Quantitative Aptitude

Pipe & Cistern

Level-1

Q1 (A) (B) 14 hrs
(C) 5 hrs (D) 12 hrs
(E) 10 hrs

Q2 Pipe A can fill the tank in 8 hours and B empties it in 12 hours find the time taken to fill the tank, if both are opened at the same time?
(A) 20 hrs (B) 22 hrs
(C) 12 hrs (D) 24 hrs
(E) 10 hrs

Q3 A pipe connected with motor can empty a borewell in 12 hours and another pipe can do the same in 16 hours. If both the pipes are started at the same time, find the time taken in which a borewell is emptied?
(A) 9.29 hours (B) 6.85 hours
(C) 7.42 hours (D) 8.56 hours
(E) 9.59 hours

Q4 A tap can fill a cistern in 10 hours and another tap can empty it in 15 hours. If both the taps are open, the time (in hours) taken to fill the tank will be:
(A) 30 hr (B) 25 hr
(C) 20 hr (D) 15 hr
(E) None of these

Q5 A and B pipe of a tank fill in 6 hour, B and C pipe fill in 4 hour and C and A pipe fill in 3 hour. C alone can fill the tank in x hours, find the value of x?
(A) 24/5 (B) 34/5
(C) 28/5 (D) 38/5
(E) None of these

Q6 A and B pipes of a tank fill in 9 hours, B and C pipes fill in 6 hours and C and A pipes fill in 18 hours. In how many minutes pipe C alone fills the tank?
(A) 15 (B) 30
(C) 18 (D) 40
(E) 50

Q7 A pipe can fill a tank in 15 hours. Due to a leak in the bottom, it is filled in 20 hours. If the tank is full, how much time will the leak take to empty it?
(A) 30 (B) 40
(C) 50 (D) 60
(E) None of these

Q8 A pipe can fill a tank in 20 minutes but due to a leak develop at the bottom of the tank, 1/5 of the water filled by the pipe leaks out. Find the time in which the tank is filled.
(A) 30 min (B) 25 min
(C) 35 min (D) 20 min
(E) 15 min

Q9 A pipe can fill a tank in 3 hours, but due to leakage in the tank it requires 5.25 hours to completely fill the tank. After filling the tank completely, in how much time will the tank get emptied due to leakage?
(A) 7 hours (B) 4 hours
(C) 9 hours (D) 6 hours
(E) 8 hours

Q10 A water filter pipe can fill a water bottle in 24 seconds. But it took 36 seconds and on careful examination found that there is a small hole at the bottom of the bottle. How much time does it take to drain the entire water bottle?

(A) 48 seconds (B) 60 seconds
(C) 72 seconds (D) 96 seconds
(E) None of these

Q11 A water tank can be filled by a tap in 20 minutes and another tap can fill it in 24 minutes. If both the taps are kept open for 10 minutes and then the first tap is closed, how long will it take for the tank to be full?

(A) 10 min (B) 15 min
(C) 12 min (D) 18 min
(E) None of these

Q12 A tank is filled by a pipe A in 20 min. and pipe B in 30 min. When filled, it can be emptied by pipe C in 60 minutes. If all the three pipes are opened simultaneously, 2/3rd of tank will be filled in

(A) 15 min (B) 25 min
(C) 20 min (D) 10 min
(E) None of these

Q13 A tap can empty a tank in one hour. A second tap can empty it in 40 minutes. If both the taps operate simultaneously, how much time is needed to empty the tank?

(A) 22 minutes (B) 20 minutes
(C) 24 minutes (D) 26 minutes
(E) None of these

Q14 A tank has a leak which can empty a full tank in 32 minutes. A tap is turned on which can fill 5 liters a minute. The tank now becomes empty in 40 minutes. What is the capacity of the tank?

(A) 800 (B) 250
(C) 160 (D) 500
(E) None of these

Q15 A pipe can fill a tank with water in 3 hours. Due to leakage in bottom, it takes 3.5 hour to fill it. the leak will empty the fully filled tank in x hours, find the value of x?

(A) 27 (B) 29
(C) 30 (D) 21
(E) 35

Q16 A Cistern is three-fifth full. Pipe X can fill a tank in 20 minutes and pipe Y can empty it in 12 minutes. If both the pipes are open,how long will it take to empty or fill the tank completely?

(A) 9 minutes (B) 18 minutes
(C) 28 minutes (D) 8 minutes
(E) None of these

Q17 2 pipes A and B can fill a tank in 24 minutes and 32 minutes respectively while working alone. If both the pipes are opened simultaneously then after how much time pipe B should be closed so that tank is full in 18 minutes?

(A) 8 minutes (B) 12 minutes
(C) 15 minutes (D) 10 minutes
(E) None of these

Q18 A 100% empty water tank can be filled by a tap in 2 hours. When the tap was opened, the water tank already had 120 litres water. If it was filled in 1 hour 40 minutes, find the total capacity of the water tank.

(A) 480 litres (B) 560 litres
(C) 720 litres (D) 840 litres
(E) None of these

Q19 A and B are inlet pipes which take 5 hours and 9 hours respectively alone to fill the tank. C is outlet pipe which alone can empty the tank in 15 hours. If all three pipes are opened

simultaneously, then in what time the tank will be filled completely?

(A) $4\frac{1}{11}$ hours

(B) $5\frac{1}{10}$ hours

(C) $2\frac{5}{11}$ hours

(D) $3\frac{4}{13}$ hours

(E) None of these

Q20 A Tank is empty by a pipe in 3 hour. When from another pipe 180 liter water per hour enter the tank then the tank empty in 4 hour. Find the capacity of the tank?

(A) 2113 (B) 2160

(C) 2800 (D) 1500

(E) 1700

Level-2

Q1 A Tank is empty by a pipe in 5 hours. When from another pipe 120 liter water per hour enters the tank then the tank is empty in 15 hours. Find the capacity of the tank?

(A) 900 (B) 2160
(C) 3600 (D) 1500
(E) 700

Q2 A Tank is empty by a pipe in 8 hours. When from another pipe 90 liter water per hour enters the tank then the tank is empty in 9 hours. Find the capacity of the tank?

(A) 6480 (B) 2760
(C) 5800 (D) 4500
(E) 5000

Q3 Three pipes A, B and C together can fill the half of the tank in 8 hours and pipe A and C together can fill the half of the tank in 12 hours. IF the efficiency of C is half of B, in how many hours A alone fill the tank completely?

(A) 30 hours
(B) 32 hours
(C) 34 hours
(D) 36 hour
(E) None of these

Q4 Two pipes A and B can fill a tank in 20 minutes and 30 minutes respectively while a third pipe C can empty the full tank in 40 minutes. All the 3 pipes are opened in the beginning. After 10 minutes, pipe C is closed. Find, in how much time (in total) will the whole tank be full?

(A) 12 minutes (B) 15 minutes
(C) 10 minutes (D) 17 minutes
(E) None of these

Q5 A water tank is filled by taps A, B and C and it would have taken 33.33% more time if tap C was closed. If tap A and B can fill the tank in 12 and 15 hours respectively, in how much time tap C can fill the tank alone?

(A) 18 hours (B) 10 hours
(C) 15 hours (D) 12 hours
(E) 20 hours

Q6 A cistern can be filled by pipe 'B' in 15 minutes and efficiency of inlet pipe 'A' is 50% more than the efficiency of pipe 'B'. Find the time taken by pipe 'C' to empty the completely filled cistern if all three pipes together takes 30 minutes to empty it.

(A) 14 minutes (B) 8 minutes
(C) 11 minutes (D) 3 minutes
(E) 5 minutes

Q7 Pipe A alone can fill 75% part of tank in 18 minutes and pipe B alone can fill the tank in 15 minutes with 80% of its original efficiency. When an outlet pipe C is connected to the tank, they together can fill the tank in $\frac{72}{7}$ minutes. In what time, pipe C alone can empty the fully filled tank?

(A) 30 minutes
(B) 42 minutes
(C) 24 minutes
(D) 45 minutes
(E) 36 minutes

Q8 A pipe A can empty a tank in 90 min alone. Another pipe B whose diameter is 3 times of A is opened. Find the time taken in which both the pipe will empty the tank together?

(A) 10 min (B) 8 min

(C) 25min (D) 9 min
(E) 15 min

Q9 A pipe can empty a tank in 240 minutes alone. Another pipe whose diameter is four times the diameter of the first pipe is also opened. Now find the time in which both pipe will empty the tank together (approx.).
(A) 4 minutes (B) 8 minutes
(C) 12 minutes (D) 10 minutes
(E) None of these

Q10 A cistern can be filled by pipe 'P' alone and pipes 'P', 'Q' and 'R' together in 20 hours and $\frac{140}{3}$ hours, respectively. Find the time taken by pipe 'R' to empty the cistern alone, if the ratio of efficiency of pipe 'Q' and 'R' is 1:5, respectively and pipe 'Q' is inlet pipe-
(A) 22 hours (B) 28 hours
(C) 20 hours (D) 25 hours
(E) None of these

Q11 A draining pipe can drain a tank in 15 hours, and a filling pipe can fill the same tank in 5 hours. For the 1st hour only the filling pipe was open, for the second hour only the draining pipe was open, for the third hour only the filling pipe was open and this cycle goes on. In how many hours could the tank be filled?
(A) 10 (B) 12
(C) 13 (D) 14
(E) None of these

Q12 Pipe X can fill $\frac{3}{4}$ part of a tank in 10 $\frac{1}{2}$minutes and pipe Y can empty the tank when it is 50% full in $10\frac{1}{2}$ minutes. If initially the tank is empty and both the pipes are together opened at 3: 30 pm, then the tank will be filled by
(A) 10 : 40 PM (B) 06 : 10 PM
(C) 4 : 12 PM (D) 11 PM
(E) None of these

Q13 A Tank is already filled up to X% of its capacity. An Inlet pipe can fill Full Tank in 40 minutes and an Outlet pipe can empty Full Tank in 20 Minutes. Now both pipes are opened then the Tank is emptied in 20 Minutes. Then initially up to what % of its capacity is Tank filled?
(A) 30% (B) 40%
(C) 50% (D) 45%
(E) 55%

Q14 A cistern is filled by 3 pipes X, Y and Z with uniform flow. The second pipe Y takes $\frac{5}{3}$ times the time taken by X to fill the tank, while Z takes thrice the time taken by Y to fill the tank. If all the three pipes can fill the tank in 14 hours, find the time required by pipe X alone to fill the tank
(A) 15.2 hours (B) 35.2 hours
(C) 55.2 hours (D) 75.2 hours
(E) None of these

Q15 A tank is connected to two inlet pipes and one outlet pipe. Through inlet pipes 25% and 75% of the tank capacity will be filled in 3 hours and 12 hours respectively and through outlet pipe it can be emptied in 12 hours. If all three pipes are opened together, then the tank will be filled in __ hours.
(A) 10 (B) 12
(C) 16 (D) 20
(E) None of these

Q16 A bathtub can be filled by the cold water pipe in 10 min and by hot water pipe in 15 min (independently each). A person leaves the bathroom after turning on both pipes simultaneously and returns at the moment when the bath should have been full. But he finds that the waste pipe has been open, he

now closes it. In 4 min more, bathtub is full. In what time would be the waste pipe empty it?

(A) 9 minutes (B) 12 minutes
(C) 15 minutes (D) 14 minutes
(E) None of these

Q17 A Tank is already filled up to X% of its capacity. An Inlet pipe can fill Full Tank in 30 minutes and an Outlet pipe can empty Full Tank in 20 Minutes. Now both pipes are opened then the Tank is emptied in 24 Minutes. Then initially up to what % of its capacity is Tank filled?

(A) 50% (B) 40%
(C) 60% (D) 48%
(E) 75%

Q18 An empty tank is filled using a pipe whose rate of flow doubles after every hour. If the pipe takes 5 hours to fill the tank, then find the ratio between the amount of water filled in first 3 hours to that in last 3 hours.

(A) 2 : 9 (B) 1 : 7
(C) 1 : 4 (D) 5 : 3
(E) None of these

Q19 Given that three flood gates, A, B, and C, can collectively fill a reservoir in 9 hours, and after working together for 3 hours, flood gate C is closed. Subsequently, flood gates A and B take an additional 5 hours to complete the remaining filling. How many hours would flood gate C alone take to fill the reservoir?

(A) $25\frac{4}{5}$ hours
(B) $19\frac{4}{5}$ hours
(C) $20\frac{4}{5}$ hours
(D) $23\frac{4}{5}$ hours
(E) None of these

Q20 A Tank is already filled up to C% of its capacity. An Inlet pipe can fill Full Tank in 60 minutes and an Outlet pipe can empty Full Tank in 40 Minutes. Now both pipes are opened then the Tank is emptied in 48 Minutes. Then initially up to what percent of its capacity is Tank filled?

(A) 50% (B) 40%
(C) 50% (D) 30%
(E) None of these

Level-3

Q1 A tank can be filled by an inlet pipe at the rate of 8 litres per minute. A leak in the bottom of a tank can empty the full tank in 16 hours. When the tank is full, the inlet is opened and due to the leak, the cistern is empty in 80 hours. How many litres does the tank hold?

(A) $7579\frac{4}{5}$ litres
(B) $7479\frac{4}{5}$ litres
(C) $7379\frac{4}{5}$ litres
(D) $7279\frac{4}{5}$ litres
(E) None of these

Q2 A tank is connected with 3 inlet pipes and 2 outlet pipes. The inlet flow of each inlet pipe is 8 L/min while the efficiency of each outlet pipe is 187.5% of efficiency of each inlet pipe. Initially the tank is completely filled with water and all the pipes are opened for 45 min. After 45 min the efficiency of each inlet pipe is increased by 50% and efficiency of each outlet pipe is decreased by 10% and now all the pipes can again fill the tank in 'T' min. Find the value of 'T' .

(A) 45 (B) 30
(C) 50 (D) 60
(E) None of these

Q3 The capacity of a tank is 100 liters. Two inlet pipes A and B whose flow rates are 5 liter/ min and 3 liter/min are fitted into it. The tank is connected to an outlet pipe C whose flow rate at N^{th} min is defined as f = ½ N. If all three pipes are opened at the same time, find out the maximum % of the tank which can get filled by this arrangement.

(A) 80% (B) 65%
(C) 60% (D) 100%
(E) 90%

Q4 There are three pipes connected to the tank. Pipe X and pipe Y can fill the tank while pipe Z alone can empty the tank in 24 hours.Pipe X is 40% more efficient than pipe Y. If all the pipes are opened simultaneously then the tank is filled in $27\frac{7}{10}$ hours. Find the time in which pipe X and pipe Y together can fill the tank when pipe Z is closed for the whole time.

(A) $15\frac{5}{6}$ hours
(B) $27\frac{5}{6}$ hours
(C) $9\frac{5}{6}$ hours
(D) $18\frac{5}{6}$ hours
(E) None of these

Q5 If three pipes A, B, and C can fill a cistern in 9 hours, and they initially work together for 3 hours before pipe C is closed, then pipes A and B take an additional 9 hours to complete the filling. What is the time required for pipe C alone to fill the cistern?

(A) 23 hours (B) 24 hours
(C) 25 hours (D) 26 hours
(E) 27 hours

Q6 Time taken by pipe A alone to fill a tank is 8 hours more than time taken by pipe B alone. Pipe C alone started emptying the full tank at 7:00 AM on Friday and completely emptied it at 7:00 PM on Sunday. All the three pipes together can fill that tank in (80/7) hours. If pipes A and C together started filling that tank at 2:00 AM on Sunday, at what time the tank will be filled completely?

(A) 6:00 AM on Monday
(B) 7:00 PM on Sunday
(C) 6:00 PM on Monday
(D) 7:00 AM on Tuesday

(E) None of these

Q7 Pipe 'A' alone can fill a tank in 40 minutes while pipes 'A' and 'B' together can fill the same tank in __ minutes. Pipes 'B' and 'C' together can fill half the tank in 15 minutes. If pipes 'A' and 'C' are opened together such that pipe 'C' works at ___% of its original efficiency, then the tank can be filled in 48 minutes.
Which among the options given below contains the values that will fill the blanks in the same order so as to make the statement true?
I. 15, 50%
II. 24, 10%
III. 16, 100%
(A) Only II and III
(B) Only III
(C) Only I and II
(D) All of I, II and III
(E) Only I and III

Q8 A purifier had a total of 15 valves among which few were connected to fill the purifier while the rest of the valves were used to drain the purified water. Each of the valves used for the purpose of filling could fill the purifier in 15 hours while each of the drain valves would take 30 hours to drain the purifier. If all the pipes are kept open and if it took 2 hours to completely fill the purifier then what % of the total pipes were reserved for draining purpose?
(A) 33.33% (B) 44.44%
(C) 39.39% (D) 48.50%
(E) None of these

Q9 A Vessel is partially filled up to volume V liters. At the same instant 24 holes generated at the bottom, and an inlet pipe is connected to the vessel, so it takes 8 hours to empty the vessel. If 20 holes are generated, then vessel is emptied in 16 hours. If (2H + 8) holes are generated then vessel is emptied in 4 hours. Find the value of H?
(A) 5 (B) 10
(C) 12 (D) 8
(E) 6

Q10 An Inlet pipe can fill a tank in 10 hours and an Outlet pipe can empty $\frac{5}{7}$ of the same Tank in 10 hours. In the first hour only Inlet pipe is opened and in the second hour, only outlet pipe is opened. They have opened alternately every hour until the tank is filled. Then in how many hours does the tank gets filled (approx)?
(A) $68\frac{2}{7}$ hours
(B) $34\frac{2}{7}$ hours
(C) $14\frac{2}{7}$ hours
(D) $44\frac{2}{7}$ hours
(E) None of these

Answer Key

Level-1

Q1	(D)
Q2	(D)
Q3	(B)
Q4	(A)
Q5	(A)
Q6	(C)
Q7	(D)
Q8	(B)
Q9	(A)
Q10	(C)
Q11	(C)
Q12	(D)
Q13	(C)
Q14	(A)
Q15	(D)
Q16	(B)
Q17	(A)
Q18	(C)
Q19	(A)
Q20	(B)

Level-2

Q1	(A)	Q11	(C)
Q2	(A)	Q12	(C)
Q3	(B)	Q13	(C)
Q4	(B)	Q14	(E)
Q5	(E)	Q15	(C)
Q6	(E)	Q16	(A)
Q7	(E)	Q17	(B)
Q8	(D)	Q18	(C)
Q9	(E)	Q19	(B)
Q10	(B)	Q20	(B)

Level-3

Q1	(E)	Q6	(C)
Q2	(B)	Q7	(E)
Q3	(C)	Q8	(A)
Q4	(E)	Q9	(C)
Q5	(E)	Q10	(A)

Hints & Solutions

Level-1

Q1 Text Solution:

If a pipe can fill a tank in 'n' hours and another pipe can empty a tank in 'm' hours (n < m), then the tank is filled in $\frac{m\times n}{n-m}$ hours.

Time taken to fill the tank = $\frac{m\times n}{n-m}=\frac{6\times 4}{6-4}$ = 12 hours

Q2 Text Solution:

If a pipe can fill a tank in 'n' hours and another pipe can empties a tank in 'm' hours (m > n), then the tank is filled in $\frac{m\times n}{m-n}$ hours.

time taken to fill the tank=$\frac{m\times n}{n-m}=\frac{8\times 12}{12-8}=24$ hours

Q3 Text Solution:

Let there be the two pipes; Pipe A and Pipe B

Pipe A can empty the borewell in 12 hours

So, Work done by pipe A in 1 hour = $\left(\frac{1}{12}\right)$

Pipe B can empty the borewell in 16 hours

So, Work done by pipe B in 1 hour = $\left(\frac{1}{16}\right)$

Work done by the both pipe in 1 hour = $\left(\frac{1}{12}\right)$ + $\left(\frac{1}{16}\right)$

Required answer =$\frac{12\times 16}{12+16}$ =$\frac{192}{28}$ =6.85 hours.

So, the entire borewell is emptied in 6.85 hours.

Q4 Text Solution:

Le time taken to fill be x.

$=> \frac{1}{10}-\frac{1}{15}=\frac{1}{x}$

$=> \frac{(15-10)}{150}=\frac{1}{x}$

$=> \frac{1}{x}=\frac{5}{150}$

$=> x = 30\ hours$

Q5 Text Solution:

LCM (6,4,3) = 12

Let the quantity of the tank be 12 l.

Quantity of tank filled in 1 min by;

A+B = $\frac{12}{6}=2\ l—(1)$

B+C = $\frac{12}{4}=3\ l—(2)$

A+C= $\frac{12}{3}=4\ l—(3)$

Adding (1),(2) and (3) and putting the value of (1) in it;

$2(A+B+C)=9$

$=> A+B+C=\frac{9}{2}$

$=> C=\frac{9}{2}-2=\frac{5}{2}$

Time taken by C, x = $\frac{12}{\frac{5}{2}}=\frac{24}{5}$ hours

Q6 Text Solution:

LCM(9,6,18)=18

Let the quantity of the tank be 18 l.

Quantity of tank filled in 1min by ;

A+B = $\frac{18}{9}=2\ l—(1)$

B+C = $\frac{18}{6}=3l—(2)$

C+A = $\frac{18}{18}=1\ l—(3)$

Adding (1), (2) and (3), and putting (1) in it;

$=> 2(A+B+C)=6$

$=> A+B+C=3$

$=> 2+C=3$

$=> C = 1\ l$

Time taken by C alone = $\frac{18}{1}=18\ min$

Q7 Text Solution:

Since tank can be filled in 15 hours ,

Therefore 1 hour work is $\frac{1}{15}$

Let x hours be taken to empty the tank ,

Therefore 1 hour work of leak is $\frac{1}{x}$

$\frac{1}{15}-\frac{1}{x}=\frac{1}{20}$

$\frac{1}{x}=\frac{1}{15}-\frac{1}{20}=\frac{1}{60}$

⇒ x = 60 hrs

Q8 Text Solution:

Let the capacity of the tank be x liters.

The pipe can fill the tank in 20 minutes, which means it can fill($\frac{x}{20}$) liters of water in 1 minute.

However, due to the leak at the bottom of the tank, 1/5 of the water filled by the pipe leaks out. So,

amount of water that remains in the tank after 1 minute $= (\frac{4}{5}) \times (\frac{x}{20}) = \frac{x}{25}$

effective rate of filling the tank = $\frac{x}{25}$ Liters per minute

Let the tank gets filled in t minutes.

Since the tank gets completely filled, so;

$(\frac{x}{25}) \times t = x$

$t = 25$

Therefore, the tank is filled in 25 minutes.

Q9 Text Solution:

Time taken to fill the tank = $\frac{ab}{b-a}$

Hence, 5.25 = $\frac{3b}{b-3}$

b = 7 hours

Q10 Text Solution:

Water removed by the leak in 1 second $= \frac{1}{24} - \frac{1}{36} = \frac{1}{72}$

Therefore, 72 seconds is required to empty the bottle.

Q11 Text Solution:

Amount of water filled tank by 1st tap in 1 minute $= \frac{1}{20}$

Amount of water filled tank by 2nd in 1 minute $= \frac{1}{24}$

Amount of tank filled by both in 1 minute $= \frac{1}{20} + \frac{1}{24} = \frac{11}{120}$

So; Amount of water filled tank by both in 10 minute

$\frac{11}{120} \times 10 = \frac{110}{120}$

Now; when 1st tap is closed;

Amount of water be filled tank by 2nd tap $= 1 - \frac{110}{120} = \frac{10}{120}$

Time taken by 2nd tap to fill the tank $= 24\ min$

So; time taken by 2nd tap to fill 10/120 of the tank

$\frac{10}{120} \times 24 = 2\ min$

Total time taken $= (10 + 2)\ min = 12\ min$

Q12 Text Solution:

Tank is filled by pipe A in 20 min.

One minute work of pipe A = $\frac{1}{20}$

Tank is filled by pipe B in 30 min.

One minute work of pipe B = $\frac{1}{30}$

Tank is emptied by pipe C in 60 minute.

One minute work of pipe C = $\frac{1}{60}$

One minute work of three pipe = $\frac{1}{20} + \frac{1}{30} - \frac{1}{60} = \frac{3+2-1}{60} = \frac{4}{60}$

they will fill the full tank in $\frac{60}{4} = 15$ min

they will fill $\frac{2}{3}$rd of the tank = $\frac{2}{3} \times 15 = 10$ min

Q13 Text Solution:

Time taken to empty the tank be x.

1 hour $= 60\ minutes$

Now;

$=> \frac{1}{40} + \frac{1}{60} = \frac{1}{x}$

$\frac{3+2}{120} = \frac{1}{x}$

$=> \frac{5}{120} = \frac{1}{x}$

$=> x = 24\ minutes$

Q14 Text Solution:

Let the capacity of the tank be x liters.

The leak can empty a full tank in 32 minutes, thus it can empty

$(\frac{x}{32})$ liters of water in 1 minute.

When the tap is turned on, it fills the tank at a rate of 5 liters per minute.

So,

net rate of water flowing out of the tank =Rate of water flowing out - Rate of water flowing in

$= (\frac{x}{32}) - 5$

As per question;

$(\frac{x}{32}) - 5 = \frac{x}{40}$

$5x - 800 = 4x$

$x = 800$

Hence, the capacity of the tank is 800 liters.

Q15 Text Solution:

Tank filling rate $= \frac{1}{3}$

Time taken with leak $= 3.5\ hours$

New, tank filling rate= $\frac{1}{3.5}$

Rate of leakage $= (\frac{1}{3} - \frac{1}{3.5}) = \frac{1}{21}$

Hence, it will taken x = 21 hours to empty the tank, when it is full.

Q16 Text Solution:

Given, Cistern is three-fifth full

Let, capacity if cistern = 240 liters

So, filled quantity = $\frac{3}{5} \times 240$ = 144 liters

And, rest quantity = 240 - 144 = 96 liters

So, this 144 liters is to be emptied, while both the pipes will be working

As, X can fill the tank in 20 minutes

So, quantity filled per minute = $\frac{240}{20}$ = 12 liters

And,Y can empty the tank in = 12 minutes

So, quantity emptied per minute = $\frac{240}{12}$ = 20 liters

As, Pipe Y is more efficient, so cistern will get empty

So, per minute resultant of both pipes = $\frac{1}{20} - \frac{1}{12} = -\frac{1}{30}$

So, time taken to completely empty the tank, while both pipes are working = 30 minutes

But, we need to empty only 144 liters, so

=> $\frac{240}{144} = \frac{30}{x}$ (where, x = time taken to empty 144 liters)

=> x = $\frac{30 \times 144}{240}$

=> x = 18 minutes

Q17 Text Solution:

Pipe A can fill the tank in 24 minutes.

Part of the tank can filled by pipe A in = $\frac{1}{24}$ minutes

Pipe B can fill the tank in 32 minutes.

Part of the tank can filled by pipe B in = $\frac{1}{32}$ minutes

Let's assume pipe B was open for "t" minutes.

Hence according to the question:

$\frac{18}{24} + \frac{t}{32} = 1$

$=> \frac{t}{32} = 1 - \frac{3}{4}$

$=> \frac{t}{32} = \frac{1}{4}$

t = 8 min

Q18 Text Solution:

Given,

An empty water tank can be filled 100% by a tap in = 2 hours

Difference = 2 hour - 1 hour 40 min = 20 min

The tap needed 20 minutes less time to fill 120 litres less volume,

So,

20 minutes ---------- > 120 litres

2 hours (120 min)---------- > $\frac{120}{20} \times 120$= 720 litres

Hence, Option C is correct.

Q19 Text Solution:

1 hour work of the three pipes = $\frac{1}{5} + \frac{1}{9} - \frac{1}{15} = \frac{11}{45}$ units

Time taken by the three pipes to fill the tank = $\frac{45}{11}$ hours

= $4\frac{1}{11}$ hours

Q20 Text Solution:

Let the capacity of the tank be C.

Rate of emptying $= \frac{C}{3}$

When 180 liters of water per hour enter the tank from another pipe,

Effective rate of emptying = Rate of emptying - Rate of filling

= $\frac{C}{3} - 180$

Given that the tank empties in 4 hours with the combined effect of both pipes. So

Effective rate of emptying $= \frac{C}{4}$

$=> \frac{C}{3} - 180 = \frac{C}{4}$

$=> C = 2160$

Therefore, the capacity of the tank is 2160 liters.

Level-2

Q1 Text Solution:

Let the capacity of the tank be C.

Rate of emptying $= \frac{C}{5}$

When 180 liters of water per hour enter the tank from another pipe,

Effective rate of emptying = Rate of emptying - Rate of filling

$= \frac{C}{5} - 120$

Given that the tank empties in 4 hours with the combined effect of both pipes. So

Effective rate of emptying $= \frac{C}{15}$

$\Rightarrow \frac{C}{5} - 120 = \frac{C}{15}$

$\Rightarrow C = 900$

Therefore, the capacity of the tank is 900 liters.

Q2 Text Solution:

Let the capacity of the tank be C.

Rate of emptying $= \frac{C}{8}$

When 90 liters of water per hour enter the tank from another pipe,

Effective rate of emptying = Rate of emptying - Rate of filling

$= \frac{C}{8} - 90$

Given that the tank empties in 4 hours with the combined effect of both pipes. So

Effective rate of emptying $= \frac{C}{9}$

$\Rightarrow \frac{C}{8} - 90 = \frac{C}{9}$

$\Rightarrow C = 6480$

Therefore, the capacity of the tank is 6480 liters.

Q3 Text Solution:

A + B + C together can fill the whole tank in = 1/16

A + C together can fill the whole tank in = 1/24

B = 1/16 – 1/24

B = $\frac{3-2}{48}$ = 1/48

C = 1/96

A = 1/24 – 1/96

A = (4 – 1)/96 = 1/32

Q4 Text Solution:

Pipe A can fill the tank in 20 minutes.

Part of the tank will be filled by pipe A in one minute = $\frac{1}{20}$

Pipe B can fill the tank in 30 minutes.

Part of the tank will be filled by pipe B in one minute = $\frac{1}{30}$

Pipe C can empty the tank in 40 minutes.

Part of the tank will be emptied by pipe C in one minute = $\frac{1}{40}$

Tank filled in 10 minutes = $10 \times \left(\frac{1}{20} + \frac{1}{30} - \frac{1}{40}\right) = \frac{7}{12}$

Remaining part = $1 - \left(\frac{7}{12}\right) = \frac{5}{12}$

Work done by (A + B) in 1 minute = $\left(\frac{1}{20} + \frac{1}{30}\right) = \frac{1}{12}$

Now $\frac{1}{12}$ part is filled by (A + B) in 1 minute.

$\frac{5}{12}$ part will be filled by (A + B) in = $\left(\frac{5}{12}\right) \times 12 = 5$ minutes

Therefore, total time in which the tank is full = 10 + 5 = 15 minutes

Q5 Text Solution:

We will use LCM method,

tap A and B can fill the tank in 12 and 15 hours respectively,

LCM of 12 and 15 is 60

The efficiency of A and B is 5 and 4 respectively

time taken by A and B will be $\frac{60}{9}$ = 6.66 hrs

Taps A, B and C and it would have taken 33.33% more time (i.e $\frac{4}{3}$) if tap C had closed

4 units = $\frac{60}{9}$ hrs

3 units = ?

? = $\frac{60}{9} \times \frac{3}{4}$

? = 5 hrs

A, B, and C take 5 hrs to fill the tank
Therefore,
As we consider the total capacity of the tank is 60
Therefore $\frac{60}{12}$ = 5 hrs
that means total efficiency is 12
From this, we can find the efficiency of C which is 3,
12 - 5 - 4 = 3 = Efficiency of C
Time taken by C is $\frac{60}{3}$ = 20 hrs

Q6 Text Solution:
Let the efficiency of 'C' be 'x' litres/minute
Let, capacity of the cistern = 30 litres (LCM of 15 and 30)
Efficiency of pipe 'B' = 30÷15 = 2 litres/minute
So, efficiency of pipe 'A' = 2 + (2 X 0.5) = 3 litres/minute
Efficiency of ('A' + 'B' + 'C') = 30÷30 = (-1) litres/minute
According to question:
3 + 2 + (x) = (-1)
Or, 5 + x = (-1)
Or, x = (-6) litres/minute
Required time taken = 30÷6 = 5 minutes
∴ Hence the answer is 5 minutes.

Q7 Text Solution:
Since, pipe A alone can fill 75% part of tank in 18 minutes.
So, time taken by pipe A alone to fill the tank fully =
$18 \times \frac{100}{75} = 24$ minutes
Since, pipe B alone can fill the tank in 15 minutes with 80% of its original efficiency.
So, time taken by pipe B alone to fill the tank with its original efficiency:
$15 \times \frac{80}{100} = 12$ minutes
Since, inlet pipes A and B and outlet pipe C together fill the tank in $\frac{72}{7}$ minutes.
And part of tank emptied by pipe C alone in 1 minute:
$\frac{1}{24} + \frac{1}{12} - \frac{7}{72} = \frac{3+6-7}{72} = \frac{1}{36}$
So, time taken by pipe C alone to empty the fully filled tank = 36 minutes

Q8 Text Solution:
Since, Pipe B has thrice the diameter of Pipe A,
=> Efficiency of Pipe B is thrice the efficiency of Pipe A.
Ratio of diameter of A :B= 1:3
=>radius of A :B = $(\frac{1}{2}) : (\frac{3}{2}) = 1 : 3$
Also;
Efficiency of pipe is directly proportional to square of radius of pipe.
=> efficiency of A :B = 1:9
Total Capacity of a tank = Efficiency × Time
=>Total capacity = $90 \times 1 = 90\,l$
When both the piper A and B are attached to tank,
Time taken to empty the tank $= \frac{90}{1+9} = 9\ min$

Q9 Text Solution:
Time taken by pipe to empty the tank is inversely proportional to cross- sectional area.
Let, radius of 1st pipe = r
So, cross section area of 1st pipe = πr^2
So, quantity emptied per minute by 1st pipe = $\frac{1}{240}$
Then, radius of 2nd pipe = 4r
So, cross section area of 2nd pipe = 16 πr^2
So, quantity emptied per minute by 2nd pipe = $\frac{1}{T}$
As, Area is 16 times more, to time taken would be 16 times less
So, time taken by second pipe will be = $\frac{240}{16}$ = 15 min

So, Time taken by both the pipes to empty the tank = $\frac{15\times240}{15+240}$
≈ 14 minutes

Q10 Text Solution:

Let total capacity of the cistern = 140 litres (LCM of 20 and 140)
Efficiency of 'P' = 140÷20 = 7 litres/hour
And, Combined efficiency of pipe 'P', 'Q' and 'R' = {140÷ $\frac{140}{3}$} = 3 litres/hour
And, ratio of efficiencies of 'Q' and 'R' = 1:5
Let the efficiency of 'Q' be 'x' litres/hour
So, efficiency of 'R' = x × 5 = '5x' litres/hour
So, 7 + x - 5x = 3
Or, 4x = 4
Or, x = 1
So, efficiency of 'R' = (5 × 1) = 5 litres/hour
Required time taken = (140÷5) = 28 hours

Q11 Text Solution:

Let the total capacity of the tank = LCM of 5 and 15 = 15 units
Efficiency of draining pipe
$= \frac{15}{15} = 1 \ unit/hour$
Efficiency of filling pipe
$= \frac{15}{5} = 3 \ unit/hour$
Tank filled in 2 hours = 3 – 1 = 2 units

Tank filled in 12 hours = 12 units

Remaining work = 15 – 12 = 3 units

In 13th hour filling pipe will work:

Work done in 13th hour = 3 units

So the answer = 13 hours

Hence, Option C is correct.

Q12 Text Solution:

Given that X can fill the $\frac{3}{4}$ part of a tank in $10\frac{1}{2}$ minutes
X can fill the whole tank in = $\frac{21}{2} \times \frac{4}{3} = 14$ minutes
Y can empty the 50% of the tank in $10\frac{1}{2}$ minutes
So Y can empty the 100% tank in $\frac{21}{2} \times \frac{100}{50}$ = 21 minutes
Time taken to fill the tank completely = $\frac{1}{\frac{1}{X}-\frac{1}{Y}} = \frac{1}{\frac{1}{14}-\frac{1}{21}} = \frac{1}{\frac{3-2}{42}}$ = 42 minutes
Since, both the pipes were opened at 3: 30, so the time when the pipe is completely full
= 3 hour + 30 minutes + 42 minutes
= 4 hour + 12 minutes
= 4: 12 pm

Q13 Text Solution:

Time taken to empty the tank $= \frac{1}{40} - \frac{1}{20} = -\frac{1}{40}$
So, full tank can be emptied in 40 mins,
Since, the tank gets emptied in 20 mins,
So; tank initially filled upto $\frac{20}{40} = \frac{1}{2}$ of its parts.
So, % tank filled initially, X% = $\frac{1}{2} \times 100 = 50\%$

Q14 Text Solution:

Let, filling time of X = a hours
So, quantity filled in 1 hour = $\frac{1}{a}$
Filling time of Y = $\frac{5}{3}$ a
So, quantity filled in 1 hour = $\frac{3}{5a}$
Filling time of Z = 3 × $\frac{5}{3}$ a = 5a
So, quantity filled in 1 hour = $\frac{1}{5a}$
All three filled the tank in 14 hours
So, quantity filled in 1 hour = $\frac{1}{14}$
Then,
$\frac{1}{a} + \frac{3}{5a} + \frac{1}{5a} = \frac{1}{14}$
$\frac{1}{a}(1 + \frac{3}{5} + \frac{1}{5}) = \frac{1}{14}$
$\frac{1}{a}(\frac{9}{5}) = \frac{1}{14}$

$\frac{9\times14}{5}$ = a

= 25.2 hours

Q15 Text Solution:

Let Inlet pipes be M and N. and outlet pipe be P.

M can fill 25% tank in 3 hours.

So M can fill 100 percent tank = $\frac{3\times100}{25} = 12\ hours$

N can fill 75% tank in 12 hours.

So N can fill 100 percent tank = $\frac{12\times100}{75} = 16\ hours$

Time taken by inlet pipes together to fill the tank $= \frac{1}{12} + \frac{1}{16} = \frac{48}{7}$ hours

Time taken by outlet pipe to empty the tank = 12 hours

When all three pipes opened together, time taken to fill the tank

$= \frac{1}{\left(\frac{7}{48}\right)-\left(\frac{1}{12}\right)} = \frac{1}{\frac{7-4}{48}} = \frac{48}{3} = 16$

Required answer is 16 hours.

Q16 Text Solution:

Let the capacity of the bath tub is l.c.m of (10, 15) = 30(total work)

Efficiency of cold water pipe = $\frac{30}{10}$ = 3 w/m

And efficiency of hot water pipe = $\frac{30}{15}$ = 2 w/m

Combined efficiency of the bathtub will be filled 3+2 = 5 w/m

Efficiency = Work/Time

If the they both opened together the bath tube will be filled in $\frac{30}{5}$ = 6 minutes, (when the waste pipe is closed)

Initially the waste pipe is opened and after 6 mins the waste pipe is closed, then it takes 4 more minutes to fill the bathtub completely.

So waste pipe has emptied $\frac{4}{6} = \frac{2}{3}$part of bathtub in 6 mins.

Rest $\frac{1}{3}$ part of bathtub can be emptied by the waste pipe in $\frac{6}{2}$ = 3 mins.

So waste pipe would empty the bathtub in 6 + 3 = 9 mins

Q17 Text Solution:

Time taken to empty the tank $= \frac{1}{30} - \frac{1}{20} = -\frac{1}{60}$

So, full tank can be emptied in 60 mins,

Since, the tank gets emptied in 24 mins,

So; tank is filled upto $\frac{24}{60} = \frac{4}{10}\text{th of its parts.}$

So, % tank filled, X% $= \frac{4}{10}\times100 = 40\%$

Q18 Text Solution:

Let the rate of flow in the first hour be 'x' litre/hour

So, rate of flow in 2nd hour = x × 2 = '2x' litres/hour

Rate of flow in 3rd hour = 2x × 2 = '4x' litres/hour

Rate of flow in 4th hour = 4x × 2 = '8x' litres/hour

Rate of flow in 5th hour = 8x × 2 = '16x' litres/hour

So, required ratio = (x + 2x + 4x):(4x + 8x + 16x) = 7x : 28x = 1 : 4

Hence, option B.

Q19 Text Solution:

Let,

Efficiency of Pipe A = A

Efficiency of Pipe B = B

Efficiency of Pipe C = C

Total work = 9 (A+B+C).....(i)

Total work = 3 (A+B+C) + 11 (A+B) .....(ii)

with (i) and (ii).....

9 (A+B+C) = 3 (A+B+C) +11 (A+B)

6 (A+B+C) = 11 (A+B)

6A + 6B + 6C = 11A + 11B

5 (A+B) = 6 C

(A+B) : C = 6 : 5

Total work = 9 (A+B+C)

Total work = 9 (6 + 5)

Total work = 99

Time taken by Pipe C = $\frac{99}{5}$ = $19\frac{4}{5}$ hours

Q20 Text Solution:

Given,

Inlet pipe can fill Full Tank in 60 minutes

So, quantity filled by inlet pipe in 1 minute = $\frac{1}{60}$

And, Outlet pipe can empty Full Tank in 40 Minutes

So, quantity emptied by outlet pipe in 1 min = - $\frac{1}{40}$

Thus, total resultant of both pipes in a minute = $\frac{1}{60} - \frac{1}{40}$

= $\frac{2}{120} - \frac{3}{120}$

= $\frac{2-3}{120}$

= - $\frac{1}{120}$

So, full tank can be emptied in 120 minutes if both the pipes are working together,

Now, According to question the tank was emptied in 48 mins

So, Capacity of tank emptied in 48 mins = $\frac{48}{120} \times 100$

= $\frac{2}{5} \times 100$

= 40%

Level-3

Q1 Text Solution:

Let, capacity of tank = x litres

Given,

Filling rate of inlet pipe = 8 litres per minute

So, quantity filled in 1 hour = 8 × 60

= 480 litres

Leaking rate through the leak in bottom = 16 hours

So, leaked quantity in 1 hour = $\frac{x}{16}$ litres

When, both inlet and leak are working together, the tanks gets emptied in 80 hours

So, quantity emptied in 1 hour = $\frac{1}{80}$

Now, according to question

=> 480 - $\frac{x}{16}$ = $\frac{1}{80}$

=> 480 - $\frac{1}{80}$ = $\frac{x}{16}$

=> $\frac{38399}{80} = \frac{x}{16}$

=> $7679\frac{4}{5}$ litres = x

Q2 Text Solution:

Outlet flow of each pipe = 187.5% of 8 = 15 L/min

Total amount of water flow(outlet) in 1 min when all the pipes are opened = (2 × 15) - (3 × 8) = 6 L

In 45 min amount of water outflows = 45 ×6 = 270 L

New inlet flow rate = 150% of 8 = 12 L/min

New outlet flow rate = 90% of 15 = 13.5 L/min

Now in 1 min amount of water filled when all the pipes are opened = (3 × 12) - (2 × 13.5) = 9 L

Time taken to fill 270 L of water = T = $\frac{270}{9}$ = 30 min

Q3 Text Solution:

Net water inflow in the tank during the 1st min = 5 + 3 - 0.5 = 7.5 liter

Net inflow during the 2nd min = 8 - 1 = 7 liter

Net inflow during the 3rd min = 8 - 1.5 = 6.5 liter and so on.

We can see that the net water inflow during every minute forms an A.P where

1st term = 7.5 and common difference = -0.5

Since the net inflow is decreasing, we have to consider the last instance where the inflow is positive.

During the 15th minute, inflow = 8 -7.5 = 0.5 liter

During the 16th minute, inflow = 8 - 8 = 0 liter

After this, the outflow rate will be higher than the inflow rate and the tank will start draining.

So we have to find the sum of the A.P series where 1st term (a) = 7.5 and common difference (d) = -0.5 and the last(15th term) = 0.5

So required sum of liter

So the maximum amount of water that can be filled in the tank is 60 liters.

Q4 Text Solution:

Given that, Pipe X is 40% more efficient than Y, that is X will take less time than Y to fill the tank alone.

So,Ratio of time taken, $\frac{x}{y} = \frac{100}{140} = \frac{5}{7}$

Let, time taken by Pipe X = 5t hours

Then, time is taken by Pipe Y = 7t hours

According to question

=> $\frac{1}{5t} + \frac{1}{7t} - \frac{1}{24} = \frac{10}{277}$

=> $\frac{12}{35t} = \frac{10}{277} + \frac{1}{24}$

=> $\frac{12}{35t} = \frac{517}{6648}$

=> t = $\frac{6648 \times 12}{35 \times 517}$

=> t = 4.40

So, time taken by X = 5t = 5(4.40) = 22 hours

And, time taken by Y = 7t = 7(4.40) ≈ $\frac{154}{5}$ hours

Thus, time taken by both the pipes = $\frac{22 \times \frac{154}{5}}{22 + \frac{154}{5}}$ = 12 $\frac{5}{6}$ hours

Q5 Text Solution:

Part of the cistern filled by pipes A, B and C in 1 hour = $\frac{1}{9}$

Part of the cistern filled by all three pipes in 3 hours = $\frac{1}{3}$

Remaining part = 1– $\frac{1}{3}$ = $\frac{2}{3}$

Now, pipe A and B fill $\frac{2}{3}$ part of the cistern in 9 hours

Pipe A and B will fill the cistern in $\frac{9 \times 3}{2}$ = $\frac{27}{2}$ hours

Part of the cistern filled by A and B in 1 hour = $\frac{2}{27}$

So Part of the cistern filled by C in 1 hour = $\frac{1}{9}$ – $\frac{2}{27}$ = $\frac{3-2}{27}$

= $\frac{1}{27}$

Pipe C will fill the cistern in 27 hours.

Q6 Text Solution:

Let, the time taken by pipes A and B alone to fill the tank are 'x+8' hours and x hours respectively. pipe C alone can employ the tank in 60 hours.

ATQ,

$\frac{1}{x+8} + \frac{1}{x} - \frac{1}{60} = \frac{7}{80}$

$\frac{1}{x+8} + \frac{1}{x} = \frac{7}{80} + \frac{1}{60} = \frac{21+4}{240}$

$\frac{x+x+8}{x(x+8)} = \frac{25}{240}$

$x = 16$

Time taken by A and C together to fill the tank

$= \frac{1}{\frac{1}{24} - \frac{1}{60}} = \frac{1}{\frac{5-2}{120}}$

= 40 hours

time at which the tank will be filled by A and C together = 6:00 pm on Monday

Q7 Text Solution:

For I:

Let the capacity of the tank = L.C.M of 40 and 15 = 120 units

Then efficiency of pipe 'A' alone = 120 ÷ 40 = 3 units/minute

Combined efficiency of pipes 'A' and 'B' = 120 ÷ 15 = 8 units/minute

So, efficiency of pipe 'B' alone = 8 - 3 = 5 units/minute

Combined efficiency of pipes 'B' and 'C' = $\frac{120}{2}$ ÷ 15 = 4 units/minute

So, efficiency of pipe 'C' alone = 4 - 5 = 1 unit/minute (outlet)

So, combined efficiency of pipes 'A' and 'C' when pipe 'C' works at 50% of its efficiency

= 3 - 1 × 0.5 = 2.5 units/minute

So, time taken to fill the tank = 120 ÷ 2.5 = 48 minutes

So, statement I is true.

For II:

Let the capacity of the tank = L.C.M of 40 and 24 = 120 units

Then efficiency of pipe 'A' alone = 120 ÷ 40 = 3 units/minute

Combined efficiency of pipes 'A' and 'B' = 120 ÷ 24 = 5 units/minute

So, efficiency of pipe 'B' alone = 5 - 3 = 2 units/minute

Combined efficiency of pipes 'B' and 'C' = $\frac{120}{2}$ ÷ 15 = 4 units/minute

So, efficiency of pipe 'C' alone = 4 - 2 = 2 units/minute

So, combined efficiency of pipes 'A' and 'C' when pipe 'C' works at 10% of its efficiency

= 3 + 2 × 0.1 = 3.2 units/minute

So, time taken to fill the tank = 120 ÷ 3.2 = 37.5 minutes ≠ 48 minutes.

So, statement II is false.

For III:

Let the capacity of the tank = L.C.M of 40 and 16 = 80 units

Then efficiency of pipe 'A' alone = 80 ÷ 40 = 2 units/minute

Combined efficiency of pipes 'A' and 'B' = 80 ÷ 16 = 5 units/minute

So, efficiency of pipe 'B' alone = 5 - 2 = 3 units/minute

Combined efficiency of pipes 'B' and 'C' = $\frac{80}{2}$ ÷ 15 = $\frac{8}{3}$ units/minute

And, efficiency of pipe 'C' alone = $\frac{8}{3}$ - 3 = $-\frac{1}{3}$ units/minute {negative sign indicates that pipe 'C' is an outlet pipe}

So, combined efficiency of pipes 'A' and 'C' at 100% efficiency and 10% efficiency respectively = 2 - $\frac{1}{3}$ = $\frac{5}{3}$ units/minute

So, time taken to fill the tank = 80 ÷ $\frac{5}{3}$ = 48 minutes.

So, statement III is true.

Hence, option E.

Q8 Text Solution:

Let the number of valves allotted to fill the tank be 'y'.

The number of valves allotted for draining purpose will be (15 - y)

A value used for filling fills the purifier in 15 hours.

So, in 1 hour it can fill 1/15th part of the purifier.

Similarly, a value used for draining drains the purifier in 30 hours. So, in 1 hour it can drain 1/30th part of the purifier.

Given, it took 2 hours to fill with all valves open.

So, the equation becomes

$\frac{2\times y}{15} - \frac{2\times(15-y)}{30} = 1$

On solving, we get y = 10

Therefore number of valves allotted to fill the purifier = 10

The number of valves allotted to drain the purifier will be 5

Percentage of valves allotted for draining purpose = $\frac{5}{15}\times 100 = 33.33\%$

Q9 Text Solution:

Answer: C

Let rate of inflow is x liters/hour and rate of outflow is y liters/hour.

Now,

V + 8x = 24× 8×y..... (1)

Also,

V + 16x = 20×16 × y..... (2)

On dividing both equations, we get

(V + 8x) / (V + 16x) = 24× 8 × y / 20 × 16 × y

V = 4x

Form equation (1)

4x + 8x = 24 × 8×y

Value of x = 16y

Now,

(4x + 4 × x) / (4 × y) = 2H + 8

8 × 16y / 4y = 2H + 8

2H + 8 = 32

Value of H = 12

Hence answer is option C.

Q10 Text Solution:

Given,

Inlet pipe can fill a tank in 10 hours

So, Quantity of tank filled by inlet pipe in 1 hour = $\frac{1}{10}$

And, Outlet pipe can empty $\frac{5}{7}$ of tank in 10 hours

So, time taken by outlet pipe to completely empty the tank

= 10 × $\frac{7}{5}$

= 14 hours

Then, quantity of tank emptied in 1 hour = - $\frac{1}{14}$

Now, Firstly inlet pipe is opened for 1 hour, and then outlet pipe is opened for next 1 hour

So, 2 hours work = $\frac{1}{10}$ - $\frac{1}{14}$

= $\frac{7}{70}$ - $\frac{5}{70}$

= $\frac{2}{70}$

= $\frac{1}{35}$

Now, 68 hours work = 34 × $\frac{1}{35}$ = $\frac{34}{35}$

Left capacity of tank to be filled = 1 - $\frac{34}{35}$

$= \frac{1}{35}$

Now, its inlet pipes term,

So, Time taken by inlet pipe to fill the $\frac{1}{35}$ part of tank = $\frac{1}{35} \times 10$

$= \frac{2}{7}$ hours

Hence, total time taken = $68 + \frac{2}{7} = 68\frac{2}{7}$ hours