11

PIPE AND CISTERN

Examples

1. A tank is fitted with two taps. The first tap can fill tank competely in 45 minutes and the second tap can empty the full tank in one hour. If both the taps are opened alternately for one minute, then in how many hours the empty tank will be filled completely?

(a) 2 hours 55 minutes

(b) 3 hours 40 minutes

(c) 4 hours 48 minutes

(d) 5 hours 53 minutes

Sol. (d)

A → 45min, B → 60min; +4, −3 → 180 (Total Capacity)

Efficiency of A and B in 2 minutes = 4 – 3 = 1 unit.

Time	work done
2 minutes	1 unit
⎯ ´ 176	⎯ ´ 176
352 minutes	176 units

Remaining part = 180 – 176

= 4 units

Time taken by A to fill remaining part = $\frac{4}{4}$ = 1 minute

So, total time taken

= 352 + 1 = 353 minutes

5 hours 53 minutes

2. Two pipes X and Y can fill a cistern in 24 minutes and 32 minutes respectively. If both the pipes are opened together, then after how much time (in minutes) should Y be closed so that the tank is full in 18 minutes?

(a) 10 (b) 8

(c) 6 (d) 5

Sol. (b) According to the question

X → 24 min, 4; Y → 32 min, 3 → 96 (Total Capacity)

According to the question,

X would be open till the end.

So, tank filled by X in 18 minutes = 18 × 4 = 72 units

Remaining part of tank

= 96 – 72 = 24 units

Pipe Y fill the remaining part in

= $\frac{24}{3}$ = 8 min

So,

after 8 minutes it must have closed

3. Pipe A can fill an empty tank in 6 hours and pipe B in 8 hours. If both the pipes open Alternately for 2 hours. In how much time B will take to fill the remaining tank?

(a) $7\frac{1}{2}$ hours (b) $2\frac{2}{5}$ hours

(c) $2\frac{2}{5}$ hours (d) $3\frac{1}{3}$ hours

Sol. (d) According to the question

A → 6, 4; B → 8, 3 → 24 (Total Capacity)

efficiency of A and B = 4 + 3

= 7 units/hour

tank filled by A and B in two hours = 7 × 2 = 14 units

Remaining capacity of tank

= 24 – 14 = 10 units

time taken by B to fill the

Remaining part = $\frac{10}{3} = 3\frac{1}{3}$ hours.

4. A tank has two pipes. The first pipe can fill it in 4 hours and the second can empty it in 16 hours. If two pipes be opened together at a time then the tank will be filled in

(a) $5\frac{1}{2}$ hours (b) 6hours

(c) 10hours (d) $5\frac{1}{3}$ hours

Sol. (d) According to the Question

A → 4h, 4; B → 16h, −1 → 16 (Total Capacity)

efficiency of A and B = 4 – 1

= 3 units/hour

time taken by A & B to fill the

full tank = $\frac{16}{3} = 5\frac{1}{3}$ h.

5. Pipe A can fill the tank in 12 hours and pipe B can fill the tank in 8 hours and third pipe C empties tank in 15 hours If all pipes are opened together then after 5 hours what portion of the tank will be filled.

(a) $\frac{17}{24}$ (b) $\frac{24}{17}$

(c) $\frac{17}{120}$ (d) $\frac{1}{3}$

Sol. (a) A → 12 h, 10; B → 8 h, 15; C → 15 h, −8 → 120 (Total Capacity)

Efficiency of A, B and C

= 10 + 15 – 8 = 17 units/hour

r A, B and C in 5
5 = 85 units

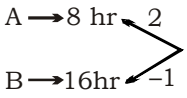
ion = $\frac{85}{120} = \frac{17}{24}$

ı cistern in 8 hours
can empty it in 16 hours. If both the taps are opened simultaneously the time (in hours) to fill the tank is:

(a) 8 (b) 10

(c) 16 (d) 24

Sol. (c) Accroding to the question



Efficiency of A and B

= 2 – 1 = 1

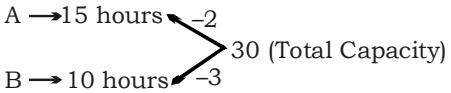
∴ Total time taken = $\frac{16}{1}$ = 16 hours.

7. A pipe can empty a tank in 15 hrs and another pipe can empty it in 10 hours. If both the pipes are opened simultaneously. Find the time in which a full tank is emptied.

(a) 8 hrs (b) 6 hrs.

(c) 4 hrs. (d) 5 hrs.

Sol. (b) According to the question



Total efficiency of A & B

= 3 + 2 = 5 units

∴ time taken by A & B to empty the full tank

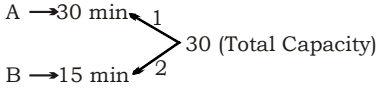
= $\frac{30}{5}$ = 6 hours.

8. Two pipes A and B can fill a tank in 30 minutes and 15 minutes respectively. If both the pipe are opened simultaneously, in how much time will be taken to fill the tank?

(a) 10 minutes (b) 12 minutes

(c) 8 minutes (d) 9 minutes

Sol. (a) According to the question



Efficiency of A and B = 1 + 2

= 3 units

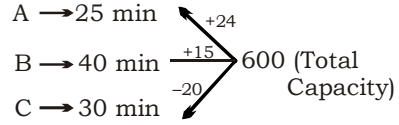
∴ Total time taken by A & B to fill the tank = $\frac{30}{3}$ = 10 min.

9. Tap A can fill a water tank in 25 minutes, tap B can fill the same tank in 40 minutes and tap C can empty in 30 minutes. In how much time they completely filled up or emptied the tank?

(a) $3\frac{2}{13}$ (b) $15\frac{5}{13}$

(c) $8\frac{2}{13}$ (d) $31\frac{11}{19}$

Sol. (d) According to the question



Total efficiency of A, B & C

= (24 + 15 – 20) = 19 units/minute

∴ Total time taken fill the tank

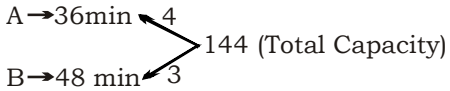
= $\frac{600}{19} = 31\frac{11}{19}$ min.

10. Two pipes A and B fill a tank in 36 minutes and 48 minutes respectively. If both the pipes are opened simultaneously, after how much time should B be closed so that the tank is full in 27 minutes?

(a) 10 min (b) 12 min

(c) 14 min (d) 16 min

Sol. (b) According to the question



According to the question,

A would be opened till the end.

So, tank filled by A in 27 minutes = 4 × 27 = 108 units

Remaining capacity of tank

= 144 – 108 = 36 units

∴ Pipe B fill the remaining tank in

= $\frac{36}{3}$ = 12 minutes

So,

after 12 minutes it must have closed.

11. Three pipes A, B and C are connected to a tank , A and B together can fill the tank in 60 minutes, B and C together in 40 minutes and C and A together in 30 minutes. In how much time will each pipe fill the tank

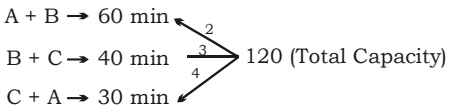
(a) 80 min, 240 min,48 min

(b) 40 min,120 min,24 min

(c) 60 min, 250 min, 64 min

(d) 65 min,240 min,64 min

Sol. (a) According to the question



Efficiency of A, B and C

= $\frac{4+3+2}{2}$ = 4.5 units

A's efficiency = 1.5 units

B's efficiency = .5 unit

C's efficiency = 2.5 units

Time taken by A = $\frac{120}{1.5}$ = 80 min

Time taken by B = $\frac{120}{.5}$ = 240 min

Time taken by C = $\frac{120}{2.5}$ = 48 min

12. Three pipes A, B and C are connected to a tank. A and B together can fill the tank in 12 hrs. B and C together in 20 hrs and C and A together in 15hrs. In how much time will be fill the tank separately?

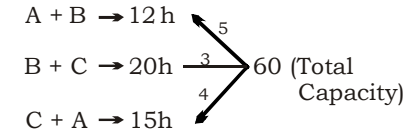
(a) 10 hrs, 15 hrs,30 hrs

(b) 20 hrs, 15 hrs, 60 hrs.

(c) 20 hrs, 30 hrs, 60 hrs.

(d) 20 hrs, 30 hrs, 45 hrs.

Sol. (a) According to the question



Efficiency of A, B and C

= $\frac{5+3+4}{2}$ = 6 units

A's efficiency = 3 units

B's efficiency = 2 units

C's efficiency = 1 unit

$$A = \frac{60}{3} = 20 \text{ hr}$$

$$B = \frac{60}{2} = 30 \text{ hr}$$

$$C = \frac{60}{1} = 60 \text{ hr}$$

13. Two pipes can separately fill a tank in 10 hrs and 15 hrs respectively Both the pipe are opened to fill the tank but when the tank is $\frac{1}{6}$ th full a leak develops in the tank through which $\frac{1}{6}$ th of the water supplied by both the pipes leak out. What is the total time taken to fill the tank?

(a) 7 hrs (b) 5 hrs

(c) 6 hrs. (d) 9 hrs

Sol.

(a) A → 10 hr, 3; B → 15 hr, 2 > 30 (Total Capacity)

Efficiency of A and B = 3 + 2

= 5 units/hour

Time taken by A and B to fill the $\frac{1}{6}$ th part of total capacity

$$= \frac{30 \times \frac{1}{6}}{5} = \frac{5}{5} = 1 \text{ hours}$$

Remaining part = 30 – 5 = 25 units

Efficiency of both the pipes when $\frac{1}{6}$ th of total efficiency of leakout

$$= 5 \times \left(1 - \frac{1}{6}\right) = \frac{25}{6} \text{ units/hour}$$

time taken by the both pipes after leaking = $\frac{25}{\frac{25}{6}} = 6$ hours

Hance, total time taken

= 6 + 1 = 7 hours.

14. Two Pipes A and B can separately fill a tank in 2 hours and 3 hours respectively. If both the pipes are opened simultaneously in the empty tank, then the tank will be filled in

(a) 1 hours 12 minutes

(b) 2 hours 30 minutes

(c) 1 hours 15 minutes

(d) 1 hours 20 minutes

Sol. (a)

A → 2hr, 3; B → 3 hr, 2 > 6 (Total Capacity)

(A+B) fill the tank in

$$= \frac{\text{T.C}}{\text{Efficiency of (A+B)}} = \frac{6}{3+2}$$

$$= 1\frac{1}{5} = 1 \text{ hours } 12 \text{ min}$$

15. A tap drops at a rate of one drop/sec 600 drops make 100ml The number of litres wasted in 300 days is:

(a) 4320000 (b) 432000

(c) 43200 (d) 4320

Sol. (d) 1 sec —— 1 drop

No of second in 300 days.

$(24_{min} \times 60_{min} \times 60_{sec}) \times 300$ days

No of litres wasted =

$$100 \times \frac{24 \times 60 \times 60 \times 300}{600} \times \frac{1}{1000}$$

$$= \frac{4320000}{1000} = 4320 \text{ litres}$$

16. Having the same capacity 9 taps fill up a water tank in 20 minutes How many taps of the same capacity are required to fill up the same water tank in 15 minutes?

(a) 10 (b) 12

(c) 15 (d) 18

Sol. (b) $\left[\frac{m_1 \times h_1 \times t_1}{w_1} = \frac{m_2 \times h_2 \times t_2}{w_2}\right]$

$9_{taps} \times 20_{mins} = T_{taps} \times 15_{mins}$

T = **12 Taps**

17. A cistern is provided with two pipes A and B A can fill it in 20 minutes and B can empty it in 30 minutes for one minute each how soon will the cistern be filled?

(a) 121 minutes

(b) 110 minutes

(c) 115 minutes

(d) 120 minutes

Sol. (c)

A → 20 min, +3; B → 30 min, –2 > 60 (Total Capacity)

Efficiency of A and B in 2 minutes = 3 – 2 = 1 unit

Time	work
2 minutes	1 unit
× 57	× 57
114 minutes	57 units

Remaining part of the tank

= 60 – 57 = 3 units

time taken by A to fill the Remaining tank = $\frac{3}{3}$ = 1 minute

Hence, total time taken by both the pipes = 114 + 1

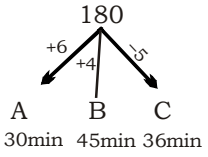
= 115 minutes

18. Two pipes A and B can fill a tank with water in 30 minutes and 45 minutes respectively. The third pipe C can empty the tank in 36 minutes First A and B are opened After 12 minutes C is opened Total time (in minutes) in which the tank will be filled up is:

(a) 12 (b) 24

(c) 30 (d) 36

Sol. (b)



tank Filled by (A + B) in 12 min

= 12 × (6 + 4)

= 12×10= 120 units

Remaining capacity of tank

= 180 –120 = 60 units

After 12 min, emptied pipe C is also opened

So, total capacity of A, B and C

= 6 + 4 – 5 = 5 units

Time taken by A, B and C with efficiency 5 units to fill the remaining part = $\frac{60}{5}$ = 12 min.

Therefore, total time which the tank will be filled up

= 12 + 12 = 24 minutes.

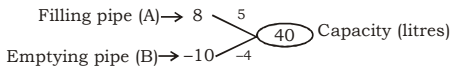
19. There are three filling pipes each

ling a cistern alone
s and 2 emptying
apable of emptying
one in 10 minutes.
e opened together
lt, tank fills 7 litres
minute. Find the
capacity of the tank.

(a) 20 litres (b) 25 litres

(c) 40 litres (d) 30 litres

Sol. (c)



Efficiency of the three filling pipes = 5 × 3 = 15 litres/min

Efficiency of the two emptying pipes = 4 × 2 = 8 litres/min

Net part of water filled

= (15 – 8) = 7 litres/min

According to the question :-

Capacity of the tank

$= \frac{7}{7} \times 40$ = **40 litres**

20. In what time would a cistern be filled by three pipes whose diameters are 1 cm, $1\frac{1}{3}$ cm, 2 cm running parallel, when the largest one alone fills it in 61 minutes. The amount of water flowing in through each pipe being proportional to the square of its diameter?

(a) 20 min (b) 36 min

(c) 18 min (d) 72 min

Sol. (b) **Note** : In such type of questions to save your valuable time follow the given below method.

Required time

$$= \frac{61 \times (2)^2}{(1)^2 + \left(\frac{4}{3}\right)^2 + (2)^2}$$

$$= \frac{61 \times 4}{1 + \frac{16}{9} + 4} = \frac{61 \times 4 \times 9}{(9 + 16 + 36)}$$

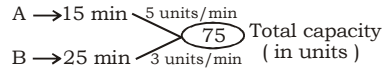
= 36 minutes

21. A cistern can be filled by two pipes filling separately in 15 and 25 minutes respectively. Both pipes are opened together for a certain time but being clogged, only $\frac{5}{6}$ of full quantity of water flows through the former and only $\frac{5}{8}$ through the latter pipe. The obstruction, however being suddenly removed, the cistern is filled in 5 minutes from that moment. How long was it before the overflow began?

(a) $\frac{161}{29}$ min. (b) $\frac{168}{29}$ min.

(c) $\frac{148}{29}$ min. (d) None of these

Sol. (b)



(Let both the pipes remain clogged for x minutes) and hence full flow began after x minutes only.

∴ Part of cistern filled in x minutes + part of cistern filled in 5 minutes = Cistern filled

$$\left(5 \times \frac{5}{6}x + 3 \times \frac{5}{8}x\right) + 5(5+3)$$

= 75

$$\Rightarrow \frac{25x}{6} + \frac{15x}{8} + 40 = 75$$

$$\Rightarrow \frac{100x + 45x}{24} = 35$$

$$\Rightarrow 145x = 840$$

$$x = \frac{840}{145} = \mathbf{\frac{168}{29}}$$ **minutes**

22. A tank has three pipes. The first pipe can fill 50% of the tank in 1 hour and second pipe can fill $\frac{2}{3}$ part in 2 hour. The third pipe is for making the tank empty. When all three pipes are opened, $\frac{7}{12}$ part of the tank is filled in 1 hours. How much time will the third pipe take to empty the completely filled tank?

(a) 3 hours (b) 4 hours

(c) 5 hours (d) 6 hours

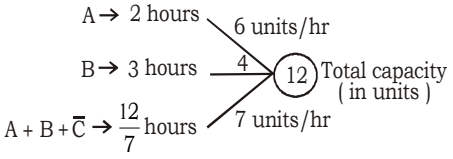
Sol. (b) Required time for pipe A to fill the tank = 2 hours

Required time for pipe B to fill the tank = 3 hours

Let $\overline{C}$ is the empty pipe.

Required time for (A+B+ $\overline{C}$)

$= \frac{12}{7}$ hours



Efficiency of waste pipe ($\overline{C}$)

= (6 + 4) – 7 = 3 units/hr

Required time for pipe ($\overline{C}$) to empty the tank = $\frac{12}{3}$

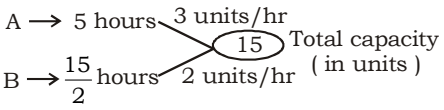
= 4 hours

23. A bath can be filled by the cold water pipe in 5 hours and by hot water pipe in $7\frac{1}{2}$ hours. A person leaves bathroom after turning on both pipes simultaneously and returns at the moment when the bath should have been full. Finding, however the waste pipe has been left open, he now closes it. In 2 hours more the bath is full. In what time should the waste pipe empty it:

(a) 6 hours (b) 4 hours

(c) 3 hours (d) $4\frac{1}{2}$ hours

Sol. (d) Let the cold water and hot water pipes are A and B respectively.



Required time to fill the bath

$= \frac{15}{(3+2)}$ = 3 hours

According to the question :-

Water filled by the pipe (A + B) in 2 hours

= Water wasted by waste pipe ($\overline{C}$) in 3 hours

$\therefore$ Efficiency of waste pipe ($\overline{C}$)

$= \frac{2\times(3+2)}{3} = \frac{10}{3}$ units/hr

Required time for ($\overline{C}$) to empty the bath

$= \frac{15}{10} \times 3 = \frac{9}{2} = \mathbf{4\frac{1}{2}}$ **hours**

Exercise

1. Two pipes A and B can fill a tank in 20 minuuts and 30 minutes respectively. If both pipes are opened together, the time taken to fill the tank is:
   (a) 50 min. (b) 12 min.
   (c) 25 min. (d) 15 min.
2. Two pipes A and B can separately fill a cistern in 60 minutes and 75 minutes respectively. There is a third pipe in the bottom of the cistern to empty it. If all the three pipes are simultaneously opened then the cistern is full in 50 minutes. In how much time the third pipe alone can empty the cistern?
   (a) 110 min. (b) 100 min.
   (c) 120 min. (d) 90 min.
3. A cistern is provided with two pipes A and B. A can fill it in 20 minutes and B can empty it in 30 minutes. If A and B be kept open alternately for one minute each, how soon will the cistern be filled?
   (a) 121 min. (b) 110 min.
   (c) 115 min. (d) 120 min.
4. If $\frac{1}{3}$rd of tank holds 80 litres of water, then the quantity of water that $\frac{1}{2}$ tank holds is :
   (a) 240 litres (b) 120 litres
   (c) $\frac{80}{3}$ litres (d) 100 litres
5. A tap can fill a tank in 6 hours. After half the tank is filled three more similar taps are opened. What is the total time taken to fill the tank completely?
   (a) 4 hours
   (b) 4 hours 15 minutes
   (c) 3 hours 15 minutes
   (d) 3 hours 45 minutes
6. Two pipes A and B can fill a cistern in $37\frac{1}{2}$ minutes and 45 minutes respectively. Both the pipes are opened. The cistern will be filled just in half an hour if the pipe B is turned off after:
   (a) 15 minutes (b) 10 minutes
   (c) 5 minutes (d) 9 minutes
7. A tank can be filled with water by two pipes A and B together in 36 minutes. If the pipe B was stopped after 30 minutes the tank is filled in 40 minutes. The pipe B can alone fill the tank in
   (a) 45 minutes (b) 60 minutes
   (c) 75 minutes (d) 90 minutes
8. Two taps A and B can fill a tank in 48 min. and 36 min. If both the taps are opened together. After how much time tap A is closed so that the whole tank will be filled in 25 min. 30 sec.
   (a) 14 min
   (b) 18 min
   (c) 14 min 30 sec
   (d) 15 min 30 sec
9. Taps A and B can fill a tank in 20 hours and 30 hours respectively. Both the pipes are opened to fill the tank but when the tank is $\frac{1}{3}^{rd}$ full, a leak develops in the bottom of the tank, through which $\frac{1}{3}^{rd}$ of the water supply by both the pipes leaks out. Then calculate in how much time the tank will be full ?
   (a) 16 hours (b) 12 hours
   (c) 18 hours (d) None of these
10. If taps A and B can fill a tank in 15 hours and 20 hours respectively. Both the taps are opened together when the tank is $\frac{1}{4}^{th}$ full, a leak develops in the bottom of the tank . Through which $\frac{1}{5}^{th}$ of water supply by both the pipes leaks out. Then calculate in how many hours the tank will be full ?
    (a) $10\frac{5}{28}$ days (b) $11\frac{5}{28}$ days
    (c) $1\frac{5}{28}$ days (d) None of these
11. In a tank four taps of equal efficiency are fitted on equal intervals. The first pipe is at the base of the tank. And the 4^{th} pipe is at $\frac{3}{4}th$ of height of the tank. Then calculate in how much time the whole tank will empty. If the first pipe can empty the tank in 12 hours.
    (a) 6 hours 15 min.
    (b) 7 hours 15 min.
    (c) 8 hours 20 min.
    (d) None of these
12. Two taps A and B can fill a tank in 30 min and 36 min respectively. Both taps are opened together but due to some

problem they work $\frac{5}{6}$ and $\frac{9}{10}$ of their efficiencies, after some time the problem was removed and now the tank will fill in $16\frac{1}{2}$ min. Then after how much time the problem was removed.

(a) 1 minutes (b) 2 minutes

(c) 3 minutes (d) $1\frac{1}{2}$ minutes

13. Two taps A and B can fill a tank in 10 hours and 12 hours respectively. There is an outlet tap C. If all the taps are opened together the tank will fill in 30 hours. In how many hours tap C can alone empty the tank.

(a) $\frac{60}{7}$ hours (b) $\frac{60}{9}$ hours

(c) $\frac{60}{11}$ hours (d) $\frac{60}{13}$ hours

14. A leak in the bottom of a tank can empty it in 6 hours. A tap fills the tank at the rate of 4 litres/min is turn on. If both the taps are opened then the tank will empty in 8 hours. Find the capacity of the tank?

(a) 2400 litres (b) 5780 litres

(c) 5760 litres (d) None of these

15. A leak in the bottom of a tank can empty it in 12 hours. A tap which can fill 20 litres of water per minute is turned on. Both the taps are opened now, then the tank is emptied in 20 hours. Find the capacity of the tank ?

(a) 36000 litres (b) 3600 litres

(c) 360 litres (d) None of these

16. 8 taps are fitted in a tank some are inlet taps and rests are outlet tap. Each inlet tap can fill the tank in 12 hours and each outlet tap can empty it in 36 hours. Then calculate the number of inlet water taps if the whole tank filled in 3 hours.

(a) 5 (b) 3

(c) 4 (d) None of these

17. 9 taps are fitted in a tank some are inlet taps and some are outlet taps. Each inlet tap can fill the tank in 9 hours and each outlet tap can empty the tank in 9 hours. If all the taps are open then tank will be full in 9 hours, then find the number of outlet taps.

(a) 4 (b) 5

(c) 3 (d) None of these

18. 12 taps are fitted in a tank some are inlet taps and some are outlet taps. Each inlet tap can fill the tank in 6 hours and each outlet tap can empty the tank in 12 hours. If all the taps are open together then the tank will be full in 4 hours. Then find the number of inlet taps.

(a) 5 (b) 4

(c) 6 (d) None of these

19. Tap A and B can fill a tank in 10 hours and 20 hours respectively. Tap C can empty it in 12 hours. If all the taps are open alternatively for 1 hour each then the whole tank will be filled in how many hours. ?

(a) $40\frac{2}{3}$ hours

(b) $20\frac{1}{3}$ hours

(c) $8\frac{2}{3}$ hours

(d) None of these

20. Pipe A can fill a tank in 12 hours and pipe B can fill it in 15 hours, separately. A third pipe C can empty it in 20 hours. Initially pipe A was opened, after one hour pipe B was opened and then after 1 hour when pipe B was opened pipe C was also opened. In how many hours the tank will be full?

(a) $9\frac{2}{3}$ hours (b) $6\frac{2}{3}$ hours

(c) 10 hours (d) None of these

21. A tank has an inlet and outlet pipe. The inlet pipe fills the tank completely in 2 hours when the outlet pipe is plugged. The outlet pipe empties the tank completely in 6 hours when the inlet pipe is plugged.

If both pipes are opened simultaneously at a time when the tank was one-third filled, when will be the tank full thereafter?

(a) $\frac{3}{2}$ hours (b) $\frac{2}{3}$ hours

(c) 2 hours (d) $1\frac{2}{3}$ hours

22. An inlet pipe can fill a tank in 5 hours and an outlet pipe can empty the same tank in 36 hours, working individually. How many additional number of outlet pipes of the same capacity are required to be opened, so that the tank never overflows ?

(a) 3 (b) 6

(c) 8 (d) 7

23. In a public bathroom there are n taps 1, 2, 3...n. Tap 1 and Tap 2 take equal time to fill the tank while tap 3 takes half the time taken by tap 2 and tap 4 takes half the time taken by tap 3. Similarly each next number of tap takes half the time taken by previous number of tap *i.e.*, K^{th} tap takes half the time taken by $(K-1)^{th}$ tap.

If the 8^{th} tap takes 80 hours to fill the tank the 10^{th} and the 12^{th} tap working together take how many hours to fill the tank?

(a) 2 hours (b) 4 hours

(c) 6 hours (d) None of these

24. Pipe A takes 3/4 of the time required by pipe B to fill the empty tank individually. When an outlet pipe C is also opened simultaneously with pipe A and pipe B, it takes 3/4 more time to fill the empty tank than it takes normally when only pipe A and pipe B are opened together. If it takes 33 hours to fill when all the three pipes are opened simultaneously, then in what time pipe C can empty the full tank operating alone ?

(a) 66 hours

(b) 50 hours

(c) 44 hours

(d) can't be determined

25. A tank is connected with 8 pipes. Some of them are inlet pipes and rest work as outlet pipes. Each of the inlet pipe can fill the tank in 8 hours, individually, while each of those that empty the tank i.e., outlet pipe, can empty it in 6 hours individually. If all the pipes are kept open when the tank is full, it will take exactly 6 hours for the tank to empty. How many of these are inlet pipes?
(a) 2 (b) 4
(c) 5 (d) 6

26. A tank has two inlet pipes which can fill the empty tank in 12 hours and 15 hours working alone and one outlet pipe which can empty the full tank in 8 hours working alone. The inlet pipes are kept open for all the time but the outlet pipe was opened after 2 hours for one hour and then again closed for 2 hours then once again opened for one hour. This pattern of outlet pipe continued till the tank got completely filled. In how many hours the tank has been filled, working on the given pattern?

(a) 8 hours 24 min.

(b) 10 hours 15 min.

(c) 9 hours 10 min.

(d) 9 hours 6 min.

27. A, B, C are three pipes attached to a cistern. A and B can fill it in 20 and 30 minutes respectively, while C can empty it in 15 minutes. If A, B, C are kept open successively for 1 minute each, how soon will the cistern be filled?
(a) 167 min. (b) 160 min.
(c) 166 min. (d) 164 min.

28. A bath can be filled by the cold water pipe in 10 minutes and by the hot water pipe in 15 minutes. A person leaves the bathroom after turning on both the pipes simultaneously and returns at the moment when the bath will be full. Finding however, that the waste pipe has been open, he now closed it. In 4 minutes more the bath is full. In what time would the waste pipe empty it.
(a) 9 min. (b) 8 min.
(c) 12 min. (d) 6 min.

29. Pipe A takes 4 minutes more to fill the cistern than two pipes A and B opened together to fill it. Second pipe B takes 9 minutes more to fill cistern than two fill pipes A and B opened together to fill it. When will the cistern be full if both pipes are opened simultaneously.
(a) 4 minutes (b) 6 minutes
(c) 5 minutes (d) 7 minutes

30. Two pipes can fill a cistern in 30 and 15 hours respectively. The pipes are opened simultaneously and it is found that due to leakage in the bottom, 5 hours extra are taken for the cistern to be filled up. If the cistern is full, in what time would the leak empty it?
(a) 60 hours (b) 45 hours
(c) 35 hours (d) 30 hours

31. There are 12 filling pipes each capable of filling a cistern alone in 32 minutes and 8 emptying pipes each capable of emptying A cistern alone in 40 minutes. All pipes are opened together and as a result, tank was filled with 28 litres of water per minute. Find the capacity of the tank.
(a) 160 litres (b) 120 litres
(c) 100 litres (d) 80 litres

32. Three pipes A, B and C are connected to a tank. A and B together can fill a tank in 60 minutes, B and C together in 40 minutes and C and A together in 30 minutes. In how much time will each pipe fill the tank separately?
(a) 80 min, 240 min, 48 min
(b) 40 min, 120 min, 24 min
(c) 60 min, 250 min, 64 min
(d) 65 min, 240 min, 64 min

33. If two pipes function simultaneously, the reservoir is filled in 6 hours. One pipe fills the reservoir 5 hours faster than the other. How many hours does the faster pipe takes to fill the reservoir ?
(a) 20 hours (b) 10 hours
(c) 15 hours (d) 12 hours

34. One filling pipe A is 5 times faster than second filling pipe B. If B can fill a cistern in 36 minutes, then find the time when the cistern will be full if both the fill pipes are opened together.
(a) 6 minutes (b) 8 minutes
(c) 4 minutes (d) 12 minutes

35. In what time would a cistern be filled by three pipes whose diameters are 1 cm, 2 cm, 4 cm, running together. When the largest alone fill it in $1\frac{1}{20}$ hours, the amount of water flowing in by each pipe being proportional to the square of its diameter.
(a) 38 minutes (b) 42 minutes
(c) 44 minutes (d) 48 minutes

36. Two pipes A and B can fill a cistern in 20 minutes and 25 minutes respectively. Both are opened together, but at the end of 5 minutes, B is turned off. How much time will the cistern takes to be filled?
(a) 16 minutes (b) 18 minutes
(c) 11 minutes (d) None of These

37. One fill pipe A takes $4\frac{1}{2}$ minutes more to fill the cistern than two fill pipes A and B opened together to fill it. Second fill pipe B takes 8 minutes more to fill the cistern than two fill pipes A and B opened together to fill it. When will the cistern be full if both the pipes are opened simutaneously.
(a) 8 min. (b) 6 min
(c) 11 min. (d) None of these

38. Two fill pipes A and B can fill a cistern in 18 and 24 minutes respectively. Both fill pipes are

opened together , but 6 minutes before the cistern is full, one pipe A is closed. How much time will the cistern takes to be full.

(a) $12\frac{4}{7}$ min. (b) $12\frac{5}{7}$ min

(c) $13\frac{5}{7}$ min. (d) None of these

39. A cistern can be filled by two pipes filling separately in 12 and 16 minutes respectively. Both pipes are opened together for a certain time but being clogged, only 7/8 of full quantity water flows through the former and only $\frac{5}{6}$ through the latter pipe. The obstructions, however being suddenly removed, the cistern is filled in 3 minutes from that moment. How long was it before the overflow began?

(a) $4\frac{1}{3}$ min. (b) $4\frac{1}{2}$ min.

(c) $3\frac{1}{2}$ min. (d) $8\frac{1}{3}$ min.

40. A cistern can be filled by one of the two pipes in 30 minutes and by the other in 36 minutes. Both pipes are opened together for a certain time but being particularly Clogged, only $\frac{5}{6}$ of the full quantity of water flows through the former and only $\frac{9}{10}$ through the latter. The obstructions, however, being suddenly removed, the cistern is filled in $15\frac{1}{2}$ minutes from that moment. How long was it before the overflow of water began?

(a) 1 min. (b) 2 min.

(c) 5 min. (d) $1\frac{1}{2}$ min.

41. Three pipes A, B, and C are attached to a cistern. A can fill it in 10 minutes and B in 15 minutes. C is a waste pipe for emptying it. After opening both the pipes A and B, a man leaves the cistern and returns when the cistern should have been just full. Finding however, that the waste pipe has been left open, he closes it and the cistern is now full in 2 minutes. In how much time the pipe C, if opened alone, empty the full cistern.

(a) 18 min. (b) 16 min.

(c) 12 min. (d) None of these

42. Three pipes A, B, and C are attached to a cistern. A can fill it in 20 minutes and B in 30 minutes. C is a waste pipe meant for emptying it. After opening both the pipes A and B, a man leaves the cistern and returns when the cistern should have been just full. Finding however, that the waste pipe has been left open, he closes it and the cistern now filled in 3 minutes. In how much time the pipe C, if opened alone, empty the full cistern?

(a) 18 min. (b) 16 min.

(c) 12 min. (d) None of these

43. Pipe A can fill a tank in 12 hours. Due to development of a hole in the bottom of the tank $\frac{1}{3}$rd of the water filled by the pipe A leaks out. Find the time when the tank will be full.

(a) 18 hours (b) 12 hours

(c) 36 hours (d) None of these

44. Two pipes A and B can fill up a half full tank in 1.2 hours. The tank was initially empty. Pipe B was kept open for half the time required by pipe A to fill the tank by itself. Then, pipe A was kept open for as much time as was required by pipe B to fill up $\frac{1}{3}$ of the tank by itself. It was found that the tank was $\frac{5}{6}$ full. The least time in which any of the pipes can fill the tank fully is :

(a) 4.8 hours (b) 4 hours

(c) 3.6 hours (d) 8 hours

45. A tank of capacity 25 litres has an inlet and an outlet tap. If both are opened simultaneously, the tank is filled in 5 minutes. But if the outlet flow rate is doubled and taps are opened then the tank never gets filled up. Which of the following can be outlet flow rate in litres/min?

(a) 2 (b) 6

(c) 4 (d) 3

46. Two taps are running continuously to fill a tank. The Ist tap could have filled it in 5 hours by itself and the second one by itself could have filled it in 20 hours. But the operator failed to realise that there was a leak in the tank from the beginning which caused a delay of one hour in the filling of the tank. Find the time in which the leak would empty the filled tank.

(a) 15 hours (b) 20 hours

(c) 25 hours (d) 40 hours

47. A cistern can be filled by two pipes filling separately in 36 min and 48 min respectively. Both pipes are opened together for a certain time but being jammed, only $\frac{4}{5}$ of full quantity water flows through the former and only $\frac{3}{5}$ through the latter pipe. The obstruction, however being suddenly removed, the cistern is filled in 17 minutes from that moment. How long was it before the overflow began?

(a) 6 min (b) 5 min

(c) 4 min (d) None of these

48. A cistern can be filled by two pipes filling separately in 30 min and 36 min respectively. Both pipes are opened together for a certain time but being jammed, only $\frac{5}{6}$ of full quantity water flows through the former and only $\frac{9}{10}$ through the latter pipe. The obstruction, however being suddenly removed, the cistern is filled in $15\frac{1}{2}$ minutes from that moment. How long was it before

the overflow began?

(a) 1 min. (b) 2 min.

(c) $1\frac{1}{2}$ min. (d) $2\frac{1}{2}$ min.

49. Four pipes A, B, C and D are attached to a cistern. A can fill it in 20 min. B in 30 min and C in 60 minutes. D is a waste pipe for emptying it. After opening all the three pipes A, B and C a man leaves the cistern and returns when the cistern should have been just full. Finding however, that the waste pipe has been left open, he closes it and the cistern now gets filled in 3 minutes. In how much time the pipe D, if opened alone, empty full cistern.

(a) $33\frac{1}{3}$ min (b) $32\frac{1}{3}$ min.

(c) $32\frac{2}{3}$ min. (d) $33\frac{2}{3}$ min.

50. Two pipes A and B can fill a cistern in 40 and 50 hours respectively, and a third pipe C can empty in 80 hours. If the pipe A is opened at 7 am and the pipe B at 9 am and the third pipe C at 12:00 noon. Then after how much time the tank will be filled?

(a) $1\frac{1}{13}$ pm on next day

(b) $2\frac{1}{13}$ pm on next day

(c) $2\frac{1}{11}$ pm on next day

(d) None of these

Solution

1. (b)

A →20 min 3
B →30min 2 → 60 (capacity of Tank)

A & B together to fill the tank

in = $\frac{60}{5}$ = 12 minutes

2. (b)

A → 60 min 5
B → 75 min 4 → 300 (capacity of tank)
A+B+IIIrd → 50 min 6

Eff. of IIIrd pipe = 5 + 4 – 6 = 3 units

III rd Pipe alone empty the tank

= $\frac{300}{3}$ = 100 minutes

3. (d) A → 20 min +3
B → 30 min –2 → 60(Capacity of Tank)

Tank filled by A in 1 min.

= 1 × 3 = 3 units

Tank empty by B in 1 min. = 1 × 2 = 2 units

\ Tank filled in 2 min.

= 3 – 2 = 1 unit

Q 1 unit tank fill in 2 min.

\ 60 units tank fill in 2 × 60 = 120 min.

4. (b) Q $\frac{1}{3}$ rd tank = 80 lit.

\ full tank = 80 ×3 = 240 lit.

Hence, the quantity of water that holds half of the tanks

= $\frac{240}{2}$ = 120 lit.

5. (d) Let the pipes are A,B,C & D having same efficiencies.

6 (capacity of tank)

1 1 1 1

A B C D

Time taken by A to fill the half tank = $\frac{3}{1}$ = 3hrs.

Time tanken by all the pipes to fill the remaining half tank = $\frac{3}{4}$ hrs = $\frac{3}{4}\times 60$ = 45 min

\ Total time taken to fill the tank = 3 hrs 45 min

6. (d) $37\frac{1}{2}$ min. = $\frac{75}{2}$ min

225 units

6 5

A B

$\frac{75}{2}$ min 45 min.

A fills the tank in 30 min = 30 × 6 = 180 units

Remaining = 225 –180 = 45 units

Time taken by B to fill the tank

45 units = $\frac{45}{5}$ = 9 min

Hence, B is turned off after 9 min.

7. (d) Tank filled by B in 30 min

= $\frac{30}{36} = \frac{5}{6}$

\ Remaining part of tank = $1-\frac{5}{6} = \frac{1}{6}$

Q $\frac{1}{6}^{th}$ tank is completed in (40–30) = 10 min

\ Time taken by $\frac{1}{6}^{th}$ tank = 10 min

\ Time taken by A to fill the full tank = 6 × 10 = 60 min.

180

3 5

A B A+B

60 min 36 min

efficiency of B = 5 – 3 = 2 units

\ Time taken by B to fill the tank

= $\frac{180}{2}$ = 90 min

8. (a) A →48 3 units/min
B →36 4 units/min → 144 Total capacity of the tank

According to the question,

Tap B would be open till the end so part filled by pipe B in 25 min

30 sec. = $4\times\frac{51}{2}$ = 102 units

$\therefore$ 25 min 30 sec = $\frac{51}{2}$ min

Reamining capacity of the tank

= (144 – 102) = 42 units

This remaining part is filled by pipe A.

So required time = $\frac{42}{3}$ = 14 min

So pipe A should be closed after 14 min.

9. (a) A $\longrightarrow$ 20, B $\longrightarrow$ 30 → 60 Total capacity of the tank (3 units/hr, 2 units/hr)

According to the question :-

Required time for filling $\frac{1}{3}^{rd}$ of the tank = $\frac{60\times1}{3(3+2)}$ = 4 hours

Now leaks has been developed.

$\therefore$ leaked out water

= $5\times\frac{1}{3}=\frac{5}{3}$ units/hour

Now required time to fill the rest capacity of the tank

= $\frac{40}{\left(5-\frac{5}{3}\right)}=\frac{40}{10}\times3 \Rightarrow$ 12 hours

Total time to fill the tank = 12 + 4

$\Rightarrow$ **16 hrs**

10. (a) A $\longrightarrow$ 15, B $\longrightarrow$ 20 → 60 Total capacity of the tank (4, 3)

According to the question,

Time required for filling $\frac{1}{4}^{th}$ part of the tank

= $\frac{60}{4\times7}=\frac{15}{7}$ hours

Now leaks have been develop.

$\therefore$ Leaked out water

= $7\times\frac{1}{5}=\frac{7}{5}$ units/hour

Now required time to fill the rest capacity of the tank

= $\frac{45}{7-\frac{7}{5}}=\frac{45\times5}{28}=\frac{225}{28}$

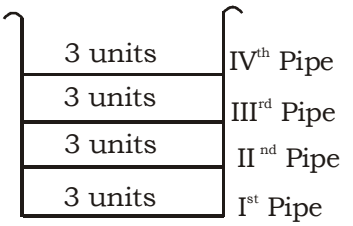
Total time = $\frac{15}{7}+\frac{225}{28}$

= $\frac{285}{28}=10\frac{5}{28}$ hours

11. (a) Let the capacity of the tank be 12 units

Ist Pipe $\longrightarrow$ 12 $\xrightarrow{-1}$ (12) Total capacity of tank

$\frac{3}{4}^{th}$ height = $\frac{3}{4}\times12$ = 9



According to the question:-

All the pipes are set on equal intervals.

Time required to empty the tank

= $\frac{3}{4}+\frac{3}{3}+\frac{3}{2}+\frac{3}{1}$

= $\frac{9+12+18+36}{12}=\frac{75}{12}$

= $6\frac{3}{12}=6\frac{1}{4}$ = **6 hours 15 min**

12. (a) A $\longrightarrow$ 30, B $\longrightarrow$ 36 → 360 Total capacity (12 units/min, 10 units/min)

If both pipes A and B working with original efficiency then filled part in $16\frac{1}{2}$ min

= $\frac{33}{2}\times(10+12)=33\times11=363$ units

Extra units = 363 – 360 = 3 units

This is because we did not count the problem time.

Now efficiency after problem occured:-

Efficiency of A = $\frac{5}{6}\times12$

= 10 units/min

Efficiency of B = $10\times\frac{9}{10}$

= 9 units/min

Combined efficiency = (10 + 9) = 19

Difference between original and new efficiency

= (22 – 19) = 3 units/min

Now Required time to fill 3 units

= $\frac{3}{3}$ = 1 min

So we can say after 1 min the problem was removed.

13. (b) According to the question:-

A $\longrightarrow$ 10, B $\longrightarrow$ 12, A + B + C $\longrightarrow$ 30 → 60 Total capacity of the tank (6, 5, 2)

Efficiency of tap C = [(6 + 5)–2]

= 9 units/hour

Required time for C to empty the tank = $\frac{60}{9}$ hours

14. (c) Let A be the leakage and B be the filling pipe.

According to the question:-

A (leak) $\longrightarrow$ 6 hours, A + B $\longrightarrow$ 8 hours → 24 Capacity of the tank (–4, –3)

It means in starting Leak A leaks out

4 units/hour and now both A (Leak) and

B (filling pipe) are opened together so they

leaks out 3 units/hour.

$\therefore$ Efficiency of filling pipe

= (4 – 3) = 1 unit/hour

Required time for B (filling pipe) to fill the tank = $\frac{24}{1}$ = 24 hours

And pipe B fills 4 litres/min [Given]

$\therefore$ Capacity = 4 × 24 × 60 = **5760 litres**

15. (a) Let A be the leakage and B be the filling pipe.

According to the question:-

A (leak) $\longrightarrow$ 12 hours, A + B $\longrightarrow$ 20 hours → 60 Total Capacity of the tank (–5, –3)

It means in starting leak A leaks out

5 units/hour and now both filling pipe (B)

and leak (A) are opened together

so they leak out 3 units/hour.

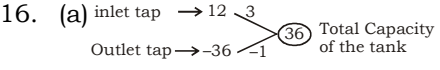
∴ Efficiency of filling pipe = (5 – 3) = 2 units/hour

Required time for B (filling pipe) to fill the tank = $\frac{60}{2}$ = 30 hours

And pipe B fills 20 litres/min [Given]

∴ Capacity of the tank

= 20 × 30 × 60 = 36000 litres

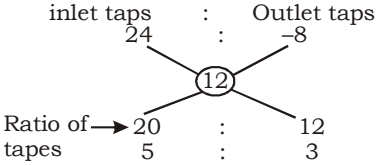
16. (a) 

According to the question :-

Required time to fill the tank = 3 hours

Avg. efficiency = $\frac{36}{3}$ = 12 units/hrs

Now By alligation method :-



Required number of water taps

= $\frac{8}{(5+3)} \times 5$ = **5**

Alternatively:-

Let the number of filling pipes = x

∴ the outlet pipes = $(8 - x)$

According to the question :-

$= \frac{x}{12} - \frac{8-x}{36}$

$= \frac{1}{3} = \frac{3x-8+x}{36}$

$= \frac{1}{3}$

$\Rightarrow 4x - 8 = 12$

$\Rightarrow 4x = 20$

$\Rightarrow \boldsymbol{x = 5}$

∴ Number of inlet pipes = 5 and, Number of outlet pipes = (8 – 5) = 3

17. (a) Let the number of water taps = x

∴ the number of outlet taps = $(9 - x)$

According to the question:-

$\Rightarrow \frac{x}{9} - \frac{(9-x)}{9} = \frac{1}{9}$

$\Rightarrow \frac{x-9+x}{9} = \frac{1}{9}$

$\Rightarrow 2x - 9 = 1$

$\Rightarrow x = 5$

∴ Number of water taps = 5 and, Number of outlet taps = (9 – 5) = 4

Alternatively:

For alligation method refer question no. 16.

18. (a) Let the number of water taps = x

∴ the number of outlet taps = $(12 - x)$

According to the question:-

$\Rightarrow \frac{x}{6} - \frac{(12-x)}{12} = \frac{1}{4}$

$\Rightarrow \frac{2x-12+x}{12} = \frac{1}{4}$

$\Rightarrow 3x - 12 = 3$

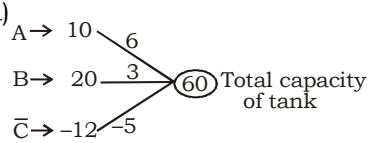
$\Rightarrow 3x = 15$

$\Rightarrow x = 5$

∴ Number of inlet water taps = 5 and, Number of outlet taps = (12 – 5) = 7

Alternatively:

For alligation method refer question no. 16.

19. (a) 

Water filled by all the three pipes (A + B + C) in 3 hours

= (6 + 3 – 5) = 4 units

Time	:	Work done
3 hours	→	4 units
↓ × 13		↓ × 13
39 hours		52 units

Remaining work = (60 – 52) = 8 units

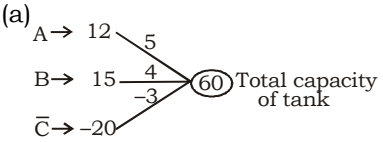
Work done by A on 14th hr = 6 units

Remaining work = (8 – 6) =2 units

Required time = $\frac{2}{3}$ hr

Total Required time

= 39 + 1 + $\frac{2}{3}$ = 40$\frac{2}{3}$ hr

20. (a) 

According to the question:-

Water filled by the pipe A in 2 hours = 5 × 2 = 10 units

Water filled by the pipe B in 1 hour = 4 × 1 = 4 units

Total water filled

= (10 + 4) = 14 units

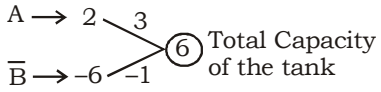
Now all the pipes will work together.

∴ Required time

= $\frac{(60-14)}{(5+4-3)} = \frac{46}{6} = \frac{23}{3}$

Total time = 12 + $\frac{23}{3}$ = 9$\frac{2}{3}$ hours

21. (c) Let A be the inlet pipe and B be the outlet pipe.



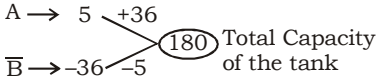
Remaining part of the tank

= 6 × $\frac{2}{3}$ = 4 units

Required time to fill the tank

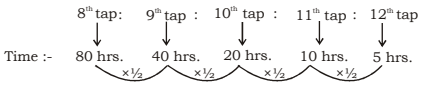
= $\frac{4}{(3-1)}$ = **2 hours**

22. (c) Let A be the inlet pipe and B be the outlet pipe.



Since, an inlet pipe $\left(\frac{36}{5} = 7.2\right)$ times efficient than an outlet pipe. Therefore inorder to tank never overflow we will need total 8 outlet pipes.

23. (b)



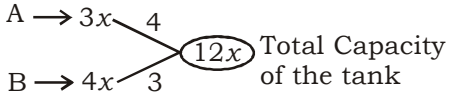
Required time = $\frac{20}{(4+1)}$

= **4 hours**

24. (c) Let the time taken by pipe B = $4x$

$\therefore$ Time Taken by pipe A

= $\frac{3}{4} \times 4x = 3x$



Required time by (A + B)

= $\frac{12x}{(4+3)} = \frac{12x}{7}$

According to the question:

= $\frac{12}{7}x + \frac{12x}{7} \times \frac{3}{4} = 33$

= $\frac{12x + 9x}{7} = 33$

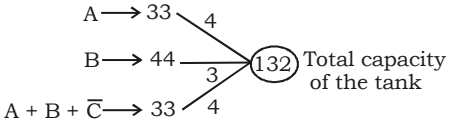
$\Rightarrow \frac{21x}{7} = 33 \Rightarrow x = 11$

Now required time by pipe A

= 3×11 = 33 hours

and required time by pipe B

= 4 × 11 = 44 hours



Time required by the pipe ($\overline{C}$)

= $\frac{132}{(7-4)}$ = 44 hours

25. (b) Let the number of inlet pipes = x

The number of outlet pipes

= $(8 - x)$

According to the question:

$\Rightarrow \frac{(8-x)}{6} - \frac{x}{8} = \frac{1}{6}$

$\Rightarrow \frac{32 - 4x - 3x}{24} = \frac{1}{6}$

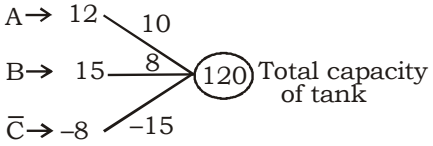
$\Rightarrow -7x + 32 = 4$

$\Rightarrow x = 4$

$\therefore$ Number of inlet pipes = 4 and, Number of outlet pipes

= (8 – 4) = 4

26. (c) Let A and B are the inlet pipes and C is the outlet pipe.



Water filled by the pipes A and B in the first two hours

= (10+8)× 2 = 36 units

Now for the next hour all the three pipes are open.

Water filled in the third hour

= (10 + 8 – 15) = 3 units

$\therefore$ Time Filled (Water)

3 hours 39 units

↓ ×3 ↓ ×3

9 hours 117 units

Now remaining capacity of the tank = 120 – 117 = 3 units

Now only pipes A and B are open.

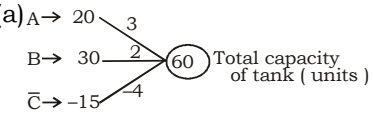
$\therefore$ Required time = $\frac{3}{(10+8)}$

= $\frac{1}{6} \times 60$ = 10 minutes.

Total time = 9 + 10 minutes

= **9 hrs. 10 min.**

27. (a)



water filled by all the three pipes (A + B + $\overline{C}$) in 1 min

= (3 + 2 – 4) = 1 unit

Time : Filled Capacity

3 min → 1 unit

↓ × 55 ↓ × 55

165 min 55 units

Remaining capacity

= (60 – 55) = 5 units

In 166th min the pipe A will work so filled part = 3 units

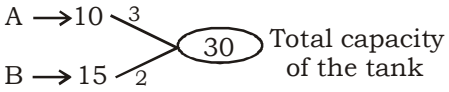
Remaining part = (5 – 3) = 2 units

Required time by B = $\frac{2}{2}$ = 1 min.

Total time

= 165 + 1 + 1 = **167 min**

28. (a) Let the cold water pipe be A and the hot water pipe be B.



Required time by (A + B) to fill the tank = $\frac{30}{(2+3)}$ = 6 min

According to the question:-

Water filled by the pipes (A + B) in 4 minutes = 4 × 5 = 20 units

Now it is emptied by the waste pipe (C) in 6 min.

Required time by the waste pipe (C) to empty the whole tank

= $\frac{30}{20} \times 6$ = **9 min**

29. (b) **Note:** In such type of questions use this method to save your valuable time.

Let the time taken by the pipes (A + B) = x min

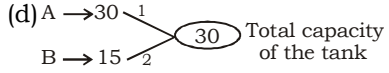
According to the question :-

A : A + B : B

$x + 4$: x : $x + 9$

Required time = $\sqrt{4 \times 9}$ = **6 min**

30. (d)

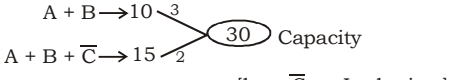


Required time for (A + B) to fill the cistern = $\frac{30}{(1+2)}$ = 10 hours

According to the question:

When leakage is open then,

required time = (10 + 5) = 15 hours



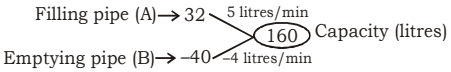
[here $\overline{C}$ = Leak pipe]

Efficiency of the leak = (3 – 2)

= 1 unit/hr

Required time for leak to empty the tank = $\frac{30}{1}$ = 30 hours

31. (a)



Efficiency of 12 filling pipes

= 12 × 5 = 60 litres/min

Efficiency of 8 emptying pipes

= 8 × –4 = – 32 litres/min

Net efficiency = (60 – 32)

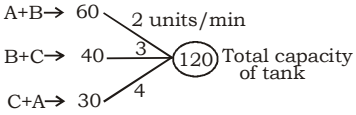
= 28 litres/min

According to the question:

Capacity of the tank = $\frac{28}{28} \times 160$

= **160 litres**

32. (a)



Efficiency of (A + B + C)

= $\frac{(2+3+4)}{2}$ = 4.5 units/min

Efficiency of C = (4.5 – 2)

= 2.5 units/min

Efficiency of B = (4.5 – 4)

= 0.5 unit/min

Efficiency of A = (4.5 – 3)

= 1.5 units/min

Required time byA to fill the tank

= $\frac{120}{1.5}$ = **80 min**

Required time by B to fill the tank

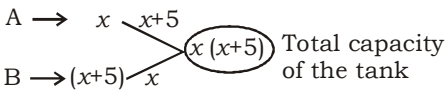
= $\frac{120}{0.5}$ = **240 min**

Required time by C to fill the tank

= $\frac{120}{2.5}$ = **48 min**

33. (b) Let the time taken by the faster pipe A = x hours

Then the time taken by the slower pipe B = $(x + 5)$ hours



According to the question:-

$\frac{x(x+5)}{x+(x+5)} = 6$

$\Rightarrow x^2 + 5x = 12x + 30$

$\Rightarrow x^2 - 7x - 30 = 0$

$\Rightarrow x^2 - 10x + 3x - 30 = 0$

$\Rightarrow x(x - 10) + 3(x - 10) = 0$

$\Rightarrow (x - 10)(x + 3) = 0$

x = 10 hours

Time taken by the faster pipe A

= 10 hours

Time taken by the slower pipe B

= (10 + 5) = 15 hours

Alternatively:

Note :- In such type of questions always take help from options to save your valuable time.

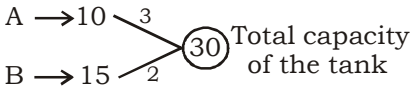
As : Option (b)

Time taken by the faster pipe A

= 10 hrs

Time taken by the slower pipe B

= 15 hrs.



Required time for (A + B) to fill the tank = $\frac{30}{(3+2)}$ = 6 hours

Now check the question conditon. So it is same Hence, option (b) is correct.

34. (a)

	A	:	B
Efficiency:-	5	:	1
Time :-	1	:	5

$\left[\because \text{Efficiency} \propto \frac{1}{\text{Time}}\right]$

Capacity of the tank = 36 × 1

= 36 units

Required time for both the pipes

(A + B) = $\frac{36}{(5+1)}$ = **6 minutes**

35. (d) $1\frac{1}{20}$ hours = 63 minutes

According to the question :-

Required time

= $\frac{63 \times (4)^2}{(1)^2 + (2)^2 + (4)^2}$

$\Rightarrow \frac{63 \times 16}{1 + 4 + 16} \Rightarrow$ **48 minutes**

36. (a)

Water filled by the pipes

(A + B) in 5 minutes

= 9 × 5 = 45 units

Remaining capacity of the tank

= (100 – 45) = 55 units

Required time for A to fill the remaining part

= $\frac{55}{5}$ = **11 minutes**

Total time for filling = (11 + 5)

= 16 minutes

Alternatively:-

According to the question :-

Water filled by the pipe B in 5 minutes = 4 × 5 = 20 units

Remaining capacity of the tank

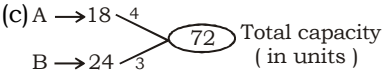
= (100 – 20) = 80 units

Required time = $\frac{80}{5}$ = **16 min**

37. (b) Required time = $\sqrt{\frac{9}{2} \times 8}$

= **6 minutes**

38. (c)



Let the cistern be filled in x minutes.

$\therefore$ Pipe B is opened for x minutes and pipe A is opened for $(x - 6)$ minutes.

Now According to the question:-

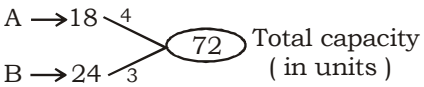
$3x + 4(x - 6) = 72$

$3x + 4x - 24 = 72$

$7x = 96$

$\Rightarrow x = \frac{96}{7} = 13\frac{5}{7}$ **min.**

Alternatively:-



Water filled by the pipe A in 6 minutes = 6 × 4 = 24 units

Total capacity = 24 + 72 = 96 units

Required time = $\frac{96}{(4+3)} = \frac{96}{7}$

= **$13\frac{5}{7}$ min**

39. (b) A $\rightarrow$ 12 min, 4 units/hr; B $\rightarrow$ 16 min, 3 units/hr; 48 — Total capacity of the tank

Let both pipes remain clogged for x minutes and hence full flow began after x minutes only.

$\therefore$ Part of cistern filled in x min + part of cistern filled in 3 minutes = Cistern filled

$$\left(4\times\frac{7}{8}x + 3\times\frac{5}{6}x\right) + 3(4+3)$$

= 48

$6x + 21 = 48 \Rightarrow 6x = 27$

$x = 4.5$ min.

40. (a) A $\rightarrow$ 30 min, 6 units/min; B $\rightarrow$ 36 min, 5 units/min; 180 — Total capacity

(Let both the pipes clogged for x minutes) and hence full flow began after x minutes only.

According to the question:

$$\left(6\times\frac{5}{6}x + 5\times\frac{9}{10}x\right) + \frac{31}{2}(6+5)$$

= 180

$$5x + \frac{9}{2}x = 180 - \frac{31\times11}{2}$$

$$\frac{19}{2}x = \frac{19}{2}$$

$\Rightarrow$ **x = 1 min**

41. (a) A $\rightarrow$ 10 min, 3 units/min; B $\rightarrow$ 15 min, 2 units/min; 30 — Total capacity (in units)

Required time by (A + B) to fill the tank = $\frac{30}{(3+2)}$ = 6 minutes

According to the question:-

Water filled by the pipes (A + B) in 2 minutes

= Water emptied by the pipe C in 6 min

$\therefore$ Efficiency of the pipe C

$= \frac{2\times(3+2)}{6} = \frac{10}{6}$ units/min

Required time for the pipe C to empty the tank

$= \frac{30\times6}{10}$ = **18 min.**

42. (d) A $\rightarrow$ 20 min, 3 units/min; B $\rightarrow$ 30 min, 2 units/min; 60 — Total capacity (in units)

Required time by (A + B) to fill the tank

$= \frac{60}{(3+2)}$ = **12 minutes**

According to the question:-

Water filled by the pipes (A + B) in 3 minutes = water emptied by the pipe C in 12 minutes

Efficiency of the pipe C

$= \frac{3(3+2)}{12} = \frac{5}{4}$ units/min

Required time for the pipe C to empty the tank = $\frac{60}{5}\times4$ = **48 min**

43. (a) A $\rightarrow$ 12 hours, 1 unit/hr; 12 — Total capacity (in units)

According to the question:-

Efficiency of the leakage = $-\frac{1}{3}$ unit/hr

Combined efficiency of (A + Leak)

$= 1 - \frac{1}{3} = \frac{2}{3}$ units/hr

Required time to fill the tank

$= \frac{12\times3}{2}$ = **18 hours**

44. (b) **Note :** In such type of questions go through options to save your valuable time. Then satisfy the question conditions.

Option (b):

Let the pipe A takes least time = 4 hours

According to the question:-

A + B takes $(2.4 = \frac{12}{5})$ hours to fill the tank.

A $\rightarrow$ 4, 3 units/hr; A + B $\rightarrow \frac{12}{5}$, 5 units/hr; 12 — Total capacity (in units)

Efficiency of B = (5 – 3) = 2 units/hr.

Now satisfy question conditon:-

Required time for A to fill the tank = 4 hours

Required time for B to fill the tank

$= \frac{12}{2}$ = 6 hours

$$\frac{4}{2}\times2 + \frac{6}{3}\times3 = \frac{5}{6}\times12$$

10 = 10

Both sides are equal so option (b) is correct.

45. (b) Efficiency of inlet and outlet tap

$= \frac{25}{5}$ = 5 litres/min

The net inflow when both pipes are opened is 5 litres/min. The outlet flow should be such that if its rate is doubled the net inflow rate should be negative or zero.

Only an option greater than or equal to '5' would satisfy this condtion.

Option (b) is the only possible value.

46. (b) Ist tap $\rightarrow$ 5 hours, 4; IInd tap $\rightarrow$ 20 hours, 1; 20 — Total capacity (in units)

Required time for (I +II) = $\frac{20}{(4+1)}$

= 4 hours

According to the question :-

When leak is open then time taken = (4 + 1) = 5 hours

I + II $\rightarrow$ 4, 5; I + II + Leak $\rightarrow$ 5, 4; 20 — Total capacity (in units)

Efficiency of the leak = (5 – 4)

= 1 unit/hr

Required time for leak = $\frac{20}{1}$

= **20 hours**

47. (b) A $\rightarrow$ 36 min, 4 units/min; B $\rightarrow$ 48 min, 3 units/min; 144 — Total capacity (in units)

Let both the pipes remain jammed for x min hence full flow began after x minutes only.

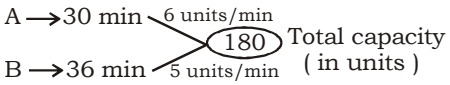
$\therefore$ part of cistern filled in x min + part of cistern filled in 17 min = cistern filled

$$\left(4\times\frac{4}{5}x + 3\times\frac{3}{5}x\right) + 17\times7 = 144$$

$$\frac{16x}{5} + \frac{9x}{5} = 25$$

x **= 5 min**

48. (a)



Let both pipes remain jammed for x min, and hence full flow began after x minutes only.

∴ part of cistern filled in x min + part of cistern filled in $\frac{31}{2}$ min

= cistern filled

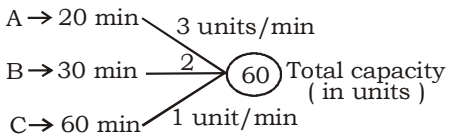
$$\left(6 \times \frac{5}{6}x + 5 \times \frac{9}{10}x\right) + \frac{31}{2} \times 11$$

= 180

$$\frac{19}{2}x = 180 - \frac{341}{2}$$

$$\frac{19}{2}x = \frac{19}{2} \Rightarrow x = \mathbf{1\ min}$$

49. (a)



Required time for (A + B + C) to fill the tank

$$= \frac{60}{(3+2+1)} = \mathbf{10\ minutes}$$

According to the question:-

Water filled by the pipes (A + B + C) in 3 minutes = water emptied by the pipe D in 10 minutes.

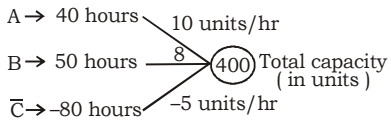
∴ Efficiency of the pipe D

$$= \frac{3 \times (3+2+1)}{10} = \frac{9}{5} \text{ units/min}$$

Required time for pipe D to empty the tank

$$= \frac{60 \times 5}{9} = \frac{100}{3} = \mathbf{33\frac{1}{3}\ min}$$

50. (a)



Till 12:00 noon water filled by the pipe A =10 ×5 = 50 units

Till 12:00 noon water filled by the pipe B = 8 × 3 = 24 units

Total water filled = 50 + 24 = 74 units

Remaining capacity of the tank

= (400 – 74)units

= 326 units Now all the three pipes (A + B + $\bar{C}$) will work simultaneously :-

∴ Required time for (A + B + $\bar{C}$)

$$= \frac{326}{(10+8-5)} = \frac{326}{13} = 25\frac{1}{13} \text{ hrs}$$

It means the tank will be filled at $1\frac{1}{13}$ PM on the next day.