
5. 120 gallons

Answer: (5) 120 gallons

Solution:

Work done by the outlet pipe in 1 minute = $\{1/15 - (1/24)+(1/20)\} = 1/15 - 11/120 = -(1/40)$

Here, the negative sign indicates the negative work done, that is the loss of water from the outlet

The capacity of 1/40 part = 3 gallons

So, Capacity of whole tank = $40 \times 3 = 120$ gallons

Q 4. It takes 20 minutes for pipe A to fill the tank completely and it takes 30 minutes for pipe B to fill the tank completely. If both the inlets are opened together, then how much time will be taken to fill the tank completely?

1. 15 minutes
2. 12 minutes
3. 11 minutes
4. 10 minutes
5. 22 minutes

Answer: (2) 12 minutes

Solution:

A portion of the tank filled by pipe A in 1 minute = $1/20$

A portion of the tank filled by pipe B in 1 minute = $1/30$

Total portion filled by both pipe A and B in 1 minute = $(1/20 + 1/30) = 1/12$

Thus it will take 12 minutes to fill the tank completely if both the inlets are opened together.

Q 5. Pipe A can fill the tank 3 times faster in comparison to pipe B. It takes 36 minutes for pipe A and B to fill the tank together. How much time will pipe B alone take to fill the tank?

1. 100 minutes
2. 124 minutes
3. 134 minutes
4. 144 minutes
5. 154 minutes

Answer: (4) 144 minutes

Solution:

Let the time taken by pipe B be x minutes

So, the time taken by pipe A = $x/3$ minutes

Thus, $1/3 + 3/x = 1/36$

$$\Rightarrow 4/x = 1/36$$

$$\Rightarrow x = 4 \times 36$$

$$\Rightarrow x = 144 \text{ minutes}$$

The questions given above are just for candidates to understand the concept better and also to analyse the type of questions which may be asked from this topic.