PIPE & CISTERN

EXERCISE

YEAR : 1999

1. Two pipes A and B can fill a tank in 20 minutes and 30 minutes respectively. If both pipes are opened together, the time taken to fill the tank is:
   (a) 50 minutes (b) 12 minutes
   (c) 25 minutes (d) 15 minutes

2. If $\frac{1}{3}$ of a tank holds 80 litres of water, then the quantity of water that $\frac{1}{2}$ of tank holds is:
   (a) 240 litres (b) 120 litres
   (c) $\frac{80}{3}$ litres (d) 100 litres

3. Three taps A, B and C can fill a tank in 12, 15 and 20 hours respectively. If A is open all the time and B and C are opened for one hour each alternatively, the tank will be full in :
   (a) 6 hours (b) $6\frac{1}{2}$ hours
   (c) 7 hours (d) $7\frac{1}{2}$ hours

YEAR : 2000

4. A pipe of diameter 'd' can drain a certain water tank in 40 minutes. The time taken by a pipe of diameter '2d' for doing the same job in :
   (a) 5 minutes (b) 10 minutes
   (c) 20 minutes (d) 80 minutes

YEAR : 2002

5. A cistern can be filled with water by a pipe in 5 hours and it can be emptied by a second pipe in 4 hours. If both the pipes are opened when the cistern is full, the time in which it will be emptied the cistern:
   (a) 9 hours (b) 18 hours
   (c) 20 hours (d) $20\frac{1}{2}$ hours

6. A pipe can fill a tank with water in 3 hours. Due to a leakage in bottom, it takes $3\frac{1}{2}$ hours to fill it. In what time the leak will empty the completely filled tank?
   (a) 12 hours (b) 21 hours
   (c) $6\frac{1}{2}$ hours (d) $10\frac{1}{2}$ hours

YEAR : 2003

7. 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 minutes (b) 100 minutes
   (c) 120 minutes (d) 90 minutes

8. 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 hrs (b) 4 hrs 15 min.
   (c) 3 hrs 15 min. (d) 3 hrs 45 min.

9. One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 36 minutes, the slower pipe alone will be able to fill the tank in
   (a) 81 minutes (b) 108 minutes
   (c) 144 minutes (d) 192 minutes

YEAR : 2004

10. Two pipes can fill a cistern in 3 hours and 4 hours respectively and a waste pipe can empty it in 2 hours. If all the three pipes are kept open, then the cistern will be filled in:
    (a) 5 hours (b) 8 hours
    (c) 10 hours (d) 12 hours

11. Two pipes can fill a tank in 15 hours and 20 hours respectively, while the third pipes can empty it in 30 hours. If all the pipes are opened simultaneously, the empty tank will be filled in
    (a) 10 hours (b) 12 hours
    (c) 15 hours (d) $15\frac{1}{2}$ hours

12. Two pipes A and B can fill a cistern in $37\frac{1}{2}$ minutes and 45 minutes respectively. Both 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

13. A tap can fill a cistern in 8 hours and another tap can empty it in 16 hours. If both the taps are open, the time (in hours) taken to fill the tank will be:
    (a) 8hrs   (b) 10hrs
    (c) 16hrs   (d) 24hrs

14. A cistern has two pipes. One can fill it with water in 8 hours and other can empty it in 5 hours. In how many hours will the cistern be emptied if both the pipes are opened together when $\frac{3}{4}$ of the cistern is already filled with water ?

    (a) $13\frac{1}{3}$ hours   (b) 10 hours

    (c) 6 hours   (d) $3\frac{1}{3}$ hours

15. $\frac{3}{4}$ part of the tank is full of water. When 30 litres of water is taken out, the tank becomes empty. The capacity of the tank is:
    (a) 36 litres   (b) 42 litres
    (c) 40 litres   (d) 38 litres

16. A tank is fitted with two taps. The first tap can fill the tank completely 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

17. A pipe can empty a tank in 40 minutes. A second pipe with diameter twice as much as that of the first is also attached with the tank to empty it. The two pipe together can empty the tank in:

    (a) 8 minutes   (b) $13\frac{1}{3}$ minutes

    (c) 30 minutes (d) 38 minutes

18. Two pipes can fill a tank with water in 15 and 12 hours respectively and a third pipe can empty it in 4 hours. If the pipes be opened in order at 8, 9 and 11 a.m. respectively, the tank will be emptied at
    (a) 11 : 40 a.m. (b) 12 : 40 p.m.
    (c) 1 : 40 p.m.   (d) 2 : 40 p.m.

19. A pump can fill a tank with water in 2 hours. Because of a leak in the tank it was taking $2\frac{1}{3}$ hours to fill the tank. The leak can drain all the water from the tank in :
    (a) 8 hours   (b) 7 hours
    (c) $4\frac{1}{3}$ hours   (d) 14 hours

20. A tank can be filled by two pipes in 20 minutes and 30 minutes respectively. When the tank was empty, the two pipes were opened. After some time, the first pipe was stopped and the tank was filled in 18 minutes. After how much time of the start the first pipe stopped?
    (a) 5 minutes   (b) 8 minutes
    (c) 10 minutes (d) 12 minutes

21. 12 pumps working 6 hours a day can empty a completely filled reservoir in 15 days. How many such pumps working 9 hours a day will empty the same reservoir in 12 days?
    (a) 15   (b) 9
    (c) 10   (d) 12

22. A tap takes 36 hours extra to fill a tank due to a leakage equivalent to half of its inflow. The inflow can fill the tank in how many hours ?
    (a) 36 hrs   (b) 24 hrs
    (c) 30 hrs   (d) 18 hrs

23. 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

24. Two pipes A and B can fill a water tank in 20 and 24 minutes respectively and a third pipe C can empty at the rate of 3 gallons per minute. If A, B and C are opened together to fill the tank in 15 minutes, find the capacity of tank ?
    (a) 180 gallons
    (b) 150 gallons
    (c) 120 gallons (d) 60 gallons

25. Three pipes P, Q and R can separately fill a cistern in 4, 8 and 12 hours respectively. Another pipe S can empty the completely filled cistern in 10 hours. Which of the following arrangements will fill the empty cistern in less time than others?
    (a) Q alone is open
    (b) P, R and S are open
    (c) P and S are open
    (d) P, Q and S are open

26. A tank has a leak which would empty the completely filled tank in 10 hours. If the tank is full of water and a tap is opened which admits 4 litres of water per minute in the tank, the leak takes 15 hours to empty the tank. How many litres of water does the tank hold?
    (a) 2400 l (b) 4500 l
    (c) 1200 l (d) 7200 l

27. A boy and girl together fill a cistern with water. The boy pours 4 litres of water in every 3 minutes and the girl pours 3 litres of water in every 4 minutes. How much time will it take to fill 100 litres of water in the cistern ?
    (a) 36 minutes
    (b) 42 minutes
    (c) 48 minutes
    (d) 44 minutes

28. Three pipes A, B and C can fill a cistern in 6 hours. After working together for 2 hours, C is closed and A and B fill it in 7 hours more. The time taken by C alone to fill the cistern is
    (a) 14 hours   (b) 15 hours
    (c) 16 hours   (d) 17 hours

YEAR : 2010

29. Three taps A, B and C together can fill an empty cistern in 10 minutes. The tap A alone can fill it in 30 minutes and the tap B alone in 40 minutes. How long will the tap C alone take to fill it?
    (a) 16 minutes (b) 24 minutes
    (c) 32 minutes (d) 40 minutes

30. One tap can fill a water tank in 40 minutes and another tap can make the filled tank empty in 60 minutes. If both the taps are open, in how many hours will the empty tank be filled?
    (a) 2 hours (b) 2.5 hours
    (c) 3 hours (d) 3.5 hours

31. A tap can fill an empty tank in 12 hours and another tap can empty half the tank in 10 hours. It both the taps are opened simultaneously, how long would it take for the empty tank to be filled to half its capacity?
    (a) 10 hrs (b) 30 hrs
    (c) 15 hrs (d) 20 hrs

32. A tap can fill a cistern in 40 minutes and a second tap can empty the filled cistern in 60 minutes. By mistake without closing the second tap, the first tap was opened. In how many minutes will the empty cistern be filled?
    (a) 72 m (b) 84 m
    (c) 108 m (d) 120 m

33. Two pipes, P and Q can fill a cistern in 12 and 15 minutes respectively. Both are opened together, but at the end of 3 minutes, P is turned off. In how many more minutes will Q fill the cistern?
    (a) 7 minutes (b) $7\frac{1}{2}$ minutes
    (c) 8 minutes (d) $8\frac{1}{4}$ minutes

34. A cistern is normally filled in 8 hours but takes another 2 hours longer to fill because of a leak in its bottom. If the cistern is full, the leak will empty it in :
    (a) 16 hours (b) 20 hours
    (c) 25 hours (d) 40 hours

YEAR : 2011

35. Pipes P and Q can fill a tank in 10 hours and 12 hours respectively and C can empty it in 6 hours. If all the three are opened at 7 am, at what time will one-fourth of the tank be filled?
    (a) 10 am (b) 10 pm
    (c) 11 pm (d) 11 am

YEAR : 2012

36. A tank can be filled by pipe A in 2 hours and pipe B in 6 hours. At 10 am pipe A was opened. At what time will the tank be filled if pipe B is opened at 11 A.M. ?
    (a) 12.45 A.M. (b) 5 P.M.
    (c) 11.45 A.M. (d) 12 P.M.

    (SSC CGL Tier II Exam 16.09.12)

37. If $\frac{3}{5}$ th of a cistern is filled in 1 minute, the time needed to fill the rest is :
    (a) 40 sec (b) 30 sec
    (c) 36 sec (d) 24 sec

    (SSC CHSL DEO & LDC Exam 28.10.12)

38. A cylindrical cistern of diameter 25 cm is full of water. If 11 litres of water is drawn off, the water level in the cistern will drop by?
    $\left(\text{use } \pi = \frac{22}{7} \right)$
    (a) $10\frac{1}{2}$ cm (b) $12\frac{6}{7}$ cm
    (c) $22\frac{2}{5}$ cm (d) $20\frac{2}{5}$ cm

    (SSC CHSL DEO & LDC Exam 28.10.12)

YEAR : 2013

39. There are two pumps to fill a tank with water. First pump can fill the empty tank in 8 hours, while the second in 10 hours. If both the pumps are opened at the same time and kept open for 4 hours, the part of tank that will be filled up is :
    (a) $\frac{9}{10}$ (b) $\frac{1}{10}$
    (c) $\frac{2}{5}$ (d) $\frac{1}{5}$

    (SSC MTS Exam 10.6.13)

40. Two pipes A and B can fill a cistern in 3 hours and 5 hours respectively. Pipe C can empty it in 2 hours. If all the three pipes are open, in how many hours the cistern will be filled?
    (a) can't be filled (b) 10 hours
    (c) 15 hours (d) 30 hours

    (SSC FCI Assistant Grade III Exam 7.4.13)

41. Three taps A, B, C can fill an overhead tank in 4, 6 and 12 hours respectively. How long would the three taps take to fill the tank if all of them are opened together ?
    (a) 2 hrs. (b) 4 hrs.
    (c) 3 hrs. (d) 5 hrs.

    (SSC Constable (GD) Exam 12.05.13)

42. Two pipes function simultaneously, a tank is filled in 12 hours. One pipe fill the tank 10 hours faster than the other. How many hours does the faster pipe alone take to fill the tank?
    (a) 20 hrs (b) 18 hrs
    (c) 15 hrs (d) 12 hrs

    (SSC CHSL DEO & LDC Exam 27.10.13)

43. 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 m (b) 8 m
    (c) 6 m (d) 5 m

    (SSC CHSL DEO & LDC Exam 12.05.13)

44. Three pipes A, B and C can fill a tank in 6 hours, 9 hours and 12 hours respectively. B and C are opened for half an hour, then A is also opened. The time taken by the three pipes together to fill the remaining part of the tank is:
    (a) 3 hours (b) 2 hours
    (c) $2\frac{1}{2}$ hours (d) $3\frac{1}{2}$ hours

    (SSC MTS Exam 17.03.13)

45. A pipe can fill a cistern in 9 hours. Due to a leak in its bottom, the cistern fills up in 10 hours. If the cistern is full, in how much time will it be emptied by the leak ?
    (a) 70 hours (b) 80 hours
    (c) 90 hours (d) 100 hours

    (SSC CGL Tier I Reexam 24.03.13)

46. Which of these pipes will empty the pool fastest ?
    (a) One pipe of diameter 60 m
    (b) Two pipes of diameter 30 cm
    (c) Three pipes of diameter 20 cm
    (d) None of these

YEAR : 2014

47. A water tank can be filled by a tap in 30 minutes and another tap can fill it in 60 minutes. If both the taps are kept open for 5 minutes and then the first tap is closed, how long will it take for the tank to be filled ?
    (a) 20 minutes (b) 25 minutes
    (c) 30 minutes (d) 45 minutes

48. Two pipes A and B can fill a tank in 36 minutes and 45 minutes respectively. Another pipe C can empty the tank in 30 minutes. First A and B are opened. After 7 minutes, C is also opened. The tank is filled up in
    (a) 39 minutes (b) 46 minutes
    (c) 40 minutes (d) 45 minutes

49. 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 hour 12 minutes
    (b) 2 hours 30 minutes
    (c) 1 hour 15 minutes
    (d) 1 hour 20 minutes

50. A tap drips at a rate of one drop/ sec. 600 drops make 100ml. The number of litres wasted in 300 days is:
    (a) 4320000 litres
    (b) 432000 litres
    (c) 43200 litres
    (d) 4320 litres

51. 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

52. 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 alternatively for one minute each, how soon will the cistern be filled?
    (a) 121 minutes (b) 110 minutes
    (c) 115 minutes (d) 120 minutes

53. 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. After12 minutes C is opened. Total time (in minutes) in which the tank will be filled up is:
    (a) 12 min   (b) 24 min
    (c) 30 min   (d) 36 min

54. A Pipe can fill a tank in x hours and another can empty it in y hours. In how many hours they together fill it in (y > x):
    (a) (x – y) hrs   (b) (y –x) hrs

    (c) ($\frac{xy}{x-y}$) hrs (d) ($\frac{xy}{y-x}$) hrs

55. Pipe A can fill a tank in 4 hours and pipe B can fill it in 6 hours. If they are opened on alternate hours and if pipe A is opened first then in how many hours, the tank shall be full?

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

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

56. Pipe A can fill an empty tank in 6 hours and pipe B in 8 hours. If both the pipes are opened and after 2 hours pipe A is closed, 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

57. 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) 6 hours

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

58. A pipe can fill a tank in 24 hours. Due to a leakage in the bottom, it is filled in 36 hours. If the tank is half full, how much time will they take to empty the tank?
    (a) 24 hrs   (b) 48 hrs
    (c) 36 hrs   (d) 72 hrs

59. A water reservoir has two inlets and one outlet. Through the inlet it can be filled in 3 hours and 3 hours 45 minutes respectively. It can be emptied completely in 1 hour by the outlet. If the two inlets are opened at 01:00pm and 02:00pm respectively and the outlet at 03:00pm then it will be emptied at:
    (a) 05:55 pm   (b) 05:00 pm
    (c) 05:20 pm   (d) 05:30 pm

60. Pipe A can fill the tank in 12 hours and pipe B can fill the tank in 8 hours. A 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) $\frac{1}{3}$

61. Pipe A can fill the tank in 8 hours and pipe B can fill it in 12 hours. If pipe A is opened at 7:00 am and pipe B is opened at 9:00 am, then at what time will the tank be full?
    (a) 12 : 00 PM (b) 12 : 30 PM
    (c) 11 : 48 PM (d) 12 : 36 PM

62. Two pipes can independently fill a bucket in 20 minutes and 25 minutes. Both are opened together for 5 minutes after which the second pipe is turned off. What is the time taken by the first pipe alone to fill the remaining portion of the bucket?

(a) 11 min   (b) 16 min

(c) 20 min   (d) 15 min

63. A water tap fills a tub in 'p' hours and a sink at the bottom empties it in 'q' hours . If ' p<q and both tap and sink are opened the tank is filled in 'r' hours; then the relation between p, q, r is:
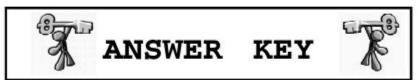
(a) $\dfrac{1}{r} = \dfrac{1}{p} + \dfrac{1}{q}$

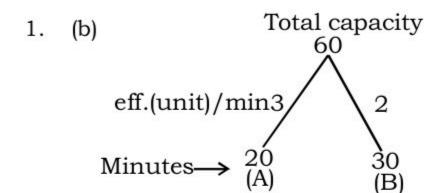(b) $\dfrac{1}{r} = \dfrac{1}{p} - \dfrac{1}{q}$

(c) $r = p + q$

(d) $r = p - q$

ANSWER KEY

1.	(b)	8.	(d)	15.	(c)	22.	(a)	29.	(b)	36.	(c)	43.	(b)	50.	(d)	57.	(d)
2.	(b)	9.	(c)	16.	(d)	23.	(d)	30.	(a)	37.	(a)	44.	(c)	51.	(b)	58.	(c)
3.	(c)	10.	(d)	17.	(a)	24.	(c)	31.	(c)	38.	(c)	45.	(c)	52.	(c)	59.	(c)
4.	(b)	11.	(b)	18.	(d)	25.	(d)	32.	(d)	39.	(a)	46.	(a)	53.	(b)	60.	(a)
5.	(c)	12.	(d)	19.	(d)	26.	(d)	33.	(d)	40.	(d)	47.	(d)	54.	(d)	61.	(d)
6.	(b)	13.	(c)	20.	(b)	27.	(c)	34.	(d)	41.	(a)	48.	(b)	55.	(b)	62.	(a)
7.	(b)	14.	(b)	21.	(c)	28.	(a)	35.	(b)	42.	(a)	49.	(a)	56.	(d)	63.	(b)

EXPLANATION

1. (b)

Total capacity
60

eff.(unit)/min 3 ⟋ ⟍ 2

Minutes → 20 (A)   30 (B)

(A+B)'s capacity of filling for one minute = (3 + 2)= 5 units/minute

(A +B) can fill the full tank in

$$\dfrac{\text{Total capacity}}{\text{efficiency of A and B}} = \dfrac{60}{5}$$

=**12 min.**

2. (b) If $\dfrac{1}{3}$ unit of tank holds 80 litres

Then 1 unit of tank hold

$$= \dfrac{80}{\frac{1}{3}} = \dfrac{80 \times 3}{1} = 240 \text{ litres}$$

then, $\dfrac{1}{2}$ unit of tank hold

$$= 240 \times \dfrac{1}{2} = \textbf{120 litres}$$

3. (c)

(Total capacity)
60

efficiency unit/hour → 5   4   3

hours→ 12   15   20
pipe →(A) (B) (C)
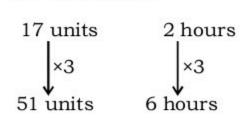
First hour, A and B works together and in second hour A and C works together and It becomes 1 cycle.

(A+B)'s one hour work (A+B)

= 5 + 4 = 9 units

(A+C)'s one hour work = 5 + 3 = 8 units

They complete (9 + 8) = 17 units in two hours

17 units   2 hours
↓×3   ↓×3
51 units   6 hours

Remaining Capacity
= 60 – 51 = 9 units

Now 3 cycle's are completes
Now pipes (A + B) will start filling then they will fill it in

$$= \dfrac{\text{total capacity left}}{\text{efficiency of A+B}} = \dfrac{9}{9} = \textbf{1 hour}$$

Total time = 6 + 1 = 7 hours

4. (b)

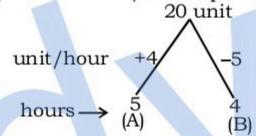|	Pipe 1 :	Pipe2
Diameter	D :	2D

area $\quad \pi\left(\dfrac{D}{2}\right)^2 : \pi\left(\dfrac{2D}{2}\right)^2$

$\pi D^2 : 4\pi D^2$

efficiency of draining 1 : 4

Pipe1 : Pipe2
efficiency 1 : 4
Time 4 : 1
     ↓×10   ↓×10
Actual time 40 min   10 min

5. (c)

(Total capacity)
20 unit
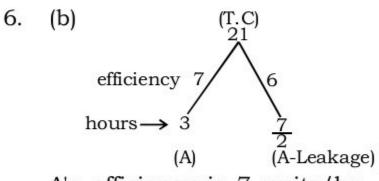
unit/hour +4 ⟋ ⟍ –5

hours → 5 (A)   4 (B)

(+) sign shows filling efficiency
(–) sign shows emptying efficiency

If A and B work simultaneously. Then A will fill 4 units/hour and B will empty 5 units/hour

If overall 1 unit/hour will be emptied.

Then full tank will empty in

$$\dfrac{\text{total capacity}}{\text{A's eff. + B's eff.}} = \dfrac{20}{4-5} = \dfrac{20}{-1}$$

= **20 hours**

6. (b)

(T.C)
21

efficiency 7 ⟋ ⟍ 6

hours → 3 $\dfrac{7}{2}$
      (A)   (A-Leakage)

A's efficiency is 7 units/hr
A's efficiency after leakage 6 units/hr
Leakage efficiency = 7 – 6
= 1 units/hour

Leakage will empty the fully filled tank:

$$\dfrac{\text{T.C}}{\text{Efficiency}} = \dfrac{21}{1}$$

= **21 hrs**

7. (b)

(Total capacity)
300

unit/min → 5   4   6

min → 60 (A)   75 (B)   50 (A + B – C)

(C is third pipe It is emptying pipe

efficiency of A + B – C = 6
5 + 4 – C = 6
– C = 6 –5 – 4
– C = – 3
C = 3 units/min

Third pipe can empty the tank,

$$\dfrac{\text{T.C.}}{\text{C's eff.}} = \dfrac{300}{3}$$

= **100 minutes**

8. (d) Let total capacity of tank = 6 units

∴ Efficiency of A/hr. = $\dfrac{6}{6}$

= 1unit

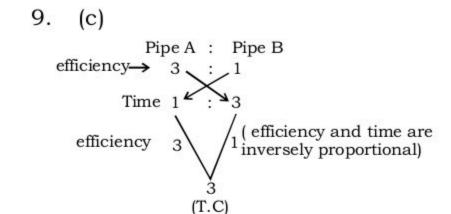Half tank capacity = $\dfrac{6}{2}$ = 3 units

It will be filled in = 3 hrs
According to question,
3 more taps of capacity (1 unit/hr) are opened with first tap
Total capacity of 4 taps
= 4 units/hrs
They will fill the tank in

$$= \dfrac{\text{Remaining capacity}}{\text{efficiency}}$$

$$= \dfrac{3 \text{ units}}{4 \text{ units/h}} = \dfrac{3}{4} \text{ hours}$$

Total time = $3\dfrac{3}{4}$ hrs

= **3 hr.45 min**

9. (c)

Pipe A : Pipe B

efficiency→ 3 : 1

Time 1 : 3

(crossed arrows)

efficiency 3 ✗ 1 (efficiency and time are inversely proportional)

3 (T.C)

Total time taken by A +B

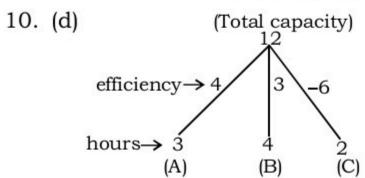$$= \frac{T.C}{\text{efficiency of (A+B)}} = \frac{3}{3+1} = \frac{3}{4}$$

$\frac{3}{4}$ units of time = 36 min

1 unit of time = $36 \times \frac{4}{3}$

(B takes 3 units of time to fill alone)

3 units of time = $36 \times \frac{4}{3} \times 3$

= 144 mins

10. (d)

(Total capacity) 12

efficiency→ 4 / 3 \ −6

hours→ 3 (A) / 4 (B) \ 2 (C)

(A and B are filling pipe and C is empty pipe

If all pipes are kept open then unit/hr filled:
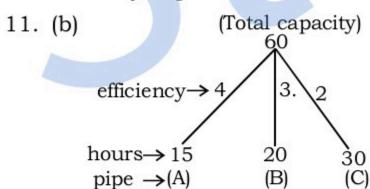
A + B − C

⇒ 4 + 3 − 6

⇒ 1 units/hr

Empty tank will be filled in

$$\frac{T.C}{\text{efficiency}} = \frac{12}{1} = \textbf{12 hrs}$$

11. (b)

(Total capacity) 60
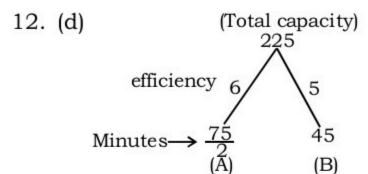
efficiency→ 4 / 3. \ 2

hours→ 15 (A) / 20 (B) \ 30 (C)

pipe →(A) (B) (C)

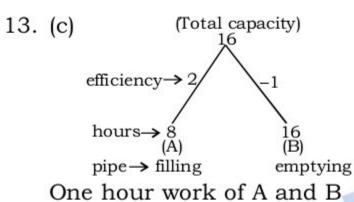(A and B → filling pipe, C →waste pipe)

According to question

All pipes opened simultaneously A+B will fill (4+3) = 7 units/hr

C will empty =2 units/hr

total filling/hr = 7 − 2 = 5units

Tank will be filled in:

$$\frac{T.C}{\text{Efficiency}} = \frac{60}{5} = 12 \text{ hrs}$$

12. (d)

(Total capacity) 225

efficiency 6 / \ 5

Minutes→ $\frac{75}{2}$ (A) / 45 (B)

According to question,

cistern fills in 30 minutes

So pipe A worked for 30 minutes

It filled = 30×6 = 180 units

Remaining capacity = 225 − 180 = 45 units
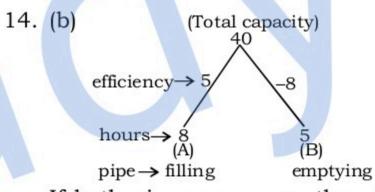
So this remaining capacity must be filled by B

B must have filled it in $\frac{45}{5}$ = **9 min.**

13. (c)

(Total capacity) 16

efficiency→ 2 / \ −1

hours→ 8 (A) / 16 (B)

pipe→ filling   emptying

One hour work of A and B

= 2 − 1 = 1 unit

Time taken to fill the empty cistern

$$\frac{T.C}{\text{eficiency}} = \frac{16}{1} = \textbf{16 hrs}$$

14. (b)

(Total capacity) 40

efficiency→ 5 / \ −8

hours→ 8 (A) / 5 (B)

pipe→ filling   emptying

If both pipes are open, then total units/hr. empty the tank

(A − B) = 5 − 8 = − 3 units

According to question,

Tank has $\frac{3}{4}$ of its total capacity

in begining $\frac{3}{4} \times 40$ =30 units

Time taken to empty the tank

$$\frac{30}{(-3)} = \textbf{10 hours}$$

15. (c) According to question,

If tank has $4x$ litres of total capacity and it holds $3x$ litres of water and, if 30 litres of water is taken out, then tank becomes
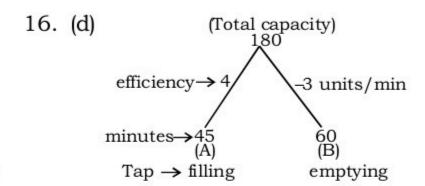
empty. It mean 3x litres of water is taken out

$3x$ = 30 litres

x = 10 litres

∴ capacity of tank

= $4x$ = 4×10 = 40 litres

16. (d)

(Total capacity) 180

efficiency→ 4 / \ −3 units/min

minutes→45 (A) / 60 (B)

Tap → filling   emptying

In first minute A fills 4 units of water

In second minute B empty − 3 units of water

After two minutes tanks has 1 units of water.

Note: Decrease the higher value i.e 4 from total capacity 180−4 = 176 units.

1 unit filled in 2 minutes

176 units filled in 352 minutes

Now in next minutes pipe A will fill 4 units. And tank is full so total time taken is 352 + 1 = 353 minutes or **5 hour 53 minutes**

17. (a)

Pipe A : Pipe B

diameter   D : 2D

$$\pi\left(\frac{D}{2}\right)^2 : \pi\left(\frac{2D}{2}\right)^2$$

$$\frac{\pi D^2}{4} : \pi D^2$$

$$\pi D^2 : 4\pi D^2$$

$$1 : 4$$

A : B

eff. 1 : 4

Time 4 : 1

×10↓   ↓×10
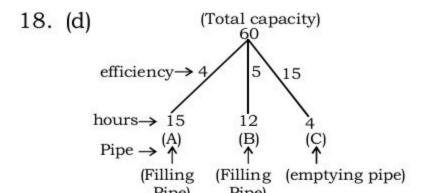
40 min   10 min

efficiency → 1 / \ 4

40 (T.C)

(A+B) empties in $= \dfrac{40}{4+1}$

= 8 minutes

18. (d)

(Total capacity)
60

efficiency→ 4 / 5 \ 15

hours→ 15 (A) / 12 (B) / 4 (C)

Pipe → (Filling Pipe) / (Filling Pipe) / (emptying pipe)

Pipe A opens at 8 am. it fills 4 units/hr
Pipe A fills 4 × 3 = 12 unit in 3 hrs
So by 11 am. it fills 12 units
Similarly,
Pipe B opens at 9 am. it fills 5 units/hr
By 11 am it fills 5×2 = 10 units
total water in tank till 11 am
= 12 + 10 = 22 units
Now, 11 am onwards all pipes work simultaneously including emptying pipe.
(A + B + C) efficiency is 4 + 5 – 15 = – 6 units
now 6 unit will be emptied per hour then Tank will be emptied at after

$$\frac{22}{6} = 3\frac{4}{6} = 3hr\ .40\ minutes$$

The tank will be emptied at
= 11am + 3hrs 40 min.
= **2 : 40pm**

19. (d)

(Total capacity)
14

efficiency 7 / 6

hour → 2 (A) / $\frac{7}{3}$ (A -Leak)

efficiency of A = 7 units/hour
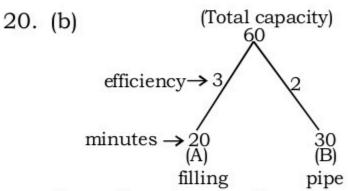efficiency of A after leak
= 6 units/hour
Leak's efficiency
= 7 – 6 = 1 unit/hour
Now leak can drain Full tank in

$$\frac{T.C}{efficiency\ of\ leak} = \frac{14}{1} = \textbf{14 hrs}$$

20. (b)

(Total capacity)
60

efficiency→ 3 / 2

minutes → 20 (A) filling / 30 (B) pipe

According to questions,
Pipe 'A' is closed after some time. and Tank is filled in 18 miuntes so B started filling the tank in beginning and worked till last i.e 18 minutes

So, 2 × 18 = 36 units is filled
Work left = 60 – 36 = 24 units
This 24 units must be filled by Pipe A in beginning.

It can fill it in $\frac{24}{3}$ = **8 minutes**

21. (c) Apply formula of

$$\frac{M_1D_1h_1}{W_1} = \frac{M_2D_2h_2}{w_2}$$

Let 'P' pumps are required to empty the reservoir.

$$\frac{12_{pumps} \times 6_{hours} \times 15_{days}}{1_{reservoir}} = \frac{P \times 9_{hours} \times 12_{days}}{1_{reservoir}}$$

P = **10 pumps**

22. (a)

efficiency→ Pipe A : Pipe A-leakage
2 : 1

Time 1 : 2
×36 | 1 unit= 36hrs

36hrs

23. (d) let (A + B) fills 1 litre in 1 minutes
then (A + B) fills in 36 minutes
= 36 litres
According to question
(A+B) work only for 30 minutes then pipe filled by (A+B) in 30 minutes is = 30 litres
remaining part = (36–30) = 6 litres
6 litres part filled by A in
=10 minutes

1 part filled by A = $\frac{10}{6}$ minutes

36 part filled by A = $\frac{10}{6}$ × 36

= 60 minutes
A + B = 36 minutes
A = 60 minutes

T.C
180

efficiency→ 3 / 5 litres/minute

60 (A) / 36 (A + B)

A's efficiency
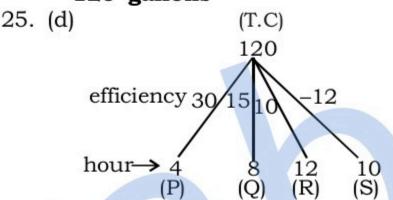= 3 litres/minute
B's efficiency
= 2 litres/minute.
B can alone fill the tank in

$$= \frac{T.C}{eff.\ of\ B} = \frac{180}{2} = \textbf{90 minutes}$$

24. (c)

(Total capacity)
120

efficiency→ 6 / 5 \ 8

minutes→20 (A) / 24 (B) / 15 (A+B+C)

(A + B – C) one day work = 8
6 + 5 – C = 8
11 – C = 8
C = 8 – 11
C = 3
C = 3 units   T.C = 120
×1 ↓   ×1 ↓
Actual 3 Gallons   120 Gallons
emptying capacity

Capacity of tank is
= **120 gallons**

25. (d)

(T.C)
120

efficiency 30 / 15 | 10 \ –12

hour→ 4 (P) / 8 (Q) / 12 (R) / 10 (S)

In order to fill the cistern in less time. So efficiency of filling should be more
Now, check all options
(A) → Q efficiency 15 units/hr
(B) → (P + R – S) efficiency
= 30 + 10 – 12 = 28 units/hr
(C) → (P + S) efficiency = 30 – 12
= 18 units/hr
(D) → (P + Q –S) efficiency
= 30 + 15 – 12 = 33 units/hr
Option'D' is answer.
Since efficiency of option'D' is highest.

26. (d)

(Total capacity)
30

efficiency→ 3 / 2

hours → 10 (–A) Emptying / 15 (–A+B) Filling

Pipe A is emptying at 3 units/hr
When filling pipe'B' start functioning then emptying rate comes down to 2 units/hr
So filling pipe efficiency is
(3 – 2) = 1 unit/hr

Pipe 'B' will fill tank in= $\frac{30}{1}$ =30 hrs

filling rate is 4 litres/minute
It will fill 4 × 60 = 240 litres/hr.
Total capacity = 240×30
= **7200 litres**

27. (c)

	Qty	Time(in min)
Boy →	4 litres	3
Girl →	3 litres	4

Boy → 4×4 3×4= 16 litres in 12 miuntes

Girl → 3×3 4×3 = 9 litres in 12 miuntes

(Boy + Girl) pour

25 litres	12 minutes
×4↓	×4↓
100 litres	**48 minutes**

28. (a) let total capacity = 42 units
∴ (A + B + C) per hour work

$= \dfrac{42}{6}$ = 7 units

A + B + C fills 7 units/hour
They all worked for 2 hour
Total water filled = 7 × 2 = 14 units
Remaining capacity
= 42 – 14 = 28
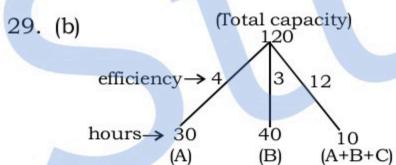
(A+B)'s efficiency = $\dfrac{28}{7}$

= 4 units/hr.
(A+B) efficiency 4 units/hr.
C's efficiency
= [(A+B+C) –(A + B)] efficiency
= 7 – 4 = 3 units/h
C can alone fill the cistern in

$\dfrac{T.C}{Efficiency} = \dfrac{42}{3}$ = 14 hrs

29. (b)

(Total capacity)
120

efficiency→ 4   3   12

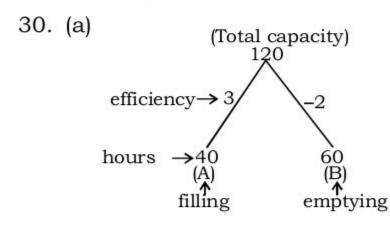| hours→ 30	40	10
(A)	(B)	(A+B+C)

C's efficiency
= efficiency of (A+ B + C) – efficiency of (A+B) = 12 – (4 + 3)
= 5 units/minutes
C can fill the cistern alone in

$\dfrac{T.C}{Efficiency\ of\ C} = \dfrac{120}{5}$ =24 mintues

30. (a)

(Total capacity)
120

efficiency→ 3   –2

hours →40	60
(A)	(B)
filling	emptying

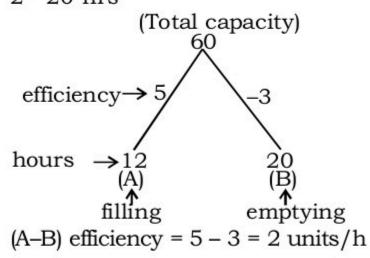Total unit of water filled is
= 3 – 2 = 1 unit/min

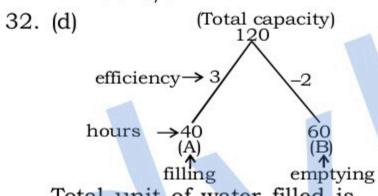Tank will be filled in = $\dfrac{120}{1}$

= **120 minutes**
Tank will be filled in 120 minutes
= **2 hrs**

31. (c) If emptying pipe empty half the tank in 10 hrs then emptying pipe empty full tank in 10 × 2= 20 hrs

(Total capacity)
60

efficiency→ 5   –3

hours →12	20
(A)	(B)
filling	emptying

(A–B) efficiency = 5 – 3 = 2 units/h

$\Rightarrow \dfrac{\frac{1}{2}\ of\ T.C}{2\ unit/s} \Rightarrow \dfrac{30}{2}$ = **15 hrs**

32. (d)

(Total capacity)
120

efficiency→ 3   –2

hours →40	60
(A)	(B)
filling	emptying

Total unit of water filled is
= 3 – 2 = 1 unit/min

Tank will be filled in = $\dfrac{120}{1}$

= **120 minutes**
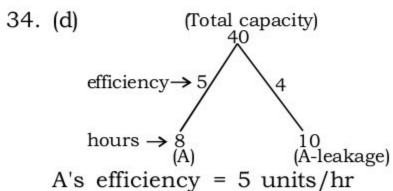
33. (d)

(Total capacity)
60

efficiency→ 5   4

minutes→12	15
(P)	(Q)

(P + Q) efficiency = (5 + 4)
= 9 units/minutes
(P + Q) fill in 3 minutes = 9 × 3
= 27 units
Remaining capacity = 60 – 27
= 33 units
Q fill remaining cistern in

$\dfrac{T.C}{Efficiency\ of\ Q} = \dfrac{33}{4} = 8\dfrac{1}{4}$ minutes

34. (d)

(Total capacity)
40

efficiency→ 5   4

hours → 8	10
(A)	(A-leakage)

A's efficiency = 5 units/hr

A's efficiency after leakage
= 4 units/hr
∴ Leakage = 1 unit/hr
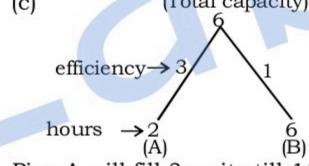Leakage empties the whole cistern in $\dfrac{40}{1}$ = 40 hours

35. (b)

(Total capacity)
60

efficiency→ 6   5   10

hours→ 10	12	6
(P)	(Q)	(C)

(P + Q) fills (6 + 5) = 11 units/hr
C empties = 10 units/hr
If all pipes are open
So, only 11 – 10 = 1 unit of water can be filled in tank

$\dfrac{1}{4}$ of tank will be filled in

$\dfrac{T.C}{Efficiency} = \dfrac{\left(\frac{1}{4}\times 60\right)}{1} = \dfrac{15}{1}$ = 15 hrs

= 7 am +15 hr = **10 pm**

36. (c)

(Total capacity)
6

efficiency→ 3   1

hours →2	6
(A)	(B)

Pipe A will fill 3 units till 11 am.
Remaining capacity
= 6 – 3 = 3 units
Now both pipes will fill the tank in

$\dfrac{T.C}{Efficiency} = \dfrac{3}{(3+1)} = \dfrac{3}{4}$ hours

So, $\left(11+\dfrac{3}{4}\right)am$, tank will be filled

= **11 : 45 A.M**

37. (a) let total capacity of cistern is 5 units
filled part of the cistern

= 5 units $\times \dfrac{3}{5}$ = 3 units

Rest part of the cistern
= 5 – 3 = 2 units
3 units filled in = 60 sec.

1 unit filled in = $\dfrac{60}{3}$

2 units filled in = $\dfrac{60}{3}$ × 2 = 40 sec.

38. (c) Volume of cistern $= \pi r^2 h$

$\pi r^2 \times h = 11000$ cm³

$\dfrac{22}{7} \times \dfrac{25}{2} \times \dfrac{25}{2} \times h = 11000\,cm^3$

$h = \dfrac{11000 \times 7 \times 2 \times 2}{22 \times 25 \times 25}$

$h = \dfrac{28 \times 4}{5} = \dfrac{112}{5} = 22\dfrac{2}{5}$ cm

39. (a)

```
            (Total capacity)
                 40
efficiency→ 5 /     \ 4
         hours→8      10
            (A)       (B)
```

(A+B)'s one hour filling (A + B) = 9 unit

(A+B)'s 4 hour filling (A+B) = 9×4 = 36 units

Part of tank filled $= \dfrac{36}{40} = \dfrac{9}{10}$

40. (d)

```
            (Total capacity)
                 30
efficiency→10 /  |6  \15
        hours→ 3   5    2
            (A)  (B)  (C)
```
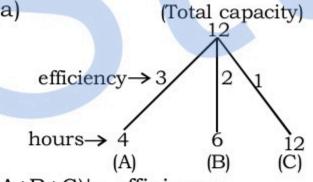
If all pipes are open together, then efficiency of filling/hour is

= efficiency of A + B – efficiency of C = (10 + 6) – 15 = 1 unit/hr
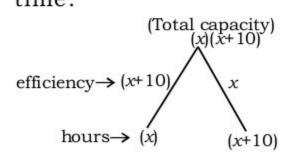
1 unit is filled in 1 hr

30 units is filled in 1×30 = **30 hrs**

41. (a)

```
            (Total capacity)
                 12
efficiency→3 /  |2  \1
       hours→ 4   6   12
           (A)  (B)  (C)
```

(A+B+C)'s efficiency = 3+2+1 = 6 units/hr

(A+B+C) can fill the tank in

$= \dfrac{\text{T.C}}{\text{Efficiency of}\,(A+B+C)} = \dfrac{12}{6} = \textbf{2 hrs}$

42. (a) Always try to solve these question by options to save time.

```
            (Total capacity)
                (x)(x+10)
efficiency→ (x+10) /   \ x
       hours→ (x)        (x+10)
```
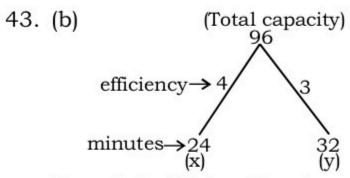
total time taken by both pipe

$= \dfrac{(x) \times (x+10)}{(x+10) + x}$

Now take out one option and put it in place of 'x'

$\Rightarrow x = 20$ (from option (a))

$\dfrac{(20) \times (20+10)}{(20+10)+(20)} = \dfrac{20 \times 30}{50} = 12$ hrs

It matches with question figure. Total time matches. So, the answer is 20 hrs

43. (b)

```
            (Total capacity)
                 96
efficiency→ 4 /     \ 3
     minutes→24      32
          (x)        (y)
```

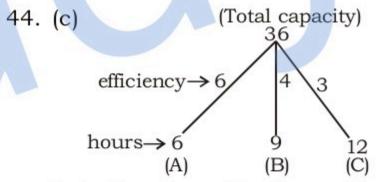If tank is fill in 18 minutes so pipe 'x' will work for these 18 minutes

Pipe'x' fills in 18 minutes = 18 × 4 = 72 units

Remaining capacity = 96−72 = 24 units

So remaining capacity of tank/cistern must be filled by pipe'y'

pipe y fills in $\dfrac{24}{3} = 8$ mins

So, after 8 minutes it must have been closed.

44. (c)

```
            (Total capacity)
                 36
efficiency→ 6 / |4  \3
      hours→ 6   9    12
          (A)  (B)   (C)
```

In half an hour (B+C) must have filled

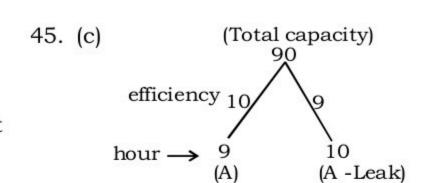$= \dfrac{4}{2} + \dfrac{3}{2} = \dfrac{7}{2}$ units

Capacity left

$= 36 - \dfrac{7}{2} = \dfrac{65}{2}$ units

Now, all pipes will fill the remaining tank

$= \dfrac{65}{2 \times (6+4+3)} = \dfrac{65}{2 \times 13} = \dfrac{5}{2}$

$= 2\dfrac{1}{2}$ **hrs**

45. (c)

```
          (Total capacity)
               90
efficiency 10 /    \ 9
      hour → 9       10
           (A)     (A -Leak)
```

Efficiency of pipe with leak is 9 units

(A – leak) = 9 units

10 – leak = 9 units

– leak = 9 – 10

leak = 1 units/hr

leak will empty the full tank in

$= \dfrac{\text{T.C}}{\text{Efficiency}} = \dfrac{90}{1} = \textbf{90 hrs}$
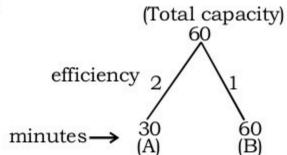
46. (a) Flow of water depend upon

	Pipe 1	Pipe 2	Pipe 3
Diameter→	60	30	20
radius →	30	15	10
	$\pi(30)^2$	$\pi(15)^2$	$\pi(10)^2$
	900π	225π	100π

unit of water they can flow (v∝r²) : 900, 225, 100

No. of pipes : $\dfrac{1}{900}$, $\dfrac{2}{450}$, $\dfrac{3}{300}$

Total water filled →

So pipe 1 with diameter 60 m is fastest

47. (d)

```
            (Total capacity)
                 60
efficiency 2 /      \ 1
    minutes→ 30       60
           (A)        (B)
```
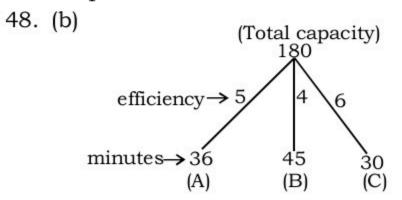
(A+B)'s filling (2+1) = 3 units/min)

In 5 minutes. they will fill 3 × 5 = 15 units

Remaining capacity = 60 – 15 = 45 units

Second pipe (B) fills it in

$\dfrac{\text{R.C}}{\text{efficiency of B}}$

$= \dfrac{45}{1} = \textbf{45 minutes}$

48. (b)

```
            (Total capacity)
                180
efficiency→ 5 / |4  \6
   minutes→36   45    30
          (A)  (B)   (C)
```

(A + B)'s 7 minutes filling
= (5 + 4) × 7 = 63 units
Remaining capacity = 180 – 63
= 117 units
Now C is opened, it empties by
6 units/min.
So total units filled in tank is
= (5+4)–6 = 3 units/min
Now tank can be filled in

$= \dfrac{117}{3}$ = 39 min.

Tank is filled up in
= 7 + 39 minutes = **46 min.**

49. (a)

efficiency → 3 / 2
hours → 2 (A) / 3 (B)
(top: 6)

(A + B) fill tank in

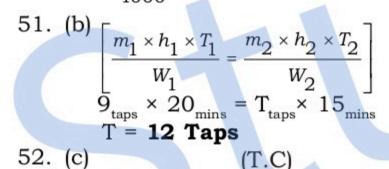$= \dfrac{\text{T.C}}{\text{Efficiency of (A+B)}} = \dfrac{6}{3 + 2}$

$= 1\dfrac{1}{5}$ = **1 hour 12 min**

50. (d) 1 sec → 1 drop
No of second in 300 days.
$(24_{hrs} × 60_{mins} × 60_{sec}) × 300$ days
No of milli-litres wasted

$100 × \dfrac{24 × 60 × 60 × 300}{600} = 43200 × 100$

= 4320000 ml

$= \dfrac{4320000}{1000} = 4320$ litres

51. (b) $\left[\dfrac{m_1 × h_1 × T_1}{W_1} = \dfrac{m_2 × h_2 × T_2}{W_2} \right]$

$9_{taps} × 20_{mins} = T_{taps} × 15_{mins}$

T = **12 Taps**

52. (c)

(T.C) 60
efficiency → 3 / –2
minutes → 20 (A) / 30 (B)

A fill 3 units in first minute and
B empties 2 units in second
minutes
(A + B)'s efficiency = 3–2/2min
= 1 units/2min

Efficiency	Time
1 ×57	2 ×57
57	114 min
A work +3	+1
60	115 min

They take to fill 60 units in
= 115 min.

---

53. (b)

Total capacity (180)
6 l./m. → A (30 min.) (+)
4 l/m. → B (45 min.) (+)
–5 l./m. → C (36 min.) (–)

A ... (+) 30 minutes
B ... (+) 45 minutes
C ... (–) 36 minutes
⇒ Water filled by (A+B) in 12 min
= 12 × (6 + 4)
= 12 × 10 = 120 litre
⇒ Remaining capacity
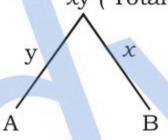= 180– 120 = 60 litre
⇒ After 12 min. emptied pipe C
is also opened
⇒ Total capacity (A + B – C)
= (6 + 4 – 5) = 5 l./m.
⇒ Time taken by (A + B – C) with
capacity 5 l./m. to fill the
remaining part

$= \dfrac{60\, l.}{5\, l./m.}$ = 12 min.

⇒ Therefore, total time in which
the tank will be filled up is
= 12 + 12 = 24 minutes.

54. (d)

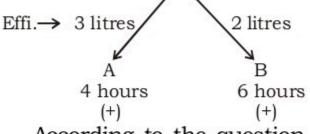xy (Total Capacity)
y / x
A / B
x (+) hour / y (–) emptied hour

Time will be taken by both of
them to fill the tank

$= \dfrac{x\, y}{y - x}$

55. (b) A → 4 hours
B → 6 hours
LCM → 12 litres → Total Capacity
Effi. → 3 litres / 2 litres
A (4 hours) (+) / B (6 hours) (+)

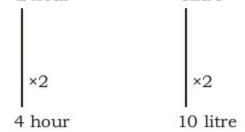According to the question,
⇒ For the first hour tap A is
opened and B for second hour
⇒ Work done by both in 2 hours
→ (3l/h + 2l/h)×2 = 10 units

2 hour | 5litre
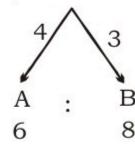×2 | ×2
4 hour | 10 litre

⇒ Remaining part
= 12 – 10 = 2 litre
⇒ Again 5th hour A will be opened
Tap A will fill the 2 litre water

with its efficiency $= \dfrac{2}{3}$ hours

⇒ Therefore tank will be filled in

$= \left(4 + \dfrac{2}{3}\right)$ hours $= 4\dfrac{2}{3}$ hours.

56. (d) Total capacity = 24

4 / 3
A : B
6 : 8

2 hours work of both pipes

= (4 + 3) × 2 = 14 units

Remaining capacity
= 24 – 14 = 10 units
Now B fills remaining capacity
of tank in

$\Rightarrow \dfrac{10}{3} = 3\dfrac{1}{3}$ hours

57. (d) According to the question,

A → 4h, 4 unit/hr
16 (Total capacity)
B → 16h, –1unit/hr

A & B one hour work (4 – 1)
= 3 units
A + B filled the tank in

$= \dfrac{16}{3} = 5\dfrac{1}{3}$ hours

58. (c)

72 (Total Capacity)
+3 l/h / 2 l/h
A (Pipe) 24 hours (+) / B (Pipe + leakers) 36 hours

According to Question
Efficiency of leakage
= 3–2 = 1 L/h

Half capacity $= \dfrac{72}{2}$

= 36 litres
Time taken by leakage to empty
the Half filled tank

$= \dfrac{36\ \text{litre}}{1\ \text{litre/h}}$ = 36 hours
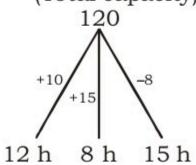
59.(c)

15
(Total Capacity)

Efficiency → 5 / 4 / 15

Hours → 3 $\frac{15}{4}$ 1

(I)   (II)   (III)

I^{st} pipe fills till 3pm = 5×2 = 10 units

IInd pipe fills till 3pm = 4×1= 4 units

Total filled = 10+4 = 14 units

Net Pipe (III) efficiency = 15 – 9 = 6 units/hrs

Tank will be empty in

$=\dfrac{14}{6}$ = 2hr 20 min.

3pm + 2hr 20min = 5:20 pm

60. (a)

(Total capacity)
120

+10 / +15 / −8

12 h   8 h   15 h

In one Hour it will fill
= 10 + 15 − 8 = 17

∴ In 5 hr = 17 × 5 = 85

∴ Portion will filled in 5 hr

$=\dfrac{85}{120}=\dfrac{17}{24}$

61. (d)

A − 8 ⟍ 3   A opened at 7 Am
        ⟩24
B − 12 ⟋ 2   B opened at 9 Am

A Opened 2 hours early to B.

In 2 hours A can do 3 × 2 = 6 unit work
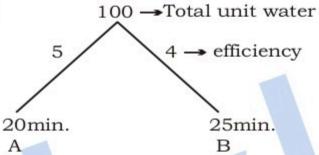
Remaining work = 24 − 6 = 18

A + B can do it in → $\dfrac{18}{5}$

$=3\dfrac{3}{5}$ h = 3h 36 min

∴ Tank will be full in 9 Am + 3h 36 m

= 12 : 36 PM

62. (a)

100 → Total unit water

5 / 4 → efficiency

20min.   25min.
A   B

after '5' min the water fill by A + 5 × 9 = 45 unit water

Then remaining water unit = 100 − 45 = 55

This remaining unit water filled by A

$=\dfrac{55}{5}$

= 11 minutes

63. (b)

Total work → pq

efficiency → q / p

time → p   q
      (+)   (−)

Net efficiency = q − p (∵ q>p)

time required = $\dfrac{pq}{q-p}$

r = $\dfrac{pq}{q-p}$

or $\dfrac{1}{r}=\dfrac{1}{p}-\dfrac{1}{q}$