

If Bunty worked $\frac{1}{3}$ as efficiently as he actually did and Balaji worked $\frac{1}{3}$ as efficiently as she actually did, the work would have been completed in 6 days. Find the time taken by Bunty to complete the job alone :

- (a) 8 days (b) $\frac{38}{35}$ days
(c) $\frac{15}{2}$ days (d) $13\frac{1}{3}$ days

12. A single reservoir supplies the petrol to the whole city, while the reservoir is fed by a single pipeline filling the reservoir with the stream of uniform volume. When the reservoir is full and if 40,000 litres of petrol is used daily, the supply fails in 90 days. If 32,000 litres of petrol is used daily, it fails in 60 days. How much petrol can be used daily without the supply ever failing?
(a) 64000 litres (b) 56000 litres
(c) 78000 litres (d) 60000 litres

13. Railneer is packaged in a water bottling plant, with the help of two machines M_1 and M_2 . M_1 and M_2 produces 400 and 600 bottles per minute. One day's production can be processed by M_1 operating alone for 9 hours, by M_2 operating alone for 6 hours or by both M_1 and M_2 operating simultaneously for 3 hours and 36 minutes. If one day's production is processed by M_1 operating alone for $\frac{1}{3}$ of the time and M_1 and M_2 simultaneously operating for $\frac{2}{3}$ of the time, then in how many hours total production of one day will be completed?
(a) 2 (b) 3
(c) 4.5 (d) 4.8

14. **Directions for questions 8, 9 and 10 :** At Arihant Prakashan every book goes through 3 phases (or stages) typing, composing and binding. There are 16 typists, 10 composers and 15 binders. A typist can type 8 books in each hour, a composer can compose 12 books in each hour and a binder can bind 12 books in each hour. All of the people at Arihant Prakashan works for 10 hours a day and each person is trained to do only the job of 1 category.

8. How many books can be prepared in each day?
(a) 1500 (b) 1200
(c) 1440 (d) 1380

9. If company has hired 12 more people, who can do any of the three jobs, then maximum how many books can be prepared in each day?
(a) 1500
(b) 1680
(c) 1800
(d) more than 2000

10. If company wanted to reduce the number of employees by 3, then from which category it reduces the number of employees without reducing the amount of production of books?
(a) It should reduce two binders and 1 typist
(b) It should reduce three binders only
(c) It should reduce 1 typist, 1 composer and 1 binder
(d) both (a) and (b) are possible

14. How much work he had been completed, before increasing the number of workers?

- (a) 10%
(b) $14\frac{2}{7}\%$
(c) 20%
(d) can't be determined

15. Some-time after the new workers were introduced, all of the newly introduced workers left the work due to heavy rain and the efficiency of the remaining workers reduced by 20% due to which the work finally got completed by delay of 60% of the scheduled time then how much work still remained incomplete by the end of the scheduled time?
(a) $17\frac{3}{5}\%$ (b) 21%
(c) $27\frac{5}{7}\%$ (d) 28%

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Time and Work
Directions for questions 16 to 20: A typist employed a certain number of typists for his project. 8 days later 20% of the typist left the job and it was found that it took as much time to complete the rest work from then as the entire work needed with all the employed typists. The average speed of a typist is 20 pages/hour.

- 20 pag

16. How many typists left the work?
 (a) 10
 (b) 5
 (c) 16
 (d) can't be determined

17. Minimum how many typist could be employed?
 (a) 10
 (b) 5
 (c) 15
 (d) 4

18. What could be the number of typists remained at work when 20% of the employed typists left the job?
 (a) 15
 (b) 18
 (c) 68
 (d) 78

19. What is the actual number of days required, when it is done with actual work force, through out the completion :
 (a) 32 days
 (b) 48 days
 (c) 40 days
 (d) can't be determined

20. 16 days after the 20% typist left the job it was decided to complete the work on time by increasing the work-force again. By how much percentage increase in work-force is required?
 (a) 100%
 (b) 50%
 (c) 200%
 (d) none of these

21. Five tailors *A, B, C, D* and *E* stich 1800 shirts in 90 days working alternatively. Find the minimum possible number of shirts that can be stiched in a single day by working together :
 (a) 100
 (b) 20
 (c) 50
 (d) 4

6 Directions for question number 22, 23 : 8 men and 5 women working 6 hours a day can complete a work in 4 days. Also 4 men and 5 women working for 8 hours a day can complete the same job in 5 days. Similarly 5 boys working 8 hours a day can complete the same job in 30 days.

22. If 4 men, 3 women and 4 boys worked together everyday for 5 hours, then in how many days they have completed the work?
 (a) 3
 (b) 4
 (c) 8
 (d) 6

23. If women and children (boys) can't be employed, then minimum how many men are required to complete the job in 6 days if the working hours per day cannot exceed 9?
 (a) 4
 (b) 5
 (c) 6
 (d) 7

24. Eklavya can do the 6 times the actual work in 36 days while Faizal can do the one-fourth of the original work in 3 days. In how many days will both working together complete the 3 times of the original work?
 (a) 6
 (b) 10
 (c) 12
 (d) 15

25. Program

Progressive Company Pvt. Ltd. hired some employees in a fix pattern. On the first day it hired one person, on the second day one more joined him. On the third, fourth etc (i.e., every

32. Milinda takes $8\frac{1}{3}$ hours more when she works alone in comparison of when she works with Bill. While Bill takes $5\frac{1}{3}$ hours more when he work alone in comparison to the time, when he works with Milinda. How long it will take Bill to complete the work alone?

(a) 10 hours (b) 15 hours
(c) 18 hours (d) 12 hours

33. Pascal and Rascal are two workers. Working together they can complete the whole work in 10 hours. If the Pascal worked for 2.5 hours and Rascal worked for 8.5 hours, still there was half of the work to be done. In how many hours Pascal working alone, can complete the whole work?

(a) 24 hours (b) $17\frac{1}{7}$ hours
(c) 40 hours (d) can't be determined

34. Boston, Churchill and David are three workers, employed by a contractor. They completed the whole work in 10 days. Initially all of them worked together, but the last 60% of the work was completed by only Churchill and David together. Boston worked with Churchill and David only for initial two days then he left the work due to his poor health. Also Churchill takes 20% less time to finish the work alone than that of David working alone. If they were paid Rs. 3000 for the entire work, then what is the share of least efficient person?

(a) Rs. 900 (b) Rs. 1200
(c) Rs. 1000 (d) none of these

35. There are three boats B_1 , B_2 and B_3 working together they carry 60 people in each trip. One day an early morning B_1 carried 50 people in few trips alone. When it stopped carrying the passengers B_2 and B_3 started carrying the people together. It took a total of 10 trips to carry 300 people by B_1 , B_2 and B_3 . It is known that each day on an average 300 people cross the river using only one of the 3 boats B_1 , B_2 and B_3 . How many trips it would take to B_1 to carry 150 passengers alone?

(a) 15 (b) 30
(c) 25 (d) 10

36. Three men and 5 women together can finish a job in 3 days. Working on the same job 3 women take 5 days more than the time required by 2 men. What is the ratio of efficiency of a man to a woman?

(a) 2 : 1 (b) 3 : 2
(c) 5 : 2 (d) 4 : 1

37. Henry and Ford are two different persons, but when they worked together, they complete it in 10 days. Had Henry worked at half of his efficiency and Ford at five times of his efficiency it would have taken them to finish the job in 50% of the scheduled time. In how many days Ford can complete the job working alone?

(a) 12 (b) 24
(c) 15 (d) 30

38. Anne, Benne and Cenne are three friends. Anne and Benne are twins. Benne takes 2 days more than Cenne to complete the work. If Anne started a work and 3 days later Benne joins

him, then all three can complete in 3 more days. Working together Anne, Benne and Cenne can complete thrice the original work in 6 days. In how many days Benne can complete twice the original work with double the efficiency working alone?

(a) 2 (b) 3
(c) 4 (d) 6

39. Three typists A , B and C working together 8 hours per day can type 900 pages in 20 days. In a day B types as many pages more than A as C types as many pages more than B . The number of pages typed by A in 4 hours equal to the number of pages typed by C in 1 hour. How many pages C types in each hour?

(a) 1 (b) 2
(c) 3 (d) 4

40. **Directions for question number 40 and 41:** Four pipes A , B , C and D can fill a cistern in 20, 25, 40 and 50 hours respectively.

40. The first pipe A was opened at 6:00 am, B at 8:00 am, C at 9:00 am and D at 10:00 am. When will the cistern be full?

(a) 4:18 pm (b) 3:09 pm
(c) 12:15 pm (d) 11:09 am

41. If A and B are opened as inlet pipe into the cistern and C and D are opened as outlet pipes from the cistern and all the four pipes are opened simultaneously, how many hours will it take to fill the cistern completely?

(a) 20 hours (b) $11\frac{1}{9}$ hours
(c) $22\frac{2}{9}$ hours (d) 45 hours

42. A tank is connected with four pipes A , B , C and D of which two are filling the tank and other two are emptying it. The time taken by A , B , C and D to finish their jobs are 10 hours, 15 hours, 20 hours and 30 hours respectively. All four pipes are opened. When the tank was empty, it took 12 hours to fill it completely. Which two are the outlet pipes?

(a) A and B (b) C and D
(c) A and C (d) B and D

43. Two pipes A and B can fill a tank in 24 hours and $\frac{120}{7}$ hours respectively. Harihar opened the pipes A and B to fill an empty tank and some times later he closed the taps A and B , when the tank was supposed to be full. After that it was found that the tank was emptied in 2.5 hours because an outlet pipe C connected to the tank was open from the beginning. If Harihar closed the pipe C instead of closing pipes A and B the remaining tank would have been filled in :

(a) 2 hours (b) 8 hours
(c) 6 hours (d) 4 hours

44. 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?

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- Time and Work
(a) $9\frac{2}{3}$ hours
(b) $10\frac{1}{3}$ hours
(c) 10 hours
(d) none of these

Directions for question number 45 and 46: 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.

45. If both pipes are opened simultaneously at a time when the tank was one-third filled, when will the tank fill thereafter?
(a) $\frac{3}{2}$ hours
(b) $\frac{2}{3}$ hour
(c) 2 hours
(d) $1\frac{2}{3}$ hours

46. If there is a leakage also which is capable of draining out the liquid from the tank at half of the rate of outlet pipe, then what is the time taken to fill the empty tank when both the pipes are opened?
(a) 3 hours
(b) $3\frac{2}{3}$ hours
(c) 4 hours
(d) none of these

47. 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 over flows?
(a) 3
(b) 6
(c) 8
(d) 7

Directions for question number 48 and 49: 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 $(K-1)^{\text{th}}$ tap.

48. If the 10th tap takes 2 hours to fill the tank alone then what is the ratio of efficiency of 8th tap and 12th tap, respectively?
(a) 4:1
(b) 5:3
(c) 16:1
(d) 1:16
49. If the 8th tap takes 80 hours to fill the tank then the 10th and 12th taps working together take how many hours to fill the tank?
(a) 2 hours
(b) 4 hours
(c) 6 hours
(d) none of these

50. Pipe A takes $\frac{3}{4}$ of the times 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 $\frac{3}{4}$ more time

Final Round

Directions for question number 1 to 5: In a nut-bolt factory 180 workers are working for 6 hours a day. Out of 180 workers there are some men, some women and rest are boys. All the workers can produce either nut or bolt or both of them. A man can produce 60 nuts and 80 bolts in each hour and a woman

to fill the empty tank than it takes, when only pipe A and pipe B are opened together. If it takes to fill 33 hours 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

Directions for question number 51, 52 and 53: A contractor undertook a project to complete it, in 20 days which needed 5 workers to work continuously for all the days estimated. But before the start of the work the client wanted to complete it earlier than the scheduled time, so the contractor calculated that he needed to increase 5 additional men every 2 days to complete the work in the time the client wanted it:

51. How many men were working on the day the project was completed as per the date of client wanted to complete it?
(a) 5
(b) 10
(c) 20
(d) none of these

52. Find the number of days in which client wanted to complete his work.
(a) 15
(b) 10
(c) 8
(d) can't be determined

53. If the work was further increased by 50% but the contractor continues to increase the 5 workers on every 2 days then how many more days are required over the initial time specified by the client?
(a) 1 day
(b) 2 days
(c) 5 days
(d) none of these

54. 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

55. 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 minutes
(b) 10 hours 15 minutes
(c) 9 hours 10 minutes
(d) 9 hours 6 minutes

can produce 30 nuts and 60 bolts per hour. A man is thrice as efficient as a boy and $\frac{3}{2}$ times as efficient as a woman. Given that all men, all women and all boys produce equal number of articles of one kind (i.e., either nut or bolt) per hour.

1. Working 6 hours a day, how many nuts they can produce with 52500 bolt in each day?
 (a) 17500 (b) 26250
 (c) 50850 (d) can't be determined
2. In how many hours can 15 men, 12 women and 8 boys can produce 12000 nuts and 8200 bolts?
 (a) 3 (b) 5
 (c) 6 (d) none of these
3. If 30 women and 50 boys can produce 5400 bolts in one hour then to produce equal number of nuts in one hour how many men are required?
 (a) 30 (b) 40
 (c) 50 (d) none of these
4. If the efficiency of each boy is doubled then what is the increase in production per hour?
 (a) 100% (b) 50%
 (c) 33.33% (d) none of these
5. If the manager of factory wanted equal number of men, women and boys in his factory but the efficiency of a man, woman and a boy remains constant, then the change in production is :
 (a) increased by 10% (b) decreased by 10%
 (c) increased by 8.33% (d) none of these

6. Ram Lal is a renowned packager of fruits in Varanasi. He packs 70 mangoes or 56 guavas every day working 7 hours per day. His wife also helps him. She packs 30 mangoes or 24 guavas working 6 hours per day. Ram Lal has to pack 3300 mangoes and 2400 guavas with the help of his wife. They work alternatively, each day 10 hours. His wife started packaging on the first day and works on every alternate days. Similarly Ram Lal started his work on second day and worked alternatively till the completion of the work. In how many days the work will be finished?

- (a) 85 days (b) $85\frac{2}{5}$ days
 (c) 84 days (d) none of these

7. Directions for question number 7 to 11 : A company produces three products. The products are processed on 3 different machines. The time required to manufacture one unit of each the three products and the daily capacity of three machines are given in the table below :

Machine	Time per unit (in min.)			Machine capacity (min./day)
	Product 1	Product 2	Product 3	
M_1	2	2	3	450
M_2	2	5	-	410
M_3	3	-	4	480

7. How many units of product 1 can be produced in one day?
 (a) 160 (b) 205
 (c) 225 (d) 64
8. If minimum 20 units of P_1 and 30 units of P_2 have to be produced, then what is the maximum units of P_3 that can be produced in a day?
 (a) 116 (b) 105
 (c) 205 (d) 220

Directions for question 9, 10 and 11 : Read the following additional data for question number 9, 10 and 11. The profit per unit for product 1, 2 and 3 is Rs. 3, Rs. 4 and Rs. 5.

9. What combination of P_1 , P_2 and P_3 will yield maximum profit under the manufacturing constraints?
 1. $P_1 = 25$, $P_2 = 50$, $P_3 = 100$
 2. $P_1 = 20$, $P_2 = 60$, $P_3 = 80$
 3. $P_1 = 100$, $P_2 = 0$, $P_3 = 50$
 4. $P_1 = 0$, $P_2 = 80$, $P_3 = 100$
 (a) 4 (b) 2
 (c) 3 (d) 1
10. Which of the machine if it breaks down will affect profitability the least?
 (a) Machine 1 (b) Machine 2
 (c) Machine 3 (d) Machine 1 or 3
11. If no production of product 2 is scheduled today and it is decided to only produce one type of product today, then what is the maximum profits that can be had today?
 (a) Rs. 480 (b) Rs. 750
 (c) Rs. 600 (d) none of these

Directions for question number 12-15 : Ready Tailoring Services is very well known in its quality and time bound services. The company (Ready Tailoring Services) received a large order for stitching military uniforms. It has two different orders to prepare the shirts one for Officers and second for Jawans (non-officers). It has three cutters who will cut the fabric. Six tailors who will do the stitching and 3 assistant to stitch the buttons and iron the shirts. Each of these 12 persons will work for exactly 8 hours a day. Each of the Officers uniform requires 20 minutes for cutting the fabric, 1 hour for stitching and 20 minutes for stitching buttons and ironing the shirts. Whereas the Jawan's uniform requires 15 minutes for cutting the fabric and 60 minutes for stitching and 10 minutes for buttons and ironing.

12. If the company has to supply 40 officers uniforms only and no other on a particular day, how many man-hours are utilised on that day?
 (a) $33\frac{1}{3}$ hours (b) $66\frac{2}{3}$ hours
 (c) 40 hours (d) 60 hours
13. If the number of tailors will be increased by 50% then maximum how many uniforms for officers can be completed in one day?
 (a) 48 (b) 50
 (c) 60 (d) 72
14. If the company can increase maximum 3 employees of any category then for which category should it hire to get maximum increase in production capacity, assuming that it needs to stitch only officer's uniform :
 (a) cutter (b) tailor
 (c) assistant (d) can't be determined
15. If the company has to produce the shirts for only one category then of which category it can produce maximum number of uniforms?
 (a) Officers (b) Jawans
 (c) either (a) or (b) (d) none of these



FINAL
1. (c)
11. (c)



LEVEL-1

1. (c)	2. (b)	3. (c)	4. (a)	5. (d)	6. (b)	7. (b)	8. (c)	9. (b)	10. (c)
11. (b)	12. (c)	13. (a)	14. (a)	15. (b)	16. (b)	17. (a)	18. (a)	19. (b)	20. (a)
21. (a)	22. (c)	23. (d)	24. (c)	25. (b)	26. (b)	27. (a)	28. (c)	29. (c)	30. (c)
31. (b)	32. (a)	33. (b)	34. (d)	35. (a)	36. (c)	37. (c)	38. (b)	39. (b)	40. (d)
41. (a)	42. (b)	43. (b)	44. (c)	45. (b)	46. (a)	47. (a)	48. (c)	49. (a)	50. (a)
51. (c)	52. (a)	53. (d)	54. (b)	55. (a)	56. (c)	57. (b)	58. (a)	59. (d)	60. (a)
61. (a)	62. (c)	63. (b)	64. (d)	65. (c)	66. (b)	67. (b)	68. (a)	69. (b)	70. (b)
71. (b)	72. (c)	73. (d)	74. (a)	75. (c)	76. (d)	77. (b)	78. (b)	79. (b)	80. (c)
81. (b)	82. (a)	83. (a)	84. (a)	85. (b)	86. (a)	87. (b)	88. (d)	89. (c)	90. (c)
91. (d)	92. (c)	93. (a)	94. (b)	95. (a)	96. (c)	97. (a)	98. (b)	99. (c)	100. (a)

LEVEL-2

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

FINAL ROUND

1. (c)	2. (b)	3. (a)	4. (c)	5. (c)	6. (c)	7. (a)	8. (b)	9. (d)	10. (b)
11. (c)	12. (b)	13. (d)	14. (b)	15. (c)					



Hints & Solutions

LEVEL 1

1. Efficiency of $A = \frac{100}{12} = 8.33\%$

Efficiency of $B = \frac{100}{15} = 6.66\%$

Combined efficiency of A and $B = 8.33 + 6.66 = 15\%$
Number of days taken by A and B , when worked together

$$= \frac{100}{15} = 6 \frac{10}{15} = 6 \frac{2}{3} \text{ days}$$

NOTE Efficiency \times Time period = Fixed amount of work

Also, in terms of percentage total work to be done is considered as 100% (in fraction it is 1), unless otherwise stated.

Alternatively : It can be done through unitary method, also.

2. Efficiency of $A = \frac{100}{10} = 10\%$

Efficiency of $B = \frac{100}{12} = 8.33\%$

Efficiency of $C = \frac{100}{15} = 6.66\%$

Combined efficiency of A , B and $C = 10 + 8.33 + 6.66 = 25\%$

\therefore Required number of days, when A , B and C worked together

$$= \frac{100}{25} = 4 \text{ days}$$

3. Efficiency of $A = 20\% \left(= \frac{100}{5}\right)$

Efficiency of $B = 10\% \left(= \frac{100}{10}\right)$

Efficiency of A , B and $C = 50\% \left(= \frac{100}{2}\right)$

\therefore Efficiency of $C = (\text{Efficiency of } A, B \text{ and } C) - (\text{Efficiency of } A \text{ and } B)$
 $= (50) - (20 + 10) = 20\%$

\therefore Number of days required by C to work alone $= \frac{100}{20} = 5 \text{ days}$

Alternatively : Go through options and satisfy the values.

Days	A	B	C	$(A + B + C)$
Efficiency	20%	10%	20%	50%
	5	10	5	2

Consider option (c)

4. Efficiency of $A = 12.5\%$

Efficiency of $B = 6.25\%$

Efficiency of $C = 1.25\%$

Efficiency of $(A + B + C) = 20\% (= 12.5 + 6.25 + 1.25)$

Required number of days $= \frac{100}{20} = 5 \text{ days}$

5. Efficiency of $A = 10\%$

Efficiency of $B = 6.66\%$

\therefore Required number of days $= \frac{100}{16.66} = 6 \text{ days}$

6. Efficiency of $A = \frac{100}{24} = 4.16\%$

Efficiency of $B = \frac{100}{30} = 3.33\%$

Efficiency of $(A + B + C) = \frac{100}{12} = 8.33\%$

\therefore Efficiency of $C = (8.33) - (4.16 + 3.33) = 0.83\%$

\therefore Number of days required by C to complete the work alone

$$= \frac{100}{0.83} = \frac{100}{5/6} = 120 \text{ days}$$

NOTE $\frac{5}{6} = 0.833$

7. Efficiency of $A = 10\%$

Efficiency of $B = 4.16\%$

Efficiency of $(A + B + C) = 16.66\%$

Efficiency of $C = (16.66) - (10 + 4.16) = 2.5\%$

Number of days required by C alone to finish the work

$$= \frac{100}{2.5} = 40 \text{ days}$$

8.

Efficiency of $A = 7.14\%$

Efficiency of $B = 4.76\%$

Efficiency of $A + B = 11.9\%$

\therefore Number of days required by A and B , working together

$$= \frac{100}{11.9} = 8.4 \text{ days}$$

HINT You can see that there is only one option between 8 and 9 which is 8.4 hence (c) is the correct choice.

Explanation : For 8 days denominator should be 12.5 and for 9 days denominator should be almost 11.

Alternatively : One day's work of A and B

$$= \frac{1}{14} + \frac{1}{21} = \frac{5}{42}$$

\therefore Required number of days $= \frac{42}{5} = 8.4 \text{ days}$

Time and Work
 9. Efficiency of $A = 4.16\%$
 Efficiency of $B = 1.6 \times 4.16 = 6.66\%$

Number of days required by $B = \frac{100}{6.66} = 15$ days

Alternatively :

$$\begin{array}{ccc} & A & B \\ \text{Efficiency} & \rightarrow & x \\ \text{Days} & \rightarrow & 1.6k \\ \text{(Since number of days are inversely proportional to efficiency)} & & k \end{array}$$

Now $1.6k = 24 \Rightarrow k = 15$ days

Alternatively : A 's one day's work $= \frac{1}{24}$

B 's one day's work $= 160\% \text{ of } \frac{1}{24} = \frac{1}{15}$

Required number of days $= 15$

10. Efficiency of $A + B = \frac{100}{14} = 7.14\%$

Again the ratio of efficiency of A and $B = 2:1$

∴ Efficiency of $A = \frac{2}{3} \times 7.14 = 4.76\%$

∴ required number of days by $A = \frac{100}{4.76} = 21$ days

NOTE Only choice (c) lies between 20 and 24.

Explanation : For 20 days denominator should be 5 and for 24 days, denominator should be 4.16 also the only choice (c) gives a value which is multiple of 7 and very close to the answer (as appears).

Alternatively : One day's work of

$$A \text{ and } B = \frac{1}{x} + \frac{1}{2x} = \frac{1}{14}$$

$$\Rightarrow x = 21$$

Since A is twice efficient as B so A will take half of the days taken by B .

11. Efficiency of $A + B = 14.28\% \left(= \frac{100}{7} \right)$

Now, since the ratio of efficiency of A and B is $2:1$

So, the efficiency of $A = \frac{2}{3} \times 14.28 = 9.52\%$

∴ Number of days required by $A = 10.5$ days

HINT Only choice (b) is correct since there is no other value (in option) lies between 10 and 11.

Explanation : For 10 days, denominator should be 10 and for 11 days, denominator should be 9.09.

Alternatively : Let A takes x days and then B takes $2x$ days

then 1 day's work of A and $B = \frac{1}{x} + \frac{1}{2x} = \frac{1}{7}$

$$\Rightarrow x = 10.5$$

Thus A takes 10.5 days.

$$\begin{array}{ccc} & A & B \\ \text{Efficiency} & \rightarrow & 3 \\ \text{Days} & \rightarrow & 1 \end{array}$$

(Since number of days are inversely proportional to the efficiency)

Now if A requires x days, so B requires $3x$ days

∴ Difference of required days ($= 3x - x$) $= 2x = 10$
 $\Rightarrow x = 5$

Hence the number of days required by $B = 3x = 3 \times 5 = 15$ days

13.
$$\begin{array}{ccc} & A & B \\ \text{Efficiency} & \rightarrow & 2 \\ \text{Days} & \rightarrow & 1 \end{array} : \quad : \quad : \quad : \quad 2$$

$$\left(\text{Days} \propto \frac{1}{\text{Efficiency}} \right)$$

Now, let A requires x days, then B requires $2x$ days

∴ difference in number of days ($= 2x - x$) $= x = 6$

$$\Rightarrow x = 6$$

∴ B requires $2x = 2 \times 6 = 12$ days

Alternatively : If A takes x days, then B takes $x + 6$ days

Now, A 's 1 day's work $= \frac{1}{x}$
 B 's 1 day's work $= \frac{1}{x+6}$

$$\frac{1/x}{1/(x+6)} = \frac{2}{1}$$

(Since A does twice the work as B does)

$$\Rightarrow x = 6$$

∴ B takes $2x = 12$ days.

Alternatively : $\frac{1}{x} + \frac{1}{(x+6)} = \frac{1}{4}$

$\Rightarrow x = 6$ and $2x = 12$ days (required by B)

Alternatively : Go through option and satisfy all the conditions.

14.
$$\begin{array}{ccc} & A & : & B & : & C \\ \text{Ratio of efficiency} & 3 & : & 1 & : & 2 \\ \text{Ratio of number of days} & \left\{ \begin{array}{ccc} \frac{1}{3} & : & \frac{1}{1} & : & \frac{1}{2} \end{array} \right\} \\ \text{or} & 2 & : & 6 & : & 3 \end{array}$$

Hence, (a) is correct $\left[\because \text{Time} \propto \frac{1}{\text{Efficiency}} \right]$

15.
$$\begin{array}{ccc} & \text{Ajit} & \text{Bablu} \\ \text{Efficiency} & 3 & : & 1 \\ \text{No. of days} & 1 & : & 3 \\ & X & & Y \end{array}$$

16.
$$\begin{array}{ccc} & \text{Ajit} & \text{Bablu} \\ \text{Efficiency} & 5 & : & 1 \\ \text{No. of days} & 1 & : & 5 \\ & X & & Y \end{array}$$

17. Efficiency of $A + B = \frac{100}{\frac{20}{3}} = 15\%$

$$\begin{array}{ccc} & \text{A} & \text{B} \\ \text{No. of days} & 4 & : & 5 \\ \text{Efficiency} & 5 & : & 4 \end{array}$$

$\therefore \text{Efficiency of } B = \frac{4}{9} \times 15 = \frac{20}{3} = 6\frac{2}{3}\%$

18. Efficiency of $A + B = 33.33\% \left(= \frac{100}{3}\right)$

Ratio of efficiency of A and $B = 3:1$

$$\therefore \text{Efficiency of } A = \frac{3}{4} \times 33.33 = 25\%$$

$$\therefore \text{Number of days taken by } A = 4 \left(= \frac{100}{25}\right)$$

Alternatively :

	A	B
Efficiency	3	: 1
No. of days	1 (x)	: 3 (x)

$$\therefore \text{Difference in days} = 2x = 8$$

$$\Rightarrow x = 4 \text{ and } 3x = 12$$

Therefore number of days taken by A , working alone = 4 days

Alternatively : $\frac{1}{x} + \frac{1}{(x+8)} = \frac{1}{3}$

Now, you can use the options, or solve the equations to get the value of x which is equal to 4.

19. Efficiency of $(A + B) = 12.5\%$

Efficiency of $(B + C) = 8.33\%$

Efficiency of $(C + A) = 12.5\%$

$$\therefore \text{Efficiency of } [(A + B) + (B + C) + (C + A)] = 33.33\%$$

$$\therefore \text{Efficiency of } (A + B + C) = 16.66\%$$

∴ Number of days required by A, B and C together = 6 days

$$\left(= \frac{100}{16.66}\right)$$

20. Efficiency of $(A + B) = 8.33\%$

Efficiency of $(B + C) = 6.66\%$

Efficiency of $(C + A) = 5.00\%$

$$\therefore \text{Efficiency of } A + B + C = \frac{1}{2} (8.33 + 6.66 + 5) = 10\%$$

$$\therefore \text{Efficiency of } C = \text{Efficiency of } [(A + B + C) - (A + B)] \\ = (10 - 8.33) = 1.66\%$$

$$\therefore \text{Number of days required by } C \text{ alone} = \frac{100}{1.66} = 60 \text{ days}$$

21. Remember

$$\text{Time} \propto \frac{1}{\text{Efficiency}}$$

Now,

	Ganga	:	Jamuna	:	Saraswati
No. of days	3	:	1	:	2

Again, efficiency of Ganga, Jamuna and Saraswati

$$= \frac{100}{1} = 100\%$$

$$\therefore \text{Efficiency of Ganga} = \frac{3}{6} \times 100 = 50\%$$

$$\text{Efficiency of Saraswati} = \frac{2}{6} \times 100 = 33.33\%$$

$$\text{Now, number of days taken by Ganga} = \frac{100}{50} = 2$$

$$\text{Number of days taken by Saraswati} = \frac{100}{33.33} = 3$$

∴ Difference in number of days taken by Ganga and Saraswati
= 3 - 2 = 1 day

22. Day 1 2 3 4 5 6 7 8
 $\frac{A}{A} \frac{A}{A} \frac{A}{(A+B)} \frac{(A+B)}{(A+B)} \frac{(A+B)}{(A+B)} \frac{(A+B)}{(A+B)}$

$$3 \times \frac{1}{12} = \frac{3}{12} = 25\% \quad \left\{ \begin{array}{l} \text{Remaining work} \\ = 75\% = (100 - 25) \end{array} \right.$$

Now, efficiency of $A + B = 15\% = (8.33 + 6.66)$

$$\therefore \text{Number of days required by } A + B = \frac{75}{15} = 5$$

to complete rest work (= 75%)

23. '3 days before the completion of the work Raja left the work means in last 3 days only Rani has worked alone.

$$\text{So, in last 3 days worked done by Rani} = 3 \times \frac{1}{21} = \frac{1}{7}$$

So, the rest $\left(1 - \frac{1}{7}\right) = \frac{6}{7}$ work was done by Raja and Rani both.

Number of days in which Raja and Rani worked together

$$= \frac{6/7}{5/42} = \frac{36}{5} = 7 \frac{1}{5} \text{ days}$$

NOTE Work done by Raja and Rani in one day = $\frac{1}{14} + \frac{1}{21} = \frac{5}{42}$

Also, number of days = $\frac{\text{Total work to be done}}{\text{Work to be done in one day}}$

24. Work done in 11 days = $\frac{11}{30}$

$$\text{Rest work} = \frac{19}{30}$$

$$1 \text{ day's work of } A = \frac{19/30}{28} = \frac{19}{30 \times 28} = \frac{19}{840}$$

Total number of days required to complete the whole work alone

$$= \frac{1}{19/840} = \frac{840}{19} = 44 \frac{4}{19} \text{ days}$$

25. Efficiency of Sonu = $5\% = \left(\frac{100}{20}\right)$

Rest work = 75%

$$\text{Efficiency of Abhijeet} = \frac{75}{10} = 7.5\%$$

∴ Combined efficiency of Sonu and Abhijeet

$$= 12.5\% = (7.5 + 5)$$

∴ Number of days required by Sonu and Abhijeet, to work together

$$= \frac{100}{12.5} = 8 \text{ days}$$

26. Asha 5 Usha 4
 Efficiency 5 No. of days 4x 5x = 25

∴ Number of days required by Asha to finish the work alone
= 20 ∵ $(4x = 4 \times 5)$

(Alternatively, from percentage change graphic, number of days taken by Asha will be 20% less than Usha, if efficiency of Asha is 25% more than Usha)
 Now, since Asha and Usha did work together for last 5 days
 $= 5 \times 9 = 45\%$

(Since efficiency of Asha = 5% and Usha's efficiency = 4%)
 It means Asha completed 55% work alone
 ∴ Number of days taken by Asha to complete 55% work
 $= \frac{55}{5} = 11 \text{ days}$

17. Krishna's efficiency = 10%
 Mohan's efficiency = 5%
 Work done by Krishna and Mohan together in 3 days
 $= 15 \times 3 = 45\%$

Now, number of days in which B completed rest (55%) work alone
 $= \frac{55}{5} = 11$

Total number of days in which B worked = $3 + 11 = 14$
 Now number of days required by B, when A and B both worked together
 $= \frac{100}{15} = 6 \frac{2}{3}$

∴ Required difference in number of days = $(11) - (6 \frac{2}{3})$
 $= \frac{13}{3} = 4 \frac{1}{3} \text{ days}$

18. Efficiency of Kareena and Karishma

$$= 11.11 + 5.55 = 16.66\%$$

$$\text{Work done in 3 days} = 3 \times 16.66 = 50\%$$

Rest work done by Kareena, Karishma and Shahid = $\frac{50}{50} = 1 \text{ day}$

(Since efficiency of Shahid = 33.33%)

Thus in 4 ($= 3 + 1$) days they have completed the work.

19. Efficiency of Kavita = 5%

Efficiency of Babita = 1.66%

Efficiency of Samita = 3.33%

Work done in 5 days by K + B + S = $5 \times (10) = 50\%$

Work done in 3 days by K + B = $3 \times (6.66) = 20\%$

Remaining work (30%) done by Kavita alone = $\frac{30}{5} = 6 \text{ days}$

20.

A	:	B	:	C	
Efficiency →	10	:	9	:	6
No. of days →	$9x$:	$10x$:	$15x$

Now,

$$15x - 9x = 6$$

$$x = 1$$

Number of days taken by A = 9

Number of days taken by B = 10

Number of days taken by C = 15

Work done by B and C in initial 2 days = $\frac{2 \times 1}{6} = \frac{1}{3}$

$$\text{rest work} = \frac{2}{3}$$

Number of days required by A to finish $\frac{2}{3}$ work = $\frac{2/3}{1/9} = 6 \text{ days}$

31.

No. of days	Anand	Bahuguna
Efficiency	45	40

$$2.22\% \left(= \frac{1}{45} \right) \quad 2.5\% \left(= \frac{1}{40} \right)$$

Anand did the work in 56 days = $56 \times \frac{1}{45 \times 2} = \frac{28}{45}$

∴ Rest work $\left(\frac{17}{45} \right)$ was done by Anand and Bahuguna

$$= \frac{17/45}{17/360} = 8 \text{ days}$$

(Since Anand and Bahuguna do the work in one day
 $= \frac{1}{45} + \frac{1}{40} = \frac{17}{360}$)

32. Efficiency of Chandni = 11.11%

Efficiency of Divakar = 8.33%

They do 19.44% work in 2 days

∴ They need 10 days to do 97.22% work,

Now the rest work (2.78) was done by Chandni in $\frac{2.78}{11.11} = \frac{1}{4}$ day

Therefore total number of days required = $10 + \frac{1}{4} = 10 \frac{1}{4}$ days

Alternatively : Chandni's one day's work = $\frac{1}{9}$

Divakar's one day's work = $\frac{1}{12}$

Chandni's and Divakar's ($1 + 1$) = 2 day's work = $\frac{1}{9} + \frac{1}{12} = \frac{7}{36}$

So, in 10 days they do $\frac{7 \times 5}{36} = \frac{35}{36}$ work

So, the remaining $\frac{1}{36} \left(= 1 - \frac{35}{36} \right)$ work will be done by

$$\text{Chandni} = \frac{1/36}{1/9} = \frac{1}{4} \text{ day}$$

Thus total number of required days = $10 + \frac{1}{4} = 10 \frac{1}{4}$ days

HINT

Day	1	2	3	4	5	6	7	8	9	10	11
Turn	C	D	C	D	C	D	C	D	C	D	C
1	1	1	1	1	1	1	1	1	1	1	1
Work	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{36}$
	<u>$7/36$</u>	<u>$7/36$</u>	<u>$7/36$</u>	<u>$7/36$</u>	<u>$7/36$</u>	<u>$7/36$</u>	<u>$7/36$</u>	<u>$7/36$</u>	<u>$7/36$</u>	<u>$7/36$</u>	<u>$1/36$</u>
	<u>$35/36$</u>										

33.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14
F	Z	F	Z	F	Z	F	Z	F	Z	F	Z	F	Z	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<u>12</u>	<u>15</u>	<u>12</u>	<u>15</u>	<u>12</u>	<u>15</u>	<u>12</u>	<u>15</u>	<u>12</u>	<u>15</u>	<u>12</u>	<u>15</u>	<u>12</u>	<u>15</u>	<u>12</u>
<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>	<u>9/60</u>
	<u>54/60</u>													

In two days Fatima and Zahira do $\frac{1}{12} + \frac{1}{15} = \frac{1}{60}$ work. In 12

days they do $\frac{6 \times 9}{60} = \frac{54}{60}$ work

So, the remaining work = $\frac{6}{60} = \frac{1}{10}$

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Now, $\frac{1}{12}$ work will be done by Fatima in 13th day

So, the remaining work = $\frac{1}{10} - \frac{1}{12} = \frac{1}{60}$ day

This $\frac{1}{60}$ work will be done by Zahira = $\frac{1/60}{1/15} = \frac{1}{4}$ day

Thus the total number of days required

$$= 12 + 1 + \frac{1}{4} = 13\frac{1}{4} \text{ days}$$

Alternatively : A's efficiency = 8.33%
B's efficiency = 6.66% 15%

Thus in 12 days 90% work will be done and in 13th day 8.33% more work will be done so the rest work 1.66% will be done by Zahira

$$= \frac{1.66}{6.66} = \frac{1}{4} \text{ day}$$

Thus, total number of required days = $12 + 1 + \frac{1}{4} = 13\frac{1}{4}$

34. The difference will arise only on the last two days only. The work done on 13th day = $\frac{1}{15}$

$$\text{rest work} = \frac{1}{10} - \frac{1}{15} = \frac{1}{30}$$

This rest work $\left(\frac{1}{30}\right)$ will be done by Fatima = $\frac{1/30}{1/12} = \frac{2}{5}$ day

Thus total number of required days = $12 + 1 + \frac{2}{5} = 13\frac{2}{5}$ days.

1	2	3	4	5	6	7	8
A	B	C	A	B	C	A	B
$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{1}{12}$
$\frac{3}{8}$		$\frac{3}{8}$				$\frac{1}{4}$	

$$\frac{6}{8} = \frac{3}{4}$$

In 3 days A, B, C do $\frac{3}{8}$ work

In 6 days A, B, C do $\frac{3}{4}$ work

Rest work = $\frac{1}{4}$, which is less than $\frac{3}{8}$

On the 7th day, $\frac{1}{6}$ more work will be done by A

Now rest work = $\frac{1}{4} - \frac{1}{6} = \frac{1}{12}$

Now, this rest work $\left(\frac{1}{12}\right)$ will be done by B in 1 complete day.

Thus, total number of days = $6 + 1 + 1 = 8$ days

Alternatively : Efficiency of A = 16.66%

Efficiency of B = 8.33%

Efficiency of C = 12.5%

Efficiency of A + B = 25%

Efficiency of A + B + C = 37.5%

In 3 days A, B, C completes 37.5% work

In 6 days A, B, C completes 75% work

Rest work = 25%

This 25% work will be completed by A and B in next 2 days

Thus total $6 + 2 = 8$ days are needed.

36. From the previous solution 75% work will be completed in 8 days. In the next two days (i.e., on 7th and 8th day) B and C will complete 20.83% ($12.5 + 8.33$) more work.
So the remaining work = 4.16%

This 4.16% work will be completed by A = $\frac{4.16}{16.66} = \frac{1}{4}$ day

So, the total number of required days = $6 + 2 + \frac{1}{4} = 8\frac{1}{4}$ days

37. Let B takes x days to complete the work individually.

Then, the B's 1 day's work = $\frac{1}{x}$

A's 1 day's work = $\frac{1}{x-6}$

C's 1 day's work = $\frac{1}{x-8}$

$$\therefore \frac{1}{x-6} + \frac{1}{x} = \frac{1}{x-8}$$

Now either solve the equation or satisfy the equation from the choices given in the question.

Thus option (c) is correct.

Alternatively : Select an appropriate option and the solve through % efficiency.

38. A's share = Rs. 250

B's share = Rs. 100

It means the ratio of efficiency of A : B = $250 : 100 = 5 : 1$

\therefore Ratio of days taken by A and B = $2x : 5x$

Now, $5x - 2x = 9 \Rightarrow x = 3$

\therefore Number of days taken by A = 6 (efficiency = 16.66%)

Number of days taken by B = 15 (efficiency = 6.66%)

Therefore number of days taken by A and B, working together

$$= \frac{100}{23.33} = \frac{300}{70} = 4\frac{2}{7} \text{ days}$$

39. Alen's one day's work = $\frac{1}{21}$

Border's one day's work = $\frac{1}{42}$

(working alternatively) Alen and Border's two days work

$$= \frac{1}{21} + \frac{1}{42} = \frac{1}{14}$$

So, Alen and Border do $\frac{1}{14}$ work in 2 days

So, they complete the work in $14 \times 2 = 28$ days.

40. Efficiency of A and B = 16.66%

Efficiency of B and C = 10%

But efficiency of A is twice that of C

\therefore Therefore, $A = 2C$

Now $A + B = 16.66$ and $B + C = 10$

\Rightarrow

and $2C + B = 16.66$

$C + B = 10$

Time and Work
from eq. (1) and eq. (2)

$$A = 13.33\%$$

∴ Number of days taken by A to complete the work alone

$$= \frac{100}{13.33} = 7 \frac{1}{2} \text{ days}$$

$$\begin{aligned} 41. \quad A + B &= 70\% \\ B + C &= 50\% \end{aligned}$$

$$\left[\begin{aligned} A + B + B + C - (A + B + C) &= B \\ 70 + 50 - 100 &= 20\% \end{aligned} \right]$$

$$B = 20\%$$

$$A = 50\%$$

$$C = 30\%$$

and

Hence, A is most efficient.

$$C + M = \frac{8}{17}$$

$$M + G = \frac{12}{17}$$

$$M = \frac{3}{17}$$

∴

$$[\because (C + M + M + G) - (C + M + G) = M]$$

$$\left[\left(\frac{8}{17} + \frac{12}{17} \right) - 1 = \frac{3}{17} \right]$$

$$C = \frac{5}{17}$$

$$G = \frac{9}{17}$$

So the whole amount will be distributed in the ratio of 5 : 3 : 9 among C, M and G respectively.

Now since M is least efficient so he get his own share

$$= \frac{3}{17} \times 816 = \text{Rs. } 144$$

	Sharma	Kelkar
Efficiency	0.8x	x
Number of day	k	0.8k = 24

$$\therefore 0.8k = 24 \Rightarrow k = 30$$

Thus Sharma requires 30 days, to complete the work, alone.

	Man	Days
	$\frac{1}{5} \uparrow (30 \downarrow 36)$	$24 \downarrow 20 \quad \frac{1}{6} \downarrow$

Applying product constancy method.

For a constant work when days are reduced by $\frac{1}{6}$, then number of men is increased by $\frac{1}{5}$. Hence 6 men will increase.

$$\text{Alternatively : } 24 \times 30 = 20 \times x$$

∴

$$x = 36$$

Therefore 6 more men are required.

	Women	Days
	$\downarrow \frac{1}{3} (12 \downarrow 8)$	$20 \downarrow 30 \quad \frac{1}{2} \uparrow$

Thus 10 more days are required.

Alternatively :

$$12 \times 20 = 8 \times x$$

$$x = 30$$

∴ 10 more days are required.

46.

Boys	Days
$\frac{2}{5} \downarrow (35 \downarrow 21)$	$15 \downarrow 25 \quad \frac{2}{3} \uparrow$

Thus 14 boys did not turn up for the job.

Alternatively :

$$35 \times 15 = 25 \times x$$

$$x = 21$$

∴ $35 - 21 = 14$ boys did not turn up for the job.

47. $x \times 32 = 24 \times 40$

$$(M_1 D_1 = M_2 D_2)$$

48.

$$M \times D = W$$

$$16 \times 6 = \frac{1}{3} W$$

$$\text{Rest work} = \frac{2}{3} W$$

For double work in same time we need double men. So 16 more men are required.

Alternatively :

$$2 \times (16 \times 6) = 6 \times M$$

$$\Rightarrow M = 32$$

∴ 16 more men are required.

49. $M \times D = 10 \times 20 = 200 \text{ Man-days}$

$$\text{New Man-days} = (20 \times 2) \times x$$

$$200 = 20 \times 2 \times x$$

$$x = 5 \text{ days}$$

or

$$M_1 D_1 = M_2 D_2$$

$$10 \times 20 = (20 \times 2) \times x$$

$$\Rightarrow x = 5$$

50. $M_1 D_1 = M_2 D_2$

$$M_1 \times 20 = (M_1 - 12) \times 32$$

$$\Rightarrow M_1 = 32$$

Also, using the above concept you can go through options.

51. Go through options. Consider option (c)

$$30 \times 20 = 30 \times 6 + 21 \times 20$$

600 = 600, hence presumed option is correct.

Alternatively :

$$30 \times 20 = 30 \times x + 21 \times (26 - x)$$

$$\Rightarrow x = 6$$

52. Go through options. Consider choice (a)

$$25 \times 30 = 25 \times 15 + 75 \times 5$$

750 = 750, hence choice (a) is correct.

Alternatively :

$$25 \times 30 = 25 \times x + 75 \times (20 - x)$$

$$\therefore \left[30 \times \frac{2}{3} = 20 \right]$$

53. Go through options. Consider choice (d)

$$36 \times 120 = 40 \times 108$$

$$4320 = 4320$$

Hence, choice (d) is correct.

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Alternatively :

$$\begin{array}{ccccc}
 & \text{Men} & \text{Days} & & \\
 \frac{1}{9} \uparrow & x & 120 & \left(\frac{1}{10} \right) \downarrow & \\
 & \downarrow & \downarrow & & \\
 & \left(x \times \frac{10}{9} \right) & (12) & &
 \end{array}$$

From percentage change (product constancy) graphic when number of days are decreased by $\frac{1}{10}$ then the number of men are increased by $\frac{1}{9}$ and $\frac{1}{9}$ is equivalent to 4 men so the actual number of men are $9 \times 4 = 36$.

$$\begin{aligned}
 \text{Alternatively : } M_1 D_1 &= M_2 D_2 \\
 x \times 120 &= (x + 4) \times 108 \\
 \Rightarrow x &= 36
 \end{aligned}$$

54. Efficiency (per minute) of Modi = 4 copies/min
 Efficiency of Modi and Xerox together = 10 pages/min
 ∴ Efficiency of Xerox alone = $10 - 4 = 6$ pages/min
 ∴ Mr. Xerox needs 6 minutes to copy 36 pages.

$$\begin{aligned}
 55. \quad \text{Work done} &= \frac{1}{3} \\
 \text{Remaining work} &= \frac{2}{3} \\
 2 \times (20 \times 12) &= 12 \times x \\
 \Rightarrow x &= 40
 \end{aligned}$$

So, 20 men will be increased.

$$\begin{aligned}
 56. \quad \text{Work done} &= \frac{1}{5} \\
 \text{remaining work} &= \frac{4}{5} \\
 4 (20 \times 75) &= 40 \times x \\
 x &= 150
 \end{aligned}$$

Therefore 75 men should be increased.

$$\begin{aligned}
 57. \quad \text{Work done by 6 men} &= \text{Work done by 10 women.} \\
 \Rightarrow \text{Work done by 1 man} &= \text{work done by } \frac{10}{6} = \frac{5}{3} \text{ women} \\
 \therefore 12 \text{ men} + 5 \text{ women} &= 12 \times \frac{5}{3} + 5 = 25 \text{ women} \\
 W_1 \times D_1 &= W_2 \times D_2, \quad W = \text{women, } D = \text{days} \\
 10 \times 15 &= 25 \times D_2 \\
 D_2 &= 6
 \end{aligned}$$

$$\begin{aligned}
 58. \quad \text{Work done by 2 men} &= 3 \text{ women} = 4 \text{ boys} \\
 1 \text{ man} &= 2 \text{ boys} \\
 1 \text{ woman} &= \frac{4}{3} \text{ boys}
 \end{aligned}$$

$$\begin{aligned}
 \text{boys} \times \text{days} &= 4 \times 52 \text{ (boys-days)} \\
 \text{Again } 1 \text{ man} + 1 \text{ woman} + 1 \text{ boy} &= 2 + \frac{4}{3} + 1 = \frac{13}{3} \text{ boys} \\
 B_1 \times D_1 &= B_2 \times D_2, \quad B = \text{boys, } D = \text{days} \\
 4 \times 52 &= \frac{13}{3} \times D_2 \\
 D_2 &= 48 \text{ days}
 \end{aligned}$$

$$59. \quad 2 \text{ men} = 7 \text{ boys} \Rightarrow 1 \text{ man} = \frac{7}{2} \text{ boys}$$

$$\begin{aligned}
 5 \text{ women} &= 7 \text{ boys} \Rightarrow 1 \text{ woman} = \frac{7}{5} \text{ boys} \\
 7 \text{ men} + 5 \text{ women} + 2 \text{ boys} &= 7 \times \frac{7}{2} + 5 \times \frac{7}{5} + 2 = \frac{67}{2} \text{ boys} \\
 B_1 \times D_1 &= B_2 \times D_2 \\
 \text{Now, } 7 \times 469 &= \frac{67}{2} \times D_2
 \end{aligned}$$

$$\begin{aligned}
 D_2 &= 98 \text{ days} \\
 \Rightarrow 6C + 2M &= 6 \text{ days}
 \end{aligned}$$

$$60. \quad 36C + 12M = 1 \text{ days}$$

$$\Rightarrow 1M = 2C$$

$$\text{Again } 36 + 12 \times 2 = 1 \text{ day}$$

∴ 60 children can do the work in 1 day

$$\text{Now, } 5 \text{ men} = 10 \text{ children}$$

∴ 10 children can do the work in 6 days.

$$61. \quad 8M + 12W = 4 \text{ days (whole work)}$$

$$\Rightarrow 32M + 48W = 1 \text{ day}$$

$$\text{Again } 6M + 14W = 5 \text{ days}$$

$$\Rightarrow 30M + 70W = 1 \text{ day}$$

From eq. (1) and (2)

$$32M + 48W = 30M + 70W$$

$$\Rightarrow 2M = 22W$$

$$\Rightarrow 1M = 11W$$

$$\text{Now, } 30M + 70W = 1 \text{ day}$$

$$(30 \times 11 + 70)W = 1 \text{ day}$$

Therefore 400W requires 1 day to complete the whole work.
 Thus 20W needs 20 days to complete the whole work.

$$62. \quad \text{Efficiency of } A = 6.66\%$$

$$\text{Efficiency of } B = 5.55\%$$

$$\text{Efficiency of } A + B + C = 16.66\%$$

$$\therefore \text{Efficiency of } C = 4.44\%$$

Now, number of days required by

$$C = \frac{100}{4.44} = \frac{100}{(10 \times 4.44)} = \frac{45}{2} \text{ days}$$

$$63. \quad \text{Ratio of efficiencies of } A, B \text{ and } C = 6 : 5 : 4$$

$$\therefore \text{Share of } C = \frac{4}{15} \times 27000 = 7200$$

$$64. \quad \text{In 1 hour 314 weavers weave} = 6594 \times 6 \text{ shawls}$$

$$\text{In 1 hour 1 weaver weaves} = \frac{6594 \times 6}{314} \text{ shawls} = 126 \text{ shawls}$$

65.

$$\Rightarrow 3M + 2W = 4 \text{ days}$$

$$\text{Again, } 12M + 8W = 1 \text{ day}$$

$$\Rightarrow 2M + 3W = 5D$$

$$\Rightarrow 10M + 15W = 1D$$

From eq. (1) and (2)

$$\Rightarrow 12M + 8W = 10M + 15W$$

$$2M = 7W$$

$$\frac{M}{W} = \frac{7}{2}$$

Since the ratio of efficiency of women : men = 2 : 7
 So, the amount of a man per day = Rs. 154

$$\left[\left(\frac{7}{2} \times 44 \right) = 154 \right]$$

66. Go through options.

Alternatively :

$$30 \times 40 = 30 \times x + 20 \times (46 - x)$$

$$x = 28 \text{ days}$$

$$\Rightarrow \text{Women} \times \text{hours} = 8 \times 10 = 80 \text{ women hours}$$

$$\text{Now, women} \times \text{hours} = 12 \times 8 = 96 \text{ women hours}$$

Since new work force is 20% greater than previous work force.

So, the new quantity of tea leaves will be increased by 20% which is equal to $200 \times \frac{20}{100} = 40 \text{ kg}$, hence (b)

68. New work = 3×450 man-day

$$3 \times 450 = 27 \times x$$

$$\therefore x = 50 \text{ days}$$

$$69. 4B + 5G = 10 \quad \dots(1)$$

$$\Rightarrow 40B + 50G = 1 \quad \dots(1)$$

$$\text{Again, } 6B + 6G = 7$$

$$\Rightarrow 42B + 42G = 1 \quad \dots(2)$$

Comparing eq. (1) and (2)

$$40B + 50G = 42B + 42G$$

$$\Rightarrow 2B = 8G \Rightarrow 1B = 4G$$

$$\text{Now, } (42 \times 4 + 42) \text{ girls} = 1 \text{ day}$$

210 girls can do a work in 1 day

$$\text{Again } 2B + 7G = 15 \text{ girls}$$

$$\text{So, } 15 \text{ girls require } \frac{210}{15} = 14 \text{ days}$$

70. Equate the man-days

For 20 km road, $20 \times 20 = 400$ man-days are required

∴ For 40 km road 800 man-days are required

$$\text{So, } 800 = 40 \times x$$

$$\Rightarrow x = 20 \text{ days}$$

$$71. \frac{3}{4} \times (x - 2)x = (x + 7)(x - 10)$$

$$\Rightarrow x^2 - 6x - 280 = 0$$

$$\Rightarrow x = 20 \text{ and } x = -14$$

So, the acceptable values is $x = 20$

∴ Total work = $(x - 2) \times x = 18 \times 20 = 360$ unit

$$\text{Now } 360 = 30 \times k \quad \therefore (30 = 20 + 10)$$

$$\Rightarrow k = 12 \text{ days}$$

72. Efficiency of a man : woman : girl = 6 : 3 : 1

$$\therefore \text{Share of a woman and girl} = \frac{(3+1)}{(6+3+1)} \times 10,000$$

$$= \frac{4}{10} \times 10000 = \text{Rs. } 4000$$

73. Total work = $33 \times 30 = 990$ man-days

$$\text{First day's work} = \frac{1}{990} \times 44$$

$$\text{Second day's work} = \frac{1}{990} \times 43$$

$$\text{Third day's work} = \frac{1}{990} \times 42 \text{ and so on}$$

$$\text{So, the total work in 44 days} = \frac{1}{990} (44 + 43 + 42 + \dots)$$

$$= \frac{1}{990} \times \frac{44 \times 45}{2} = 1$$

Hence in 44 days total work will be completed.

$$74. \text{Efficiency of Abhishek} = 2.5\% = \left(\frac{100}{40} \right)$$

Work done in 8 days = 20%

Rest work = 80%

$$\text{Efficiency of Bacchhan} = \frac{80}{24} = 3.33\%$$

$$\therefore \text{Required number of days} = \frac{100}{(2.5 + 3.33)}$$

$$= \frac{100}{5.83} = \frac{100 \times 6}{35} = 17 \frac{1}{7}$$

HINT $0.83 = \frac{5}{6}$, so, $5.83 = 5 + \frac{5}{6} = \frac{35}{6}$

$$75. \begin{array}{cccccc} & A & & B & & C \\ \text{Efficiency} & 3 & : & 2 & : & 6 \\ \text{Number of days} & 2 & : & 3 & : & 1 \end{array}$$

∴ Number of days taken by A = 12

Number of days taken by B = 18

Number of days taken by C = 6

$$1 \text{ day's work of } (A + B) = \frac{5}{36}$$

$$1 \text{ day's work of } (B + C) = \frac{8}{36}$$

$$1 \text{ day's work of } (C + A) = \frac{9}{36}$$

Day	1	2	3	4	5	6
Work	$\frac{5}{36}$	$\frac{8}{36}$	$\frac{9}{36}$	$\frac{5}{36}$	$\frac{8}{36}$	$\frac{1}{36}$

$$\text{In 5 days total work done} = \frac{35}{36}$$

Now, the rest work $(1/36)$, which is done by AC.

∴ Number of days taken by AC for the rest work

$$= \frac{1/36}{9/36} = \frac{1}{9}$$

Therefore, total time = $5 + \frac{1}{9} = 5 \frac{1}{9}$ days

76. Efficiency of A + B = 16.66

Efficiency of B + J = 10

We have no further relevant informations, so we cannot determine.

312

	A	B
Efficiency	x	$2x$
Number of days	15	$15/2$
	A 's one day's work = $\frac{1}{15}$	
	B 's one day's work = $\frac{2}{15}$	
	$(A + B)$'s one day's work = $\frac{3}{15}$	

Now, let us assume B joined A after $(11 - x)$ days, then

$$\frac{(11 - x)}{15} + \frac{x \times 3}{15} = 1$$

$$\Rightarrow (11 - x) + 3x = 15$$

$$\Rightarrow x = 2$$

It means they worked together for 2 days.

Alternatively: Go through options and check easily with the percentage efficiency.

$$9 \times 6.66 + 2 \times 20 = 100\%$$

78.

$$\text{Efficiency of } A = 6.66\%$$

$$\text{Efficiency of } B = 3.33\%$$

$$\text{Efficiency of } C = 2.5\%$$

Work done in last two days (only C do it) = $2 \times 2.5 = 5\%$

Work done in the 3rd and 4th day from the last day (only A and C do it)

$$= 2 \times 9.16 = 18.33\%$$

$$\text{Remaining work} = 100 - (5 + 18.33) = 76.66\%$$

This 76.66% work was done by all of A , B and C .

$$\therefore \text{Number of days taken by them} = \frac{76.66}{12.5} = \frac{460}{75} = 6 \frac{2}{15}$$

$$\therefore \text{Total time required} = 6 \frac{2}{15} + 2 + 2 = 10 \frac{2}{15} \text{ days}$$

79. Let x kg of oil is used for eating purpose, daily, then

$$(x + 11) \times 50 = (x + 15) \times 45$$

$$x = 25$$

$$\therefore \text{Total quantity of oil} = (25 + 11) \times 50 = 1800$$

$$\therefore \text{Required number of days} = \frac{1800}{25} = 72 \text{ days}$$

80. Work done = $\frac{2}{3}$

Remaining work = $\frac{1}{3}$, which is half of $\frac{2}{3}$

$$\therefore \frac{1}{2} \times (20 \times 32) = 8 \times x$$

$$\Rightarrow x = 40 \text{ men}$$

Therefore, 20 more men were required.

One day's work of 7 Indian with 4 Chinese = $\frac{1}{5}$

and one day's work of 7 Japanese and 3 Chinese = $\frac{1}{7}$

Therefore, one day's work of 7 Indian, 7 Chinese and 7 Japanese

$$= \frac{1}{5} + \frac{1}{7} = \frac{12}{35}$$

Therefore, one day's work of 1 Indian, 1 Chinese and 1 Japanese
 $= \frac{12}{35} \times \frac{1}{7} = \frac{12}{35 \times 7}$

Therefore, number of days required by 1 Indian, 1 Chinese
 and 1 Japanese

$$= \frac{1}{12/(35 \times 7)} = \frac{35 \times 7}{12} = 20 \frac{5}{12} \text{ days}$$

82. In 1 minute A , B and C bind = $\frac{1}{8} + \frac{1}{12} + \frac{1}{16} = \frac{13}{48}$ book

In 12 hours A , B and C bind = $12 \times 60 \times \frac{13}{48} = 195$ books

\therefore Average number of books bind by each = $\frac{195}{3} = 65$ books

83. Work of a man for 1 hour = $\frac{3}{2}$ women's work for 1 hour

Again, work of a man for 1 day

$$= \left(\frac{3}{2} \times \frac{9}{7.5} \right) \text{ women's work for 1 hour}$$

\Rightarrow Work of a man for 1 day = $\frac{9}{5}$ women's work for 1 day

$$\Rightarrow 1 \text{ man} = \frac{9}{5} \text{ women}$$

$$\therefore 10 \text{ men} + 6 \text{ women} = 10 \times \frac{9}{5} + 6 = 24 \text{ women}$$

$$\therefore 10 \text{ men} + 9 \text{ women} = 10 \times \frac{9}{5} + 9 = 27 \text{ women}$$

Now, $D_1 \times W_1 = D_2 \times W_2$

$$18 \times 24 = D_2 \times 27$$

$$\Rightarrow D_2 = 16 \text{ days}$$

84. Number of days taken by A to complete work alone = 14 days
 Number of days taken by B to complete work alone = 7 days
 Number of days taken by C to complete work alone = 7 days

$$\text{One day's work of } A \text{ and } B = \frac{1}{14} + \frac{1}{7} = \frac{3}{14}$$

$$\text{and one day's work of } A, B \text{ and } C = \frac{1}{14} + \frac{1}{7} + \frac{1}{7} = \frac{5}{14}$$

$$3 \text{ day's work of } A \text{ and } B = 3 \times \frac{3}{14} = \frac{9}{14}$$

$$\text{remaining work} = \frac{5}{14} \quad \left(1 - \frac{9}{14} \right)$$

This remaining work will be done by A , B and C

$$= \frac{5/14}{5/14} = 1 \text{ day}$$

$$A's 5 \text{ days work} = 50\%$$

$$B's 5 \text{ days work} = 33.33\%$$

$$C's 2 \text{ days work} = 16.66\%$$

$$[100 - (50 + 33.33)] : 16.66 = 3 : 2 : 1$$

85.

91.

Eff

Eff

Eff

Eff

Eff

Eff

Eff

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A's total share = Rs. 1500

B's total share = Rs. 1000

C's total share = Rs. 500

A's one day's earning = Rs. 300

B's one day's earning = Rs. 200

and C's one day's earning = Rs. 250

Efficiency of A = 50% $\left(\frac{100}{2}\right)$

Efficiency of B = 37.5% $\left(\frac{100}{8/3}\right)$

Efficiency of C = 12.5% $\left(\frac{100}{8}\right)$

Combined efficiency of A, B and C = 100%

So, they complete the work in 1 hour.

$$\begin{array}{rcl} A & + & B \\ \downarrow & & \downarrow \\ \text{Ratio of efficiency} & 10x & + 5x \\ \hline 15x & & \end{array} \quad \begin{array}{rcl} C & + & D \\ \downarrow & & \downarrow \\ \text{Ratio of efficiency} & 9x & + 6x \\ \hline 15x & & \end{array}$$

Therefore, ratio of efficiency of A : C = 10 : 9

Therefore, ratio of days taken by A : C = 9 : 10

Therefore, number of days taken by A = 18 days

88. Efficiency of 4 men and 2 boys = 20%

Efficiency of 3 women and 4 boys = 20%

Efficiency of 2 men and 3 women = 20%

∴ Efficiency of 6 men, 6 women and 6 boys = 60%

∴ Efficiency of 1 man, 1 woman and 1 boy = 10%

Now, since they will work at double their efficiency

∴ Efficiency of 1 man, 1 woman and 1 boy = 20%

∴ Required number of days = 5

89. $M_1 \times D_1 = M_2 \times D_2$

$m \times r = (m + n) \times D_2$

$$D_2 = \frac{mr}{(m + n)}$$

90. Efficiency of A = 2.77%

Efficiency of B = 2.22%

∴ Combined efficiency of A and B = 5%

$$= (2.77 + 2.22)$$

Thus, it will take total of 20 minutes $\left(\because 20 = \frac{100}{5}\right)$

91. Efficiency of A = 8.33%

Effective efficiency = 6.66%, when there is leakage

∴ Efficiency of leakage = 1.66% = (8.33 - 6.66)

It means due to leakage a full tank will be empty in 60 hours.

92. Efficiency of A + B = $10 + 6.66 = 16.66\%$

∴ Efficiency of A + B + C = 5.55%

∴ Efficiency of C (outlet pipe) = $16.66 - 5.55$

$$= 11.11\%$$

It means outlet pipe C can empty in 9 hours.

93. Efficiency of only leakage = 16.66%
 Effective efficiency of leakage = 6.66%
 It means the capacity of filling pipe = 10%
 Therefore, the inlet pipe can fill the tank in 10 hours hence the capacity of tank = 100 L

94. Efficiency of tap A and B = $16.66\% = (10 + 6.66)$
 $\therefore 16.66x + 10 \times (8 - x) = 100\%$

$$\Rightarrow x = 3$$

Efficiency of A = 5%
 Efficiency of B = 4%
 Efficiency of C = -3.33%

It means in every 3 consecutive hours tops A, B and C can fill 5.66% ($= 5 + 4 - 3.33$)

Therefore in 51 hours ($= 3 \times 17$) tops A, B and C can fill 96.33% ($= 5.66 \times 17$)

∴ the remaining part i.e., 3.66% ($= 100 - 96.33$) can be filled up by A in $\frac{11}{15}$ hours ($= \frac{3.66}{5}$), since it is now A's turn.

Hence, the total time required = $51 + \frac{11}{15} = 51 \frac{11}{15}$

97. Efficiency when both pipes used to fill = A + B
 and efficiency when pipe A is used to fill and pipe B is used to empty the tank = A - B

$$\therefore \frac{A + B}{A - B} = \frac{2}{1}$$

$$\Rightarrow \frac{A}{B} = \frac{3}{1} \quad (\text{By componendo and dividendo})$$

Thus, the ratio of efficiency of pipe A and B = 3 : 1.

98. In ideal case:

Time taken to fill the half tank by A and B = $\frac{50}{41.66} = \frac{6}{5}$ hours

Time taken by A, B and C to fill rest half of the tank

$$= \frac{50}{16.66} = 3 \text{ hours}$$

$$\text{Total time} = \frac{6}{5} + 3 = 4 \text{ hours } 12 \text{ minutes}$$

In second case:

Time taken to fill $\frac{3}{4}$ tank by A and B = $\frac{75}{41.66} = \frac{9}{5}$ hours

Time taken by A, B and C to fill rest $\frac{1}{4}$ tank = $\frac{25}{16.66} = \frac{3}{2}$ hours

$$\text{Total time} = \frac{9}{5} + \frac{3}{2} = 3 \text{ hours } 18 \text{ minutes}$$

Therefore, difference in time = 54 minutes

99. Time taken by pipes A and B to fill the whole tank = $\frac{100}{16.66} = 6$ hours

Capacity filled in 2 hours by pipes A, B and C = $2 \times 13.33 = 26.66\%$

Remaining capacity = 73.33%

This remaining capacity can be filled by A and B

$$= \frac{73.33}{16.66} = 4 \frac{2}{5} \text{ hours}$$

So, the total time required = $2 + 4 \frac{2}{5} = 6 \text{ hours } 24 \text{ minutes}$

Thus, in this case 24 minutes extra are required.

100. In one hour pipe A can fill = $\frac{1}{30}$ part of the tank

In one hour pipe B can fill = $\frac{1}{45}$ part of the tank

Time and Work
In two hour pipes A and B can fill = $\frac{1}{18}$ part of the tank

Therefore in 36 hours the tank will be completely filled.

Alternatively: Efficiency of pipe A = 3.33%

Efficiency of pipe B = 2.22%

Combined efficiency = 5.55%

and

Therefore in 2 hours pipe A and B fill 5.55%.

Thus to fill 100% tank, these pipe will take 36 hours.

LEVEL (2)

1. LCM of 2, 3 and 4 = 12

In 12 hours A will make 6 shawls
" " " B will make 4 shawls
" " " C will make 3 shawls } 13 shawls

i.e., in 12 hours they will weave 13 shawls

so, in 84 hours they will weave 91 shawls

Now, in 9 hours A will make 4 shawls
in 9 hours B will make 3 shawls } 9 shawls
in 9 hours C will make 2 shawls }

So, they will complete 100 shawls in 93 hours.

NOTE Since, they cannot share each-others work so B will take completely 9 hours to make 3 shawls, even when A and C stay idle for the last 1 hour till B completes his own work.

2.

	M	T	W	Th	F	S
Work →	$\underbrace{A}_{15\%}$	$\underbrace{S}_{15\%}$	$\underbrace{A}_{7.5\%}$			
				37.5%		

{This pattern continued for total 2 weeks only till 75% work got completed.}

Thus in 2 weeks they will complete 75% work.

Now 15% of the remaining (25% of the work) will be done in the third week in Monday and Tuesday. Again 10% work remained undone. Out of this 8.33% work will be done by Arun on Wednesday and remaining 1.66% work will be completed on Thursday by Satyam.

Final week

	M	T	W	Th
	$\underbrace{A}_{15\%}$	$\underbrace{S}_{8.33\%}$	$\underbrace{A}_{1.66\%}$	
				25%

3. Efficiency of Kaushalya = 5%

Efficiency of Kaikeyi = 4%

Thus, in 10 days working together they will complete only 90% of the work.

$$[(5+4) \times 10] = 90$$

Hence, the remaining work will surely done by Sumitra, which is 10%.

Thus, Sumitra will get 10% of Rs. 700, which is Rs. 70.

↳ Solutions for question number 4 and 5:

	1st day	2nd day
Morning shift	A	B
Evening shift	B	A

It is clear that in two days finally they work very similar to the alternate days i.e., finally A work for 10 hours and B also works for 10 hours.

Thus in every two days they will complete 7.5% work. So, in 26 days they will complete 97.5% of the total work.

Now, the remaining work = 2.5%

Now, this is the turn of A,

Since A does 4.16% work in 10 hours.

So, he will do 2.5% work in 6 hours.

4. Thus, the work will be finished on 27th day.

5. Since, A does 2.5% work in 6 hours, which is the actual duration of morning shift. So 100% time of the morning shift was utilised.

6. From the first statement :

	$(B+C)$	$(A+B+C)$
Efficiency	$2x$	$3x$
Days	$3y$	$2y$

Thus, we can say that efficiency of A is $\frac{1}{3}$ the efficiency of $(A+B+C)$.

From the last statement:

$$\text{Share of B out of total amount} = \frac{120}{450} = \frac{4}{15}$$

From these two results we can conclude that:

Ratio of efficiency	$\frac{A}{15} \left(= \frac{1}{3} \right)$	$\frac{B}{15}$	$\frac{C}{15}$
	$\Rightarrow 5$	$\Rightarrow 4$	$\Rightarrow 6$
Ratio of number of days	$\Rightarrow \frac{1}{5}$	$\Rightarrow \frac{1}{4}$	$\Rightarrow \frac{1}{6}$
	$\Rightarrow 12x$	$\Rightarrow 15x$	$\Rightarrow 10x$

One day's work of A and B = $\frac{1}{12x} + \frac{1}{15x} = \frac{9}{60x}$

∴ A and B will take $\frac{60x}{9}$ days to complete the whole work

Again one day's work of A, B and C

$$= \frac{1}{12x} + \frac{1}{15x} + \frac{1}{10x} = \frac{15}{60x}$$

∴ A, B and C working together complete the work in $\frac{60x}{15}$ days

$$\frac{60x}{9} - \frac{60x}{15} = \frac{8}{3}$$

Time and Work
(Since, A and B take $\frac{1}{3}$ days more than A, B and C)

$$x = 1$$

Number of days required to complete the whole work by A, B and C = $4x = 4 \times 1 = 4$ days

Alternatively: You can solve through option.
Alternatively: Ratio of efficiencies of A, B and C = $5x : 4x : 6x$

Number of days required by A and B = $\frac{100}{9x}$... (1)

and number of days required by A, B and C = $\frac{100}{15x}$... (2)

$$\frac{100}{9x} - \frac{100}{15x} = \frac{8}{3} \Rightarrow x = \frac{5}{3}$$

From eq. (2) number of days required by A, B and C working together

$$= \frac{100}{15x} = \frac{100}{15 \times \frac{5}{3}} = \frac{100}{25} = 4 \text{ days}$$

MIT

$$4 \times 10 \times 60 \times E_1$$

NIT

$$= 5 \times 8 \times 80 \times E_2$$

$$\Rightarrow \frac{E_1}{E_2} = \frac{4}{3}$$

where E_1 and E_2 are the respective working efficiencies per hour.

Each engineer from NIT is 25% less efficient than each engineer from MIT.

	T	C	B
16	10	15	
8	12	12	
128	120	180	← in one hour
1280	1200	1800	← in 10 hour

Since, restriction is imposed by composers i.e., since only 1200 books can be composed in 10 hours so not more than 1200 books can be finally prepared.

To maximise the production we locate 5 persons for composing and 7 persons for typing. Only then we can maximise our production which is 1800 books per day.

	T	C	B
(16 + 7)	(10 + 5)	15	
8	12	12	
184	180	180	
1840	1800	1800	

1st case	T	C	B
15	10	13	
8	12	12	
120	120	156	
1200	1200	1560	

No change in critical value

2nd case	T	C	B
16	10	12	
8	12	12	
128	120	144	

No change in critical value*

*Critical value means the minimum amount of job which creates the restriction.

NOTE

In third case it will reduce the production below 1200 books per day (or 120 books per hour)

So, option (d) is correct.

11. Efficiency of Bunty and Babli (jointly) = 12.5%
Now, go through options and satisfy the conditions.

Consider option (d).

Efficiency	Bunty	Babli
Days	7.5% 40 3	5% 20

Now, the new efficiency of Bunty = 15%

and the new efficiency of Babli = $\frac{5}{3}\%$

∴ Combined efficiency = $\frac{50}{3}\%$

∴ Number of days taken by them = $\frac{100}{50/3} = 6$ days

Hence, the presumed option (d) is correct.

NOTE Without solving the complete problem we can say that only option (d) is true since other 3 options gives the efficiency of Bunty equal to or more than 12.5% which is inadmissible i.e., cannot be equal to or greater than the combined efficiency of both persons together.

12. Let x litre be the per day filling and v litre be the capacity of the reservoir, then

$$90x + v = 40000 \times 90 \quad \dots(1)$$

$$\text{and} \quad 60x + v = 32000 \times 60 \quad \dots(2)$$

Solving eq. (1) and (2), we get

$$x = 56000$$

Hence, 56000 litres per day can be used without the failure of supply.

13. One day's production = $400 \times 9 \times 60 = 2160000$ bottles per day

Ratio of time utilised by M_1 and $(M_1 + M_2) = 1 : 2$

Now, the production of bottles by M_1 in 1 minute = 400 and the production of bottles by M_1 and M_2 together in 2 minutes = 2000

Thus total 2400 bottles can be processed in 3 minutes

∴ 216000 bottles can be processed in

$$216000 \times \frac{3}{2400} = 4.5 \text{ hours}$$

14. Let he initially employed x workers which works for D days and he estimated 100 days for the whole work and then he doubled the worker for $(100 - D)$ days.

$$D \times x + (100 - D) \times 2x = 175x$$

$$D = 25 \text{ days}$$

⇒

NOTE $175 = 100 + \frac{3}{4} \times 100$, since required number of days are 75%

$\left(i.e., \frac{3}{4} \right)$ more than the estimated number of days.

Now, the work done in 25 days = $25x$

$$\text{Total work} = 175x$$

∴ Work done before increasing the number of workers

$$= \frac{25x}{175x} \times 100 = 14\frac{2}{7}\%$$

15. **Note:** For easier calculation consider some convenient value of x (i.e., number of workers). Let initially there were 20 workers employed.

It means work done till 25 days

$$= 25 \times 20 = 500 \text{ man-days}$$

Now, since delay in works is 60%.

It means the work was completed in 160 days. Let the increased workers worked for k days then

$$40 \times k + 16 \times (135 - k) = 75 \times 40$$

$$\Rightarrow k = 35 \text{ days}$$

∴ 40 workers work for only 35 days

Here 40 means twice the work force of 20

and 16 means 80% efficiency of the original work-force

and 135 means $(160 - 25)$ days

and 75 means $(100 - 25)$ days

Since, number of days are increased by 60 in which only 16 workers work.

∴ Remaining work after 100 days = $60 \times 16 = 960$

$$= \frac{960}{3500} \times 100 = 27 \frac{5}{7} \%$$

Solutions for 16–20: Let the actual number of typists be n required to work for D days, then

$$nD = (n \times 8) + \left(\frac{4n}{5} \times D \right)$$

$$\Rightarrow D = 40$$

16. Since, the above equation is independent of n (i.e., number of typists) so cannot be calculated. It means there are many possible values.

17. Since $20\% \left(i.e., \frac{1}{5} \right)$ typists left the job. So, there can be any value which is multiple of 5 i.e., whose 20% is always an integer. Hence, 5 is the least possible value.

18. The remaining value must be divisible by 4.

Since, $\frac{4x}{5} = k$ $x \rightarrow$ actual number of typists

$$\Rightarrow x = \frac{k \times 5}{4} \quad k \rightarrow \text{remaining number of typists}$$

So, k must be divisible by 4, since a person cannot be a fraction. Hence, option (c) could be the possible answer.

19. Since, $D = 40$

20. Work done in 8 days = $8x$

$$\text{Work done in further 16 days} = 16 \times \frac{4}{5} x = \frac{64x}{5}$$

$$\text{Remaining work} = 40x - \left(8x + \frac{64x}{5} \right) = \frac{96x}{5}$$

$$\text{Remaining number of days} = 40 - (8 + 16) = 16$$

$$\therefore \text{New work-force} = \frac{96x/5}{16} = \frac{6x}{5}$$

∴ Change (or increase) in work-force

$$= \frac{\left(\frac{6x}{5} \right) - x}{x} \times 100 = 20\%$$

21. Let A, B, C, D and E be the number of workers required to complete the work in 1, 2, 3, 4 and 5 days respectively. Then

$$\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d} + \frac{1}{e} = \frac{90}{1800} = \frac{1}{20}$$

when $a = b = c = d = e$, we get the minimum value

$$5 \times \frac{1}{a} = \frac{1}{20}$$

$$a = 100 = b = c = d = e$$

$$\Rightarrow (8M + 5W) \times 6 \times 4 = (4M + 5W) \times 8 \times 5$$

$$4M = 10W$$

$$1M = 2.5W$$

Now, substituting the value M by W , we get total work-done

$$\text{Work} = (8 \times 2.5 + 5) \times 6 \times 4 = 600 \text{ women-days-hours}$$

$$= 240 \text{ man-days-hours}$$

Again work = $5 \times 8 \times 30 = 1200 \text{ boy-days-hours}$

$$1M = 2.5W = 5B$$

$$4M + 3W + 4B = 30 \text{ boys}$$

$$\therefore \text{Required number of days} = \frac{1200}{30 \times 5} = 8 \text{ days}$$

23.

$$9 \times 6 \times M = 240$$

$$M = \frac{240}{6 \times 9} = 4.4 \text{ men}$$

Therefore, minimum 5 men are required.

24. Efficiency of Eklaya = 16.66%

Efficiency of Faizal = 8.33%

Total efficiency of Eklaya and Faizal = 25%

So, they can do actual work in 4 days

∴ 3 times work requires 12 days.

25. $1 + 2 + 3 + 4 + 5 + \dots + 24 = \frac{24 \times 25}{2} = 300$

Total work = 300 man-days

But, the person who started the work on the first day works for 24 days. Hence, his share will be maximum which is equal to $\frac{24}{300} = \frac{2}{25}$.

Thus, he will receive $5000 \times \frac{2}{25} = \text{Rs. 400.}$

26. Total efficiency of two persons = 50%

Ratio of efficiencies of first person to the second person = 1:1

Therefore, efficiency of second person = 33.33%

Hence, he will take 3 days to complete the work alone.

27. Ratio of number of men, women and children

$$= \frac{18}{6} : \frac{10}{5} : \frac{12}{3} = 3x : 2x : 4x$$

$$(3x + 2x + 4x) = 18$$

$$x = 2$$

Therefore, number of women = 4

$$\text{Share of all women} = \frac{10}{40} \times 4000 = \text{Rs. 1000}$$

$$\therefore \text{Share of each woman} = \frac{1000}{4} = \text{Rs. 250}$$

Time and Work
It can be solved easily through option.

$$(10 + 9 + 8 + \dots + 1) = 10 \times \left(10 \times \frac{55}{100}\right)$$

$$55 = 55$$

Alternatively: $\frac{n(n+1)}{2} = n \times \frac{55n}{100}$

$$n = 10$$

Hence correct.

∴ In both cases total work is 55 man-days.

Go through option. Consider choice (c).

Efficiency of first worker = 5%

Efficiency of second worker = 4%

In 7 hours first worker completed 35% work

In 5 hours second worker completed 20% work

Thus, work completed = 55%

Remaining work = 45%

Hence, one condition is satisfied.

Again, they will take 5 more hours to complete 45% work

$$\left[\frac{45}{4+5} = 5 \right]$$

Thus, first person completes $7 \times 5 + 5 \times 5 = 60\%$ work

and second person completes $5 \times 4 + 5 \times 4 = 40\%$ work

Hence, second condition is also satisfied. Hence, correct option is (c).

10. Go through option

$$140 \times 4 = (140 + 120 + 100 + \dots + 20)$$

$$560 = 560$$

Alternatively: Let n be the initial number of workers then

$$n \times 4 = n + (n - 20) + (n - 40) + \dots + (n - 120)$$

$$4n = 7n - 420$$

$$\Rightarrow 3n = 420$$

$$\Rightarrow n = 140 \text{ workers}$$

11. From the first statement

$$\begin{array}{ccc} B & & (V + M) \\ \text{Number of days} & x & = & x \\ \text{Efficiency} & 1 & : & 1 \end{array}$$

From the second statement

$$\begin{array}{ccc} V & & (V + M) \\ \text{Number of days} \rightarrow (K + 8) & & K \end{array}$$

From the third statement

$$\begin{array}{ccc} B & & V \\ \text{Number of days} \rightarrow (n - 8) & & n \end{array}$$

Now, go through option and consider option (c).

Efficiency of $(B + V + M) = 16.66\%$ (number of days = 6)

∴ Efficiency of $B = 8.33\%$ (number of days = 12)

and Efficiency of $(V + M) = 8.33\%$ (number of days = 12)

Therefore, B will take 12 days.

Now, from third statement V will take 20 days.

Hence, the efficiency of V is 5%.

Therefore, V will take 20 days. Hence, second statement is also true. Thus, the presumed option (c) is correct.

12. Consider option (d)

Time taken by Bill = 12 hours

Efficiency of Bill = 8.33%

Therefore, time taken by Bill and Milinda working together

$$= 6 \frac{2}{3} \text{ hours}$$

Hence, the efficiency of Milinda and Bill = 15%

Therefore efficiency of Milinda = $15 - 8.33 = 6.66\%$

Thus, the number of days taken by Milinda = 15, which is $8 \frac{1}{3}$ days more than when both work together. Hence, all the conditions satisfied.

Efficiency	M	$B + M$	B
Number of days	6.66%	15%	8.33%
		$6 \frac{2}{3}$	12

33. Efficiency of Pascal and Rascal = 10%
Pascal worked for 2.5 hours and Rascal worked separately 8.5 hours. Which means it can be considered that Pascal and Rascal worked together for 2.5 hours and Rascal worked alone for 6 hours.

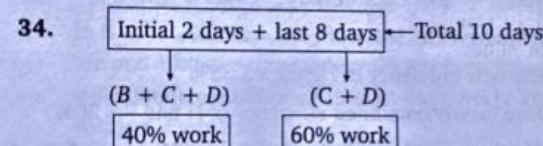
Thus, Pascal and Rascal in 2.5 hours can complete 25% work. It means the remaining $(50 - 25) = 25\%$ of the work was done by Rascal in 6 hours.

Therefore, Rascal can do 100% work in 24 hours. It means the efficiency of Rascal = 4.16%

Therefore, efficiency of Pascal = $(10 - 4.16) = 5.83\%$

Thus, Pascal require $\frac{100}{5.83} = 17 \frac{1}{7}$ hours to complete the work alone.

Alternatively: Go through option.



From the above diagram it is clear that efficiency of C and D is 7.5%, since C and D complete 60% work in 8 days and efficiency of B , C and D is 20%. It means efficiency of B alone is $12.5\% = (20 - 7.5)$.

Now

$$\begin{array}{ccc} C & : & D \\ \text{Number of days} & 4x & : & 5x \\ \text{Efficiency} & 5y & : & 4y \end{array}$$

$$\therefore \text{Efficiency of } C = \frac{5}{9} \times 7.5 = 4.16\%$$

$$\text{and } \text{Efficiency of } D = \frac{4}{9} \times 7.5 = 3.33\%$$

Thus, D is the least efficient person.

Now share of work done by David

$$(D) = 3.33\% \times 10 = 33.33\%$$

Hence, his share of amount = 33.33% of Rs. 3000 = Rs. 1000

35. Combined efficiency of all the three boats = 60 passenger/trip
Now, consider option (a).

15 trips and 150 passengers means efficiency of $B_1 = 10 \frac{p}{t}$

which means in carrying 50 passengers B_1 must have taken 5 trips. So the rest trips equal to $5(10 - 5 = 5)$ in which B_2 and B_3 together carried remaining 250 (300 - 50) passengers.

Therefore the efficiency of B_2 and $B_3 = \frac{250}{5} = 50 \frac{P}{t}$

Since, the combined efficiency of B_1 , B_2 and B_3 is 60. Which is same as given in the first statement hence option (a) is correct.

Alternatively: It can be solved by framing quadratic equation.

36. Efficiency of 3 men + 5 women = 33.33%

Required number of days by 2 men = x

\therefore Required number of days by 3 women = $x + 5$

Now, consider option (c).

Therefore, $3M + 5W = 3M + 2M = 5$ men

Therefore, efficiency of a man = 6.66%

Hence, a man needs 15 days to finish the job, working alone.

Again $3M + 5W = 7.5W + 5W = 12.5W$

Therefore, efficiency of a woman = 2.66%

Therefore, a woman needs 37.5 days.

Thus, 2 men needs 7.5 days to work alone $\therefore \left(7.5 = \frac{15}{2}\right)$

and 3 women needs 12.5 days to work alone $\therefore \left(12.5 = \frac{37.5}{3}\right)$

Hence, the difference in number of days = 5 which is same as given in the problem. Hence correct option is (c).

37. Efficiency of Henry and Ford (combined) = 10%
Consider option (d).

Efficiency of Ford = 3.33% (30 days)

Therefore, Efficiency of Henry = 6.66%

Now, the new efficiency of Ford = 16.66%

and the new efficiency of Henry = 3.33%

Therefore, newly combined efficiency of H and F = 20%

Therefore, required number of days by Henry and Ford working together = 5

Since 5 is half of 10, hence the option (d) is correct.

38. **From the last statement:**

Efficiency of Anne (A), Benne (B) and Cenne (C) = 50%

From the first statement: Number of days taken by B is 2 more than C.

From the second statement: Anne had worked for 6 days and Benne had worked for 3 days only. Now, consider option (d).

Number of days taken by B = 6,

Efficiency = 16.66%

It means Benne had completed $16.66 \times 3 = 50\%$ work in 3 days.

Therefore Anne had completed 50% work in 6 days.

Thus, the efficiency of Anne = $8.33\% \left(\frac{50}{6}\right)$

Hence, the efficiency of Cenne = $50 - (16.66 + 8.33) = 25\%$

Thus B takes 6 days (\therefore efficiency = 16.66%)

and C takes 4 days (\therefore efficiency = 25%)

which is true according to the first statement, hence option (d) is correct.

39. Number of pages typed by A, B and C together per day = k
Now let the number of pages typed by B is x
then the number of pages typed by A = $x - d$
and the number of pages typed by C = $x + d$
 $\Rightarrow (x - d) + (x) + (x + d) = 45$
 $\Rightarrow x = 15$ pages per day.

Again let C types k pages per day then A types $\frac{k}{4}$ pages per day.

Therefore, the ratio of typing of pages per day of A and C = 1 : 4

\therefore Number of pages typed by C in one day

$$= \frac{4}{5} \times 30 = 24 \text{ pages}$$

(30 = 45 - 15)

\therefore Number of pages typed by C per hour = $\frac{24}{8} = 3$ pages/hour

40. Efficiency of P = 5%

Efficiency of Q = 4%

Efficiency of R = 2.5%

Efficiency of S = 2%

Till 10 am pipe P filled 20%

Till 10 am pipe Q filled 8% } 30.5%

Till 10 am pipe R filled 2.5%

Thus, at 10 am pipe P, Q and R filled 30.5% of the cistern.
Now, the time taken by P, Q, R and S together to fill the remaining capacity of the cistern

$$= \frac{69.5}{13.5} = \frac{139}{27} = 5 \text{ hours and 9 minutes (approx)}$$

Therefore, total time = 4 hours + 5 hours 9 minutes
= 9 hours and 9 minutes

It means cistern will be filled up at 3 : 09 pm

41. Efficiency of P + Q = 9% (inlet pipes)

Efficiency of R + S = 4.5% (outlet pipes)

Net efficiency = 4.5%

So, the time taken = $\frac{100}{4.5} = 22 \frac{2}{9}$ hours

42. Efficiency of A = 10%

Efficiency of B = 6.66%

Efficiency of C = 5%

Efficiency of D = 3.33%

Efficiency of A + B + C + D = 8.33

(time = 12 hours)

Now, go through options and consider A and B as inlet pipes and C and D as outlet pipes, then

$$(10 + 6.66) - (5 + 3.33) = 8.33$$

which is required hence it is certain that C and D are outlet pipes.

NOTE There is no any other such combination.

43. Efficiency of inlet pipe A = 4.16%

Efficiency of inlet pipe B = 5.83%

Time and Work
 Now, if the efficiency of outlet pipe be $x\%$ then in 10 hours the capacity of tank which will be filled = $10 \times (10 - x)$
 Now, since this amount of water is being emptied by C at $x\%$ per hour, then

$$\frac{10 \times (10 - x)}{x} = 2.5 \text{ hours} \Rightarrow x = 8\%$$

Therefore in 10 hours 20% tank is filled only. Hence, the remaining 80% of the capacity will be filled by pipes A and B in $\frac{80}{10} = 8$ hours.

44. Efficiency of pipe A = 8.33%

Efficiency of pipe B = 6.67%

Efficiency of pipe C = 5%

When tap C was opened pipe A filled 16.66% capacity

When tap C was opened pipe B filled 6.67% capacity

Therefore rest capacity of the tank to be filled

$$= 100 - 23.34 = 76.66\%$$

Now, the net efficiency of A, B and C = 10%

Hence, pipes A, B and C will take = $\frac{76.66}{10} = 7.66 = 7 \frac{2}{3}$ hours

∴ Total time = 2 hours + $7 \frac{2}{3}$ hours = $9 \frac{2}{3}$ hours

45. Efficiency of inlet pipe = 50%

Efficiency of outlet pipe = 16.66%

Net efficiency of pipes A and B = 33.33%

Capacity of tank to be filled up = 66.66%

Hence, required time = $\frac{66.66}{33.33} = 2$ hours

46. Rate of leakage = 8.33% per hour

Net efficiency = $50 - (16.66 + 8.33) = 25\%$

Time required = $\frac{100}{25} = 4$ hours

47. Since, an inlet pipe is 7.2 times efficient than an outlet pipe. Therefore, in order to tank never overflow we will need total 8 outlet pipes.

Thus we need only 7 more ($8 - 1 = 7$) outlet pipes.

48. Time taken by 8th tap = $2 \times 2 \times 2 = 8$ hours

and time taken by 12th tap = $2 \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}$ hour

Ratio of time taken by 8th tap and 12th tap = $8 : \frac{1}{2} = 16 : 1$

∴ Ratio of efficiencies of 8th tap and 12th tap = $1 : 16$

49. Time taken by 10th tap = $80 \times \frac{1}{2} \times \frac{1}{2} = 20$ hours

Time taken by 12th tap = $80 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 5$ hours

Thus 10th tap and 12th tap together will take 4 hours.

50. Let pipe A fill the tank in $3x$ hours then pipe B fill it in $4x$ hours.

Therefore, in 1 hour they will fill = $\frac{1}{3x} + \frac{1}{4x} = \frac{7}{12x}$

i. e.,

they will take $\frac{12x}{7}$ hours

When an inlet pipe C is also opened then it takes

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

$$= \frac{12x}{7} \left(\frac{7}{4} \right) = 3x \text{ hours}$$

Now, in one hour pipe A, B and C working together fill

$$= \frac{1}{3x} + \frac{1}{4x} - \frac{1}{C} = \frac{1}{3x}$$

$$\Rightarrow \frac{7}{12x} - \frac{1}{C} = \frac{1}{3x}$$

$$\Rightarrow \frac{1}{C} = \left(\frac{1}{12x} - \frac{1}{3x} \right)$$

$$\Rightarrow C = 4x$$

Hence in $4x$ hours pipe C can empty the whole tank.

Now, since $3x = 33 \Rightarrow x = 11$

$$\therefore 4x = 4 \times 11 = 44 \text{ hours}$$

51. Total work = $5 \times 20 = 100$ man-days.

Let the client needed to complete it in n days then

$$(5 \times 2) + (10 \times 2) + (15 \times 2) + (20 \times 2) = 100$$

Hence, in 8 days all the work will be completed as per the requirement of client.

And on the 8th day 20 men were working.

52. It requires total 8 days by adding the work force successively.

53. Total work = $100 + 50 = 150$ man-days

In 8 days 100 man-days work has been completed. Now on 9th and 10th day there will be 25 workers. So in 2 days they will complete additional 50 man-days work. Thus the work requires 2 more days.

54. Let there be ' n ' inlet pipes then there must be $(8 - n)$ outlet pipes.

$$\text{Therefore } (8 - n) \frac{1}{6} - n \times \frac{1}{8} = \frac{1}{6} \Rightarrow n = 4$$

Alternatively: $(8 - n) 16.66 - n \times 12.5 = 16.66$

$$\Rightarrow n = \frac{116.66}{29.16} = \frac{700}{175} = 4$$

Alternatively: It can be solve through options very easily.

55. Efficiency of two inlet pipes A and B = $8.33 + 6.66 = 15\%$

Efficiency of two inlet pipes A and B along with an outlet pipe

$$C = 8.33 + 6.66 - 12.5 = 2.5\%$$

Hours	1	2	3	4	5	6	7	8	9	10
Efficiency \rightarrow	15	15	2.5	15	15	2.5	15	15	2.5	
				32.5		32.5		32.5		2.5%

In 9 hours 97.5% tank will be completely filled. On the 10th hour 2.5% (remaining capacity) will be fill by pipe A, B with its 15% efficiency.

Thus, A will take = $\frac{2.5}{15} = \frac{1}{6}$ hour = 10 minutes

Therefore, total time = 9 hours and 10 minutes.



5

PERCENTAGES

It is one of the most important chapters which is the backbone of calculations either involved in commercial arithmetic or in real life. Personally I do maximum arithmetical calculation using percentage and others too. So in the context of calculation it is necessary to know the clear concepts of percentage which plays a very vital role in Data Interpretation

PERCENTAGE AND ITS APPLICATION

A fraction with denominator 100 is called a per cent. Per cent is an abbreviation for the latin word "percentum" meaning "per hundred" or "hundredths" and is denoted by symbol %.

NOTE A fraction with denominator 10 is called as decimal.

Since per cent is a form of fraction, we can express per cent as fractions (or decimals) and vice-versa.

CONVERSION OF A FRACTION INTO PERCENTAGE

To convert a fraction into a percentage, multiply the fraction by 100 and put "%" sign.

EXAMPLE 1 Convert the following fractions into percentages:

$$(i) \frac{1}{2} \quad (ii) \frac{3}{4} \quad (iii) \frac{4}{5} \quad (iv) \frac{7}{8}$$

SOLUTION (i) $\frac{1}{2} \rightarrow \frac{1}{2} \times 100 = 50\%$

(ii) $\frac{3}{4} \rightarrow \frac{3}{4} \times 100 = 75\%$

(iii) $\frac{4}{5} \rightarrow \frac{4}{5} \times 100 = 80\%$

(iv) $\frac{7}{8} \rightarrow \frac{7}{8} \times 100 = 87.5\%$

CONVERSION OF A PERCENTAGE INTO A FRACTION

To convert a percentage into a fraction, replace the % sign with $\frac{1}{100}$ and reduce the fraction to simplest form.

besides quantitative Aptitude section. On an average two problems i.e., nearly 4–5 % problems in QA only, are being asked in CAT every year.

In other entrance/competitive exams like MAT, XAT and UPMCAT, etc there are too many questions asked from this chapter.

EXAMPLE 2 Express the following percentage as fraction

$$(i) 20\% \quad (ii) 30\% \quad (iii) 45\% \quad (iv) 5 \frac{1}{8}\% \quad (v) 155\%$$

SOLUTION (i) $20\% = \frac{20}{100} = \frac{1}{5}$
 (ii) $30\% = \frac{30}{100} = \frac{3}{10}$
 (iii) $45\% = \frac{45}{100} = \frac{9}{20}$
 (iv) $5 \frac{1}{8}\% = \frac{41}{8 \times 100} = \frac{41}{800}$
 (v) $155\% = \frac{155}{100} = \frac{31}{20} = 1 \frac{11}{20}$

CONVERSION OF A PERCENTAGE INTO A RATIO

To convert a percentage into a ratio, first convert the given percentage into a fraction in simplest form and then to a ratio.

EXAMPLE 3 Solve the following :

$$(i) 38\% \quad (ii) 25\% \quad (iii) 66.66\%$$

SOLUTION (i) $38\% = \frac{38}{100} = \frac{19}{50} = 19 : 50$

(ii) $25\% = \frac{25}{100} = \frac{1}{4} = 1 : 4$

(iii) $66.66\% = 66 \frac{2}{3}\% = \frac{200}{3 \times 100} = \frac{2}{3} = 2 : 3$

CONVERSION OF A RATIO INTO A PERCENTAGE

To convert a ratio into a percentage, first convert the given ratio into a fraction then to a percentage.

EXAMPLE 4 Express the following ratios as percentage :

- (i) 1 : 5 (ii) 2 : 3 (iii) 4 : 9

SOLUTION (i) $1 : 5 = \frac{1}{5} = \frac{1}{5} \times 100 = 20\%$

(ii) $2 : 3 = \frac{2}{3} = \frac{2}{3} \times 100 = 66.66\%$

(iii) $4 : 9 = \frac{4}{9} = \frac{4}{9} \times 100 = 44.44\%$

CONVERSION OF A PERCENTAGE INTO A DECIMAL

To convert a percentage into a decimal remove the % sign and move the decimal point two places to the left.

EXAMPLE 5 Convert the following percentages into decimals :

- (i) 36% (ii) 250% (iii) 57.5% (iv) $17 \frac{1}{5}\%$ (v) 7%

SOLUTION (i) $36\% = 0.36$

(ii) $250\% = 2.50 = 2.5$

(iii) $57.5\% = 0.575$

CONVERSION OF FRACTION INTO PERCENTAGE

NUMERATORS

DENOMINATORS

	1	2	3	4	5	6	7	8	9	10	11	12
1	100	200	300	400	500	600	700	800	900	1000	1100	1200
2	50	100	150	200	250	300	350	400	450	500	550	600
3	33.33	66.66	100	133.33	166.66	200	233.33	266.66	300	333.33	366.60	400
4	25	50	75	100	125	150	175	200	225	250	275	300
5	20	40	60	80	100	120	140	160	180	200	220	240
6	16.66	33.33	50	66.66	83.33	100	116.66	133.33	150	166.66	183.33	200
7	14.28	28.56	42.85	57.13	71.42	85.71	100	114.28	128.56	142.85	157.13	171.42
8	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	137.5	150
9	11.11	22.22	33.33	44.44	55.55	66.66	77.77	88.88	100	111.11	122.22	133.33
10	10	20	30	40	50	60	70	80	90	100	110	120
11	9.09	18.18	27.27	36.36	45.45	54.54	63.63	72.72	81.81	90.9	100	109.09
12	8.33	16.66	25	33.33	41.66	50	58.33	66.66	75	83.33	91.66	100
15	6.66	13.33	20	26.66	33.33	40	46.66	53.33	60	66.66	73.33	80

(PERCENTAGE-FRACTION CONVERSION TABLE)

Remember : $\frac{1}{7} = 14.28\%$ and $\frac{1}{14} = 7.14\%$

$\frac{1}{6} = 16.66\%$ and $\frac{1}{15} = 6.66\%$

$\frac{1}{9} = 11.11\%$ and $\frac{1}{11} = 9.09\%$

$\frac{1}{15} = 6.66\%$ and $\frac{1}{16} = 6.25\%$

$\frac{1}{3} = 33.33\%$ and $\frac{3}{10} = 30\%$

99.99% is equivalent to 100% (in calculation)

(iv) $17 \frac{1}{5}\% = 17.2\% = 0.172$

(v) $7\% = 0.07$

CONVERSION OF A DECIMAL INTO A PERCENTAGE

To convert a decimal into a percentage, move the decimal point two places to the right (adding zeros if necessary) and put % sign.

EXAMPLE 6 Convert the following decimals into percentages :

- (i) 0.35 (ii) 8.12 (iii) 0.018

SOLUTION (i) $0.35 = 35\%$

(ii) $8.12 = 812\%$

(iii) $0.018 = 1.8\%$

- Work out some more examples so that all these things are on your finger tips.

Remember $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \dots = 50\%$ etc.

Learn and practice all the values given below.

SOME OTHER TYPICAL VALUES

$\frac{1}{13} = 7.69\% \approx 7.7\%$, $\frac{1}{17} = 5.88\%$, $\frac{1}{19} = 5.26\%$,

$\frac{1}{21} = 4.76\%$, $\frac{1}{23} = 4.35\%$, $\frac{1}{24} = 4.166\%$

Learnings from the table :

- This table is a first hand support as a percentage values of some frequently used fractions.
- All the percentage values whose decimal part is 0.33, 0.66, 0.00 contain the denominator 3 in the fraction.
- Similarly if there is 0.16, 0.33, 0.50, 0.66, 0.83, 0.00 means there is a 6 in the denominator of the fraction.

- Percentages
- (iv) Similarly if there is 0.28, 0.56, 0.85, 0.13, 0.42, 0.71 it means there is a 7 as denominator.
 - (v) If there is 0.11, 0.22, 0.33, 0.44 ... 0.99 etc. It means there is 9 as the denominator of the fraction.

PERCENTAGE OF A QUANTITY

EXAMPLE 1 Find the no. of male students (i.e., boys), if there are 42% male students in the school and the total no. of students in the school is 1000.

SOLUTION Required number of male students

$$= 42\% \text{ of } 1000 \\ = \frac{42}{100} \times 1000 = 420$$

EXAMPLE 2 A student scored 85% marks. Total marks were 400. How much did he score?

SOLUTION Marks scored = 85% of 400

$$= \frac{85}{100} \times 400 \\ = 340$$

- (vi) If there is 0.09, 0.18, 0.27 ... it means there is 11 as the denominator of the fraction.
- (viii) If two percentage values have different decimal values (there must be different denominators) then their addition or subtraction results always in decimal i.e., never as an integer.

EXAMPLE 3 In an orchard $16\frac{2}{3}\%$ of the trees are mango trees. If the total number of trees in the orchard is 360, find the number of other types of trees in the orchard.

SOLUTION Total number of trees = 360

$$\text{Number of mango trees} = 16\frac{2}{3}\% \text{ of } 360 \\ = \frac{50}{3 \times 100} \times 360 = 60$$

Therefore, the number of other trees = $360 - 60 = 300$

Alternatively: Number of mango trees = $16\frac{2}{3}\%$

$$\text{It means no. of other types of trees} = \left(100 - 16\frac{2}{3}\%\right) \\ = 83\frac{1}{3}\%$$

Thus number of other types of trees = $83\frac{1}{3}\% \text{ of } 360 = 300$

INTRODUCTORY EXERCISE-5.1

1. Find the value of :
 - (i) 25% of 200
 - (ii) 30% of 180
 - (iii) 37.5% of 300
 - (iv) 83.33% of 480
 - (v) 100% of 2 quintal
 - (vi) 165% of 330 litre
 - (vii) $5\frac{1}{2}\%$ of Rs. 1600
 - (viii) 10% of 1 hour
 - (ix) 66.66% of 300
 - (x) 20% of 1 million rupees.
2. Mr. Arvind Vidyarthi spends 30% of his money on education and he has total Rs. 15,000. How many rupees he spends on education?
3. Sonia purchased 80 metres of cloth, out of which 35% was used for making trousers. How much cloth was used by her for making trousers?
4. The total no. of students in the school are 1250. 40% of the students are girls. Find the number of boys.
5. William's monthly salary was Rs. 1140. His salary is increased by 16.66%. How much increase has he

CAT Tips Now I would like to suggest you that all the problems mentioned in the exercise must be done using fractions instead of percentage, in order to make the calculation simple and handy.

For example see the solution of question 2 :

$$15000 \times 0.3 = 4500 \quad \left[\text{Recall } \frac{x \times 30}{100} = 0.3x \right]$$

Solution for question 5 : Since $16.66\% = \frac{1}{6}$

gotten? Also find the salary if his salary increased by 33.33%.

6. The population of Vatican city is 700. If it increases by 7.14% per annum (i.e., every year). Find the population of the Vatican city after one year.
7. The speed of a car is 85 km/hr. It is increased by 20%. Find the increased speed of the car?
8. A shopkeeper announces a reduction of 8.33% on all its prices after new year. If a wrist watch was earlier for Rs. 2400. How much would it costs now?
9. 44% of the students in a class are females and the number of male students is 42. Find the total no. of students in the class.
10. 30% of a number is 225. Find the number.
11. A horse costing Rs 80,000 one year ago now costs 25% less. Find the changed price.
12. 1700 students took an exam 85% students passed it. Find the number of students who failed in the exam.

So the new salary will increase by $\frac{1}{6}$ it means the absolute value of new salary will be $\frac{7}{6} \left(= 1 + \frac{1}{6}\right)$ times of the original salary.

$$\text{So the increase in salary} = 1140 \times \frac{1}{6} = \text{Rs. 190}$$

and increased salary = original salary + increase in salary

$$= 1 + \frac{1}{6} = \frac{7}{6} = \frac{7}{6} \times 1140 = \text{Rs.} 1330$$

Similarly if the salary is increased by 33.33% it means

$$33.33\% = \frac{1}{3}$$

$$\text{Therefore new salary} = 1 + \frac{1}{3} = \frac{4}{3} = \frac{4}{3} \times 1140 = 1520$$

Solution for question 6: Since $7.14\% = \frac{1}{14}$

EXPRESSING ONE QUANTITY AS A PERCENTAGE OF ANOTHER QUANTITY

EXAMPLE 1 What per cent is number 3 of number 20?

SOLUTION As per cent means out of 100. Then by unitary method

$$\text{out of } 20 \rightarrow 3$$

$$\text{out of } 1 \rightarrow \frac{3}{20}$$

$$\text{out of } 100 \rightarrow \frac{3}{20} \times 100 = 15\%$$

Hence to find what per cent the first number is of second number, we divide the first number by the second number and multiply the result by 100.

EXAMPLE 2 Ravi obtained 325 marks out of a maximum of 400 marks. Find the percentage of marks obtained by him.

1. What per cent is :

- (i) 30 out of 600?
- (ii) 25 out of 160?
- (iii) 75 out of 225?
- (iv) 36 kg of 150 kg?
- (v) 90 cm of 4.5 metre.
- (vi) 60 litres of 40 litres
- (vii) 800 shirts out of 1200 shirts?
- (viii) 875 m of 2 km?

2. Express:

- (i) 20 as a percentage of 500.
- (ii) 60 kg as a per cent age of 80 kg.
- (iii) 350 ml as a percentage of 5.6 litre.
- (iv) Rs. 13 as a percentage of Rs. 39.
- (v) 15 seconds as a percentage of 1 hour.
- (vi) 27° as a percentage of 360° .

3. Manu scored 384 marks out of 450. What per cent marks did she get?

4. In an election, out of 60,000 eligible voters 42000 cast their vote. Calculate the percentage of voters casting their votes.

$$\text{So the new population of the city} = 700 \times \left(1 + \frac{1}{14}\right) \\ = 700 \times \frac{15}{14} = 750$$

Solution for question 8: The reduced price of the watch

$$= 2400 \left(1 - \frac{1}{12}\right) \\ \left\{ \because 8.33\% = \frac{1}{12} \right. \\ = 2400 \times \frac{11}{12} = 2200$$

SOLUTION Required percentage of marks = $\frac{325}{400} \times 100 = 81.25\%$

EXAMPLE 3 In a factory of 150 workers, 18 were absent in a day. What percentage were present?

$$\text{SOLUTION} \quad \text{Present} = 150 - 18 = 132$$

$$\text{Percentage presence} = \frac{132}{150} \times 100 = 88\%$$

EXAMPLE 4 Kurla obtained 480 marks out of 600 and Birla obtained 560 marks out of 800. Whose performance is better?

SOLUTION % marks of Kurla = $\frac{480}{600} \times 100 = 80\%$

% marks of Birla = $\frac{560}{800} \times 100 = 70\%$

So, obviously Kurla's performance is better than that of Birla even though getting less absolute marks.

INTRODUCTORY EXERCISE-5.2

5. A tin contains 24 litres of milk. Due to leakage, 720 ml is lost. What per cent of milk is still present in the tin?
6. Price of an item increased from 16.50 to Rs. 41.25. Find the percentage increase in price.
7. The excise duty on a certain item has been reduced to Rs. 3480 from Rs. 5220. Find the percentage reduction in the excise duty for that item.
8. Out of total production of 6450 tonnes of a coalmine a quantity of 645 tonnes was lost during extraction. What per cent of the total production was the net coal extracted?
9. A cricket team played 24 matches. The team won 9 matches and lost 3 matches. 12 matches ended in draw. What per cent of the total matches did the team lose?
10. In a particular month, Rs. 10,000 were allocated for the food items in a hostel out of total Rs. 50,000 budget. Further Rs. 2000 is allocated for the fruits out of Rs. 10,000 (allocated for food items) what per cent of total budget is spent on fruits only?

percentages
SOME MOST IMPORTANT VALUES

$\frac{1}{1} \rightarrow 50\%$,	$\frac{1}{3} = 33.33\%$,
$\frac{2}{2} = 66.66\%$,	$\frac{1}{4} \rightarrow 25\%$,
$\frac{3}{3} \rightarrow 75\%$,	$\frac{1}{5} \rightarrow 20\%$,
$\frac{4}{4}$	$\frac{3}{5} \rightarrow 60\%$,
$\frac{2}{2} \rightarrow 40\%$,	$\frac{5}{6} \rightarrow 83.33\%$
$\frac{1}{5} \rightarrow 16.66\%$,	
$\frac{6}{6}$	

NOTE The application of percentage is very diverse in nature e.g. profit and loss, Simple and compound interest etc. All these are exactly based on the percentage increase/decrease of the original (or actual) value.

Percentage increase/decrease in a quantity

$$= \left(\frac{\text{change in quantity}}{\text{original quantity}} \times 100 \right) \%$$

EXAMPLE 1 The height of Abhimanyu some times ago was 110 cm. Now his height is 120 cm. Find the percentage change in his height.

SOLUTION $\frac{120 - 110}{110} \times 100 = 9.09\%$

PERCENTAGE CHANGE AND PERCENTAGE POINT CHANGE

Last year Abhijeet's salary was Rs. 10,000 and Sonu's salary was Rs. 8,000. This year Abhijeet's salary is Rs. 12,000 while Sonu's salary is Rs. 10,000.

- What is the percentage increase of Abhijeet's salary?
- What is the percentage increase of Sonu's salary?
- Percentage increase in Sonu's salary is how much percent greater than the percentage increase in Abhijeet's salary?
- What is the percentage point change in the salary of Sonu and Abhijeet?

SOLUTION (i) $\frac{12,000 - 10,000}{10,000} \times 100 = 20\%$

or $\frac{2}{10} \rightarrow \frac{1}{5} \rightarrow 20\%$

ADVANCED CONCEPT OF PERCENTAGE CHANGE

(A) If a value p is increased by $x\%$, then we have to decrease the resultant value by $\left(\frac{x}{x+100} \times 100 \right)\%$ to get back to the original value p .

$$\begin{aligned} \text{Original value } p &\xrightarrow{\text{increasing value}} \frac{p \times x}{100} \xrightarrow{\text{increasing value}} \left(p + \frac{px}{100} \right) \\ &\quad \text{Increased value} \\ &= p \left(\frac{100+x}{100} \right) \end{aligned}$$

SHORTCUT

$$\frac{10}{110} \rightarrow \frac{1}{11} \rightarrow 9.09\%$$

Alternatively: $\frac{12}{11} \rightarrow 109.09\%$, so increase = 9.09%

EXAMPLE 2 The total expenses of a hostel were Rs. 8000 per month. Some students left the hostel due to which the new expenses come down by Rs. 1000. Find the percentage decrease in expenses of the hostel.

SOLUTION

$$\frac{1000}{8000} \rightarrow \frac{1}{8} \rightarrow 12.5\%$$

EXAMPLE 3 Salary of Raja is Rs. 9000 per month and salary of Rani is Rs. 10,000 per month.

- What per cent is the salary of Rani to that of Raja?
- What per cent is the salary of Raja to that of Rani?

SOLUTION (i) $\frac{10,000}{9,000} \times 100 = 111.11\%$

Alternatively:

$$\frac{10}{9} \rightarrow \frac{9}{9} + \frac{1}{9} \rightarrow 100\% + 11.11\% \rightarrow 111.11\%$$

(ii) $\frac{9}{10} \rightarrow 90\% \quad \left(\because \frac{1}{10} \rightarrow 10\% \right)$

Hence, salary of Raja is 90% to the salary of Rani.

(ii) $\frac{2}{8} \rightarrow \frac{1}{4} \rightarrow 25\%$

(iii) Percentage increase of Sonu's salary = 25
Percentage increase of Abhijeet's salary = 20

$$\text{So the required percentage} = \frac{25 - 20}{20} \times 100 = 25\%$$

It means percentage increase of Sonu's salary is 25% greater than the percentage increase of Abhijeet's salary.

(iv) Percentage point change

$$\begin{aligned} &= (\text{Percentage increase in Sonu's salary} \\ &\quad - \text{Percentage increase in Abhijeet's salary}) \\ &= 25 - 20 = 5 \text{ percentage point} \end{aligned}$$

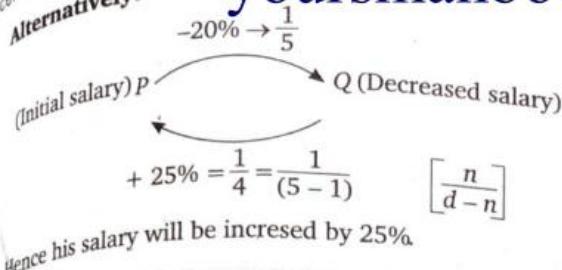
Infact percentage point change is the difference between two percentage values.

Now the percentage decrease

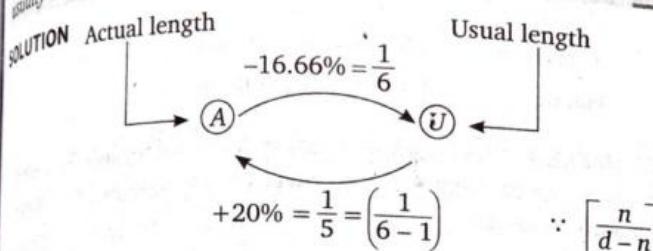
$$= \left[\frac{p \left(\frac{100+x}{100} \right) - p}{p \left(\frac{100+x}{100} \right)} \right] \times 100 = \left(\frac{x}{100+x} \times 100 \right)\%$$

In other words (i.e., in terms of fraction) if a value is increased by $\frac{n}{d}$ then to get back the same number p from the resultant value, we have to decrease the increased value by $\left(\frac{n}{d+n} \right)$.

Alternatively:



EXAMPLE 6 Kajol usually wears saree, which is 16.66% less than the actual length of the saree. By how much per cent the actual length of the saree is greater than the length of saree which kajol usually wears?



So the actual length of the saree is 20% greater than the usually used saree.

- NOTE**
- (1) If a value X is first increased by $p\%$ to Y then Y is again decreased to X by $q\%$ then p is always greater than q (for positive values)
 - (2) If a value X is first decreased by $p\%$ to Y and then Y is increased by $q\%$ to X , then p is always less than q .

CONCEPT OF PRODUCT CONSTANCY

It is the same as we know the inverse proportion in the chapter of Ratio, Proportion and Variation.

e.g., When the rate of a pencil is Rs. 1.25 then we can purchase 16 pencils by paying Rs. 20. If the rate of a pencil is decreased by Rs. 0.25 then we can purchase 20 pencils by paying Rs. 20.

Explanation : Rate \times No. of pencils = Price

$$1.25 \times 16 = 20$$

$$1.00 \times 20 = 20$$

So you can see that here the product (20) is constant in both the cases. Thus it is clear that if we reduce the price of a pencil to Rs. 0.50, then we can purchase 40 pencils in Rs. 20.

Some more examples of product constancy :

- (i) speed \times time = distance
- (ii) rate \times time = cost
- (iii) efficiency \times time = work
- (iv) length \times breadth = area
- (v) average \times no. of elements = total value
- (vi) rate \times quantity = price (or expenditure)

e.g., The price of sugar is increased by 25% then by how much per cent should a customer reduce the consumption (i.e., quantity used) of sugar so that he has not to increase his expenses on sugar.

$$\text{price} \times \text{quantity} = \text{expenditure}$$

(3) If a value A is increased by $p\%$ then again by $q\%$ once again it is increased by $r\%$, then the final value will be same as if you change the order of p, q, r i.e., A can be first increased by $r\%$ then by $q\%$ and then by $p\%$ still the result will be same.

(4) The rule 3 is also applicable for the decreasing of the values. A value ' A ' is first decreased by $p\%$, then by $q\%$ and then by $r\%$ and so on, the resultant value will be same as when A is first decreased by $q\%$ then by $p\%$ and then by $r\%$ etc.

Note : In case 3 and 4 we are discussing the successive increase or decrease in the value.

(5) A value ' A ' is first increased by $p\%$ then by $q\%$ and then it is reduced by $r\%$ will give the same results as when A is first decreased by $r\%$, then increased by $q\%$ and then by $p\%$ etc.

EXAMPLE 7 Initially Ms. Rakhi Sawant has Rs. 200 in her wallet then she increased it by 20%. Once again she increased her amount by 25%. The final value of money in her wallet will be how much per cent greater than the initial amount.

SOLUTION $200 \xrightarrow{+ 20\%} 240 \xrightarrow{+ 25\%} 300$

$$\text{So the required \% increase} = \frac{300 - 200}{200} \times 100 = 50\%$$

EXAMPLE 8 The age of B is 50% greater than the age of A . The age of C is 20% less than the age of B . By how much percentage the age of C is greater than the age of A .

SOLUTION $100 \xrightarrow{+ 50\%} 150 \xrightarrow{- 20\%} 120$

$$\text{So the required percentage change} = \frac{20}{100} \times 100$$

$$= 20\%$$

$$100 \times 100 = 10,000$$

$$125 \times x = 10,000$$

$$\Rightarrow x = \frac{10,000}{125} = 80. \text{ Therefore \% reduction} = 20\%$$

$$\text{or} \quad 1 \times 1 = 1$$

$$1.25 \times k = 1 \Rightarrow k = 0.8$$

thus there will be 20% decrease in the consumption of sugar in order to maintain the same expenditure on sugar.

PRODUCT CONSTANCY CONDITIONS

- When one factor of a product is increased by $p\%$ then the other factor will be decreased by $\left(\frac{p}{100+p} \times 100 \right)\%$

It means when one factor of a product is increased by $\frac{n}{d}$ then the other factor is decreased by $\frac{n}{(d+n)}$

- When one factor of a product is decreased by $p\%$ then the other factor will be increased by $\left(\frac{p}{100-p} \times 100 \right)\%$

It means when one factor of a product is decreased by $\frac{n}{d}$ then the other factor will be increased by $\frac{n}{(d-n)}$.

EXAMPLE 1 If the price of a commodity be raised by 20% then by how much per cent a house holder reduce his consumption of the same commodity so that his expenditure does not increase.

SOLUTION Since here product (i.e., expenditure) is constant
 $\text{rate} \times \text{consumption} = \text{expenditure}$

$$\text{initially} \rightarrow 1 \times 1 = 1$$

$$\text{After change} \quad 1.2 \times x = 1$$

$$\Rightarrow x = 0.833 \therefore \text{decrease in value} = 16.66\%$$

Alternatively:

$$\begin{array}{ccc} \text{Increase in rate} & & \text{Decrease in consumption} \\ + 20\% = + \frac{1}{5} & \longrightarrow & - 16.66\% = - \frac{1}{6} \end{array}$$

EXAMPLE 2 If the price of petrol falls down by 20% by how much per cent must a person increase its consumption, so as not to decrease the expenditure on this item?

SOLUTION Since product is constant

$$\begin{array}{ccc} \text{decrease by} & & \text{increase by} \\ 20\% = \frac{1}{5} & \longrightarrow & \frac{1}{4} = 25\% \quad \left[\because \frac{n}{d} \rightarrow \frac{n}{(d-n)} \right] \end{array}$$

EXAMPLE 3 Due to 50% increase in the price of rice. We purchased 5 kg less rice with the same amount of Rs. 60. What is the new price of rice?

CONCEPT OF 'BY' AND 'TO'

Please note that there is a clear difference between "by" and "to". e.g., the income is reduced by 40% it means the new income is 60% of the original and the income is reduced to 40% means the new income is 40% of the original value. Thus "by"

EXAMPLE 1 In an election between two candidates, the candidate who got 57% valid votes won by a majority of 420 votes. Find the total no. of valid votes.

$$\begin{array}{ccc} \text{SOLUTION} & \text{Winner} & \text{Loser} \\ & 0.57x & 0.43x \\ & \downarrow 0.14x & \uparrow \\ & 0.14x = 420 & \\ & x = 3000 & \end{array}$$

Hence total valid votes = 3000

EXAMPLE 2 Due to fall in manpower, the production in the factory decreases by 60%. By what per cent should the working hours be increased to restore the original production in the factory?

SOLUTION Manpower \times Working hours = Production

$$\begin{array}{ccc} & \downarrow & \uparrow \\ & (-60\%) = \frac{3}{5} & \rightarrow \frac{3}{2} = (+150\%) \\ & \left[\frac{3}{5} \rightarrow \frac{3}{5-3} = \frac{3}{2} \right] & \end{array}$$

Hence by 150% working hours will be increased. It means the new working hours will be 2.5 times (not 1.5 times) of the original time.

- (a) Rs. 4.66
 (c) Rs. 4

SOLUTION Increase in price

$$50\% = \frac{1}{2}$$

- (b) Rs. 5
 (d) Rs. 6

$$\longrightarrow \frac{1}{3} = 33.33\%$$

Since the new quantity of rice decreases by 33.33% which is equal to 5 kg it means initially there was 15 kg rice to be used.

So, the initial price = Rs. 4

and final price = Rs. 6

Alternatively: From the options.

Let us consider choice (d).

Therefore $[6 \times 10 = 60]$ (finally)

Hence $[4 \times 15 = 60]$ (initially)

EXAMPLE 4 The length of a plot is decreased by 33.33%. By how much % the breadth of the plot will be increased so that the area remains constant?

SOLUTION (Decrease) (Increase)

$$33.33 = \frac{1}{3} \longrightarrow \frac{1}{2} = 50\% \quad \left[\frac{1}{2} = \frac{1}{3-1} \right]$$

represents difference and "to" represents final value.

e.g., The income of Sarika is increased by 20% means new income is $100 + 20 = 120\%$ of the original income. The income of Sarika is increased to 120% means the new income of Sarika is 120% of the original income.

EXAMPLE 3 Two numbers are respectively 25% and 40% less than a third number. What per cent is the second of the first?

SOLUTION Consider A, B, C three numbers and assume $C = 100$ (as a base)

$$\begin{array}{ccc} A & B & C \\ 75 & 60 & 100 \\ \swarrow (-25\%) & \leftarrow (-40\%) & \end{array}$$

Now $\frac{60}{75} \times 100 = 80\%$

EXAMPLE 4 A person gives 10% to his wife 10% of the remaining to a hospital (as a donation) again 10% of the remaining to prime minister's relief Fund. Then he has only 7290 Rs. with him. What was the initial sum of money with that person?

SOLUTION Since he gives 10% so he is left with 90% of the original sum and since he does the same with the remaining (or left) amount. So it forms a chain.

$$\therefore \text{Remaining amount} = (x) \times 0.9 \times 0.9 \times 0.9$$

$$\Rightarrow x = 10,000, \text{ where } x \text{ is supposed to be initial amount.}$$

EXAMPLE 5 Initially a shopkeeper had n chocolates. A customer bought 10% chocolate from n then another customer bought 20% of the remaining chocolates, after that one more customer purchased 25% of the remaining chocolates. Finally shopkeeper is left with 270 chocolates in his shop. How many chocolates were there initially in his shop?

- (b) 450 (c) 500 (d) 600

$$n \times 0.9 \times 0.8 \times 0.75 = 270$$

SOLUTION

- (a) 300

POPULATION RELATED MATHEMATICAL PROBLEMS

If the original population of a locality (i.e., region) be P and the annual growth rate be $r\%$. The population after n years

$$P \left(1 + \frac{r}{100}\right)^n$$

change (or increase) in the population

$$= P \left[\left(1 + \frac{r}{100}\right)^n - 1 \right]$$

EXAMPLE 1 If the annual increase in the population be 20% and the present population be 10,000. What will be the population after 3 years hence?

- (a) 16,000 (b) 17,280
(c) 14,400 (d) 1,728

$$\text{SOLUTION } 10,000 \left(1 + \frac{20}{100}\right)^3 = 10,000 \left(\frac{6}{5}\right)^3$$

$$= 10,000 \times (1.2)^3 = 17,280$$

Hence (b) is correct.

EXAMPLE 2 The population of a town in the first year increases by 10% in the next year it decreases by 10% Once again in the third year it increase by 10% and in the fourth year it decrease by 10%. If the present population be 20,000 then the population after four years will be :

- (a) 16,902 (b) 19,602
(c) 20,000 (d) none of these

$$\text{SOLUTION } 20,000 \left(1 + \frac{10}{100}\right) \left(1 - \frac{10}{100}\right) \left(1 + \frac{10}{100}\right) \left(1 - \frac{10}{100}\right)$$

$$= 20,000 (1.1) (0.9) (1.1) (0.9)$$

$$= 20,000 \times 1.21 \times 0.81 = 19,602$$

Thus option (b) is correct.

NOTE If the value of a number is first increased by $x\%$ and then decreased by $x\%$, the net change is always a decreases (or loss) in original value.

Hence,

$$\% \text{ loss} = \left(\frac{x}{10}\right)^2 \%$$

EXAMPLE 1 Shweta is a very expert in bargaining. Once she went to a nearby shop. When Shweta asked the price of Shampoo Sachet the shopkeeper told her the price by increasing 15% of the original cost. But Shweta insisted to decrease the price by 15% so the shopkeeper sold it by decreasing the price by 15% What is the loss or profit of shopkeeper and by how much percent?

$$n = \frac{270 \times 10,000}{9 \times 8 \times 75}$$

$$n = 500$$

NOTE

These type of problems (see example no. 4 and 5) can be solved with a great convenience if we solve in reverse order, with the aid of given choices.

Let us consider option (c)

$$500 \times 0.9 = 450$$

$$450 \times 0.8 = 360$$

$$360 \times 0.75 = 270$$

Hence presumed option is correct.

If there is decrease in population be $r\%$ then,

$$\text{total population after } n \text{ years} = P \left(1 - \frac{r}{100}\right)^n$$

$$\text{and decrease in population} = P \left[1 - \left(1 - \frac{r}{100}\right)^n\right]$$

- (a) no loss

- (c) loss of 2.25%

- (b) profit of 1.5%

- (d) none of these

SOLUTION Let the actual price be 100

$$100 \xrightarrow{+15\%} 115 \xrightarrow{-15\%} 97.75 \quad (\text{loss of } 2.25\%)$$

$$\text{Alternatively: } \text{loss\%} = \left(\frac{15}{10}\right)^2 = 2.25\%$$

There is always a loss.

EXAMPLE 2 If the length and breadth of a rectangle are changed by + 20% and - 10% What is the percentage change in area of rectangle?

- (a) 8% (b) 10.8%
(c) 20% (d) data insufficient

SOLUTION

$$l \times b = \text{area}$$

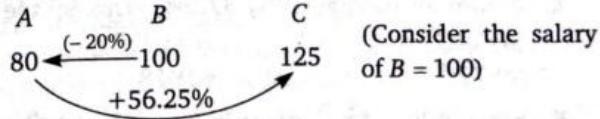
$$1 \times 1 = 1$$

$$1.2 \times 0.9 = 1.08$$

So there is 8% increase in the area of rectangle.

EXAMPLE 3 The salary of A is 20% lower than B's salary and the salary of C is 56.25% greater than A's salary. By how much percent the salary of B is less than the salary of C.

SOLUTION



$$\text{The required value} = \frac{25}{125} \times 100 = 20\%$$

Remember: Percentage change

$$= \left(\frac{\text{difference between original value and new value}}{\text{original value}} \right) \times 100$$

$$\text{Percentage increase} = \frac{\text{increased value} - \text{original value}}{\text{original value}} \times 100$$

$$\text{Percentage decrease} = \frac{\text{original value} - \text{decreased value}}{\text{original value}} \times 100$$

SOLUTION

$$20\% = \frac{20}{5}$$

$$\text{So new salary} = 80,000 \left(1 - \frac{1}{5}\right)$$

$$= 80,000 \times \frac{4}{5} = \$ 64,000$$

NOTE (1) There is a huge difference between "decreased value" and "decrease in value" and between "increased value" and "increase in value".

For example : Initial value = 70

$$\text{Final value} = 90$$

it means increased value is = 90
but increase in value is 20

$$\text{and \% increase} = \frac{90 - 70}{70} \times 100 = 28.57\%$$

(2) If there is increase of $\frac{x}{y}$ in any value P then the increased value will be $P \left(1 + \frac{x}{y}\right)$.

(3) If there is decrease of $\frac{x}{y}$ in any value, then the decreased value will be $P \left(1 - \frac{x}{y}\right)$.

EXAMPLE 1 Nishith is now 20 years old. Some years later his age will increase by 50% of himself. What will be the new age at that time?

$$\text{SOLUTION} \quad 20 \left(1 + \frac{1}{2}\right) = 30 \text{ years} \quad \left[\because 20 + 20 \times \frac{1}{2} = 20 \left(1 + \frac{1}{2}\right)\right]$$

EXAMPLE 2 The average salary of Purushottam in Infosys is 20% less than that was in Microsoft. If the salary of Purushottam in Microsoft be \$ 80,000 per month then what is the salary of Purushottam in Infosys?

1. What per cent of $\frac{3}{7}$ is $\frac{1}{105}$?

- (a) 10% (b) 2.22%
(c) 45% (d) 450%

2. What per cent is 3% of 15%?

- (a) 15% (b) 20%
(c) 40% (d) 66.66%

3. If the cost of a calculator worth Rs 250 is increased by Rs. 100, the rate of increase is

- (a) 100% (b) 40%
(c) 25% (d) none of these

4. A number increased by 37.5% gives 99 the number is

- (a) 140 (b) 61.5
(c) 72 (d) 48

5. When 40% of a number is added to 42, the result is the number itself. The number is:

- (a) 105 (b) 72
(c) 70 (d) 82

6. In an examination 52% of the candidates failed in Science 42% in Mathematics and 17% in both. The no. of those who passed in both the subjects, is :

NOTE Remember this type of problems can also be solved through percentages.

$$\text{As} \quad 80,000 \times 0.8 = 64,000$$

but the technique given above is not less important. Some times it becomes very necessary to solve through fractions. So, keep your eyes open mind focussed and use your wits to solve the problems intelligently as per the situation.

EXAMPLE 3 Which one of the following is greatest?

SOLUTION

$$\frac{3}{4} = 75\%$$

$$\frac{7}{8} = 87.5\%$$

$$\frac{16}{19} = 84.21\%$$

$$\frac{13}{15} = 86.66\%$$

So, $\frac{7}{8}$ is the greatest fraction (or rational number)

INTRODUCTORY EXERCISE-5.3

(a) 83% (b) 64%

(c) 23% (d) 55.55%

7. The price of an item is increased by 20% and then decreased by 20%. The final price as compared to original price

- (a) 4% more (b) 20% more
(c) 20% less (d) 4% less

8. Two candidates fought an election. One got 65% of the votes and won by 600 votes. The total no. of votes polled is:

- (a) 12,000 (b) 10,000
(c) 2,000 (d) 8,000

9. Out of a no. of electronic items, a person purchases 65% coloured TVs 5% of these were found to be defective. The percentage of defective TVs in all is

- (a) 3% (b) 6%
(c) 12% (d) can't be determined

10. A's salary is half that of B. If A got a 50% rise in his salary and B got a 25% rise in his salary, then the percentage increase in combined salaries of both is

- (a) 30% (b) 33.33%
(c) 55% (d) 28%

LEVEL 1

1. In our Singapore office there are 60% female employees. 50% of all the male employees are computer literate. If there are total 62% employees computer literate out of the total 1600 employees, then the no. of female employees who are computer literate :

(a) 690 (b) 672 (c) 960 (d) can't be determined

2. The price of a car depreciates in the first year by 25% in the second year by 20% in the third year by 15% and so on. The final price of the car after 3 years, if the present cost of the car is Rs. 10,00,000 :

(a) 7,80,000 (b) 5,10,000 (c) 6,90,000 (d) 1,70,000

3. A shopkeeper charges sales tax of $x\%$ up to Rs. 2,000 and above it he charges $y\%$. A customer pays total tax of Rs 320, when he purchases the goods worth Rs. 6,000 and he pays the total tax of Rs. 680 for the goods worth Rs. 12,000. The value of $(x - y)$ is :

(a) 0 (b) - 2 (c) - 4 (d) 5

4. 40% of a number when added to the square of the same number, then it is increased to 4040% of itself the actual number is :

(a) 175 (b) 400 (c) 40 (d) 120

5. In my office there are 30% female employees and 30% of these earn greater than Rs. 8,000 per month and 80% of male employees earn less than Rs. 8,000 per month. What is the percentage of employees who earn more than Rs. 8,000 per month?

(a) 30% (b) 23% (c) 60% (d) can't be determined

6. 100 students took the test on physics and chemistry. 35% students failed in Physics and 45% students failed in Chemistry and 40% of those who passed in Chemistry also passed in Physics, then how many students failed in both :

(a) 162 (b) 138 (c) 60 (d) none of these

7. In an examination 70% of the candidates passed in History and 50% in Geography and 20% students failed in both the subjects. If 500 students passed in both the subjects, then how many candidates appeared for the exam ?

(a) 1,000 (b) 1,500 (c) 2,500 (d) none of these

8. My salary is Rs. 12,345 per month. The salary of my brother is $\frac{5}{4}$ greater than that of mine. The salary of my only sister is $\frac{9}{5}$ greater than my only brother. The salary of my wife is

56 $\frac{12}{23}$ % less than the total salary of my brother and sister together, then the salary of my wife is :

(a) greater than my sister's salary (b) 33 $\frac{11}{23}$ % less than my sister's salary (c) equal to my salary (d) 44 $\frac{11}{23}$ % greater than my own salary

9. MDTV is a very popular TV channel. It telecasts the programmes from 8:00 a.m. to 12:00 p.m. It telecasts 60 advertisements each of 8 seconds and 16 advertisements each of 30 seconds. What is the percentage of time devoted in a day for the advertisements?

(a) 1.5% (b) 1.66% (c) 2% (d) 2.5%

10. Lagaan is levied on the 60% of the cultivated land. The revenue department collected total Rs. 3,84,000 through the lagaan from the village of Sukhiya. Sukhiya, a very rich farmer, paid only Rs. 480 as lagaan. The percentage of total land of Sukhiya over the total taxable land of the village is :

(a) 0.15% (b) 15% (c) 0.125% (d) none of these

11. The actual area of a rectangle is 60 cm^2 , but while measuring its length a student decreases it by 20% and the breadth increases by 25%. The percentage error in area, calculated by the student is :

(a) 5% (b) 25% (c) can't be determined (d) none of these

12. The cost of packaging of the mangoes is 40% the cost of fresh mangoes themselves. The cost of mangoes increased by 30% but the cost of packaging decreases by 50%, then the percentage change of the cost of packed mangoes, if the cost of packed mangoes is equal to the sum of the cost of fresh mangoes and cost of packaging :

(a) 14.17% (b) 7.14% (c) 6.66% (d) none of these

13. Abhinav scores 80% in Physics and 66% in chemistry and the maximum marks of both the papers are 100. What per cent does he score in maths which is of 200 marks, if he scores 80% marks in all the three subjects :

(a) 74% (b) 84% (c) 87% (d) 83%

14. In the New York Stock Exchange there are 45% female employees and thus the number of male employees is exceeded by 72. Hence the total no. of employees in the New York Stock Exchange is :

(a) 540 (b) 720 (c) 7200 (d) 550

15. Three candidates A, B and C contested an election. Out of the total votes on a voter list 25% did not vote and 6.66% votes polled were invalid. C got 2450 valid votes, which were 40% more than that of B. If A got only 40% of the total votes, then who is the winner?
 (a) A (b) B
 (c) C (d) can't be determined

16. The cost of a car is 400% greater than the cost of a bike. If there is an increase in the cost of the car is 15% and that of bike is 20%. Then the total increase in the cost of the 5 cars and 10 bikes is :
 (a) 17.5% (b) $16\frac{3}{7}\%$
 (c) 18.5% (d) 18.25%

17. The square of a positive number is 2,000% greater than the number itself, then the square of that number is :
 (a) 1762 (b) 1635
 (c) 441 (d) 139

18. The monthly salary of Shahid and Kareena together is \$ 28,000. The salary of Shahid and Kareena is increased by 25% and 12.5% respectively then the new salary of Kareena becomes 120% of the new salary of Shahid. The new (or increased) salary of Shahid is :
 (a) \$ 15,000 (b) \$ 18,000
 (c) \$ 14,000 (d) \$ 16,000

19. 80% of a smaller number is 4 less than 40% of a larger number. The larger number is 85 greater than the smaller one. The sum of these two numbers is :
 (a) 325 (b) 425
 (c) 235 (d) 500

20. 220% of a number 'X' is 44. What is 44% of 'X' ?
 (a) 88 (b) 8.8
 (c) 66 (d) data insufficient

21. The shopkeeper increased the price of a product by 25% so that customer finds it difficult to purchase the required amount. But somehow the customer managed to purchase only 70% of the required amount. What is the net difference in the expenditure on that product ?
 (a) 10% more (b) 5% more
 (c) 12.5% less (d) 17.5% less

22. In the previous government, party Q was in the opposition. Now increasing the seats by 33.33% Q is the ruling party and thus party Q enjoys twice the majority than that of party P in the previous government. If there were only two parties P and Q and the fix no. of seats be 500 in the parliament of Hum-Tum, then the no. of seats of the Q in the new government is :
 (a) 225 (b) 200
 (c) 275 (d) 300

23. In an examination a candidate got 30% marks and failed by 30 marks. If the passing marks are 60% of the total marks, then the maximum marks will be :
 (a) 450 (b) 600
 (c) 300 (d) 100

24. In a school there are 1800 students. Last day except 4% of the boys all the students were present in the school. Today except 5% of the girls all the students are present in the school, but in both the days no. of students present in the school, were same. The no. of girls in the school is :
 (a) 1200 (b) 800
 (c) 1000 (d) 600

25. In a library 60% of the books are in English and rest of the books are in Urdu. If there are 3600 books in English, then the total no. of books in Urdu are :
 (a) 2400 (b) 2500
 (c) 3000 (d) none of these

26. In a test there are total n questions. Bhanu answers 20 out of 25 questions correctly in the first section. In the second section he answers 60% question correct and thus his total score is 66.66% in the test. Given that all the questions carry equal marks, without any negative marking. The total no. of questions in the test is :
 (a) 50 (b) 60
 (c) 75 (d) 100

27. In a class of MBA students 16.66% students are from Science background and 12.5% students are from commerce background and 6.66% students from arts background and rest are from Engineering background. The minimum possible students of engineering background are :
 (a) 45 (b) 77
 (c) 100 (d) 120

28. An alloy contains the copper and aluminium in the ratio of 7 : 4. While making the weapons from this alloy, 12% of the alloy got destroyed. If there is 12 kg of aluminium in the weapon, then the weight of the alloy required is :
 (a) 48 kg (b) 40 kg
 (c) 37.5 kg (d) 14.4 kg

29. Hariharan goes to a shop to buy an FM radio costing Rs. 1404 including sales tax at 8%. He asks the shopkeeper to reduce the price of radio so that he can save the amount equal to the sales tax. The reduction of the price of the radio is :
 (a) Rs. 108 (b) Rs. 104
 (c) Rs. 112.32 (d) none of these

30. The average weight of a class of students is 67.5 kg. The weight of the class teacher is 25% more than the average weight of the class. The average weight of the class is less than the class teacher by $x\%$. The value of x is :
 (a) 33.33% (b) 25%
 (c) 20% (d) can't be determined

31. Last year in CAT, each section of the question paper had different weightage. The weightage of QA, DI and VA/RC sections was 8, 9 and 10 respectively. The maximum marks in all the three sections together were 810. Wrong answer did not carry negative marks as a penalty. If Padma had gotten 20% more marks in QA and 8% more marks in DI and 7.14...% more marks in VA/RC, then she must have gotten 100% marks in all the three sections. The total marks that Padma had scored :
 (a) 730 (b) 700
 (c) 750 (d) 775

32. A salesman gets commission on total sales at 9%. If the sale is exceeded Rs. 10,000 he gets an additional commission as bonus of 3% on the excess of sales over Rs. 10,000. If he gets total commission of Rs. 1380, then the bonus he received is :
 (a) Rs. 180 (b) Rs. 120
 (c) Rs. 480 (d) data insufficient

33. In Veeru Bhai Pvt. limited company 60% of the employees are men and 48% of the employees are Engineers and 66.6% of these are men. The percentage of women who are not engineers :
 (a) 33.33% (b) 60%
 (c) 52% (d) 46.66%

44. Initially Veer had 60% more love letters than that of Zara. In the last month the no. of love letters of Veer increased by 25% and that of Zara decreased by 25%. Again in the present month the no. of love letters of Veer decreased to 60% and that of Zara increased by 60%. Then which of the following statements is correct regarding the present no. of love letters :
- Veer has 40% more letters than that of Zara
 - Zara has 20% less letters than that of Veer
 - Veer and Zara have equal no of letters
 - Zara has 37.5% less letters than that of Veer.
45. The charges per hour of internet surfing is increased by 25% then find the percentage decrease in the time period of surfing of a user (a net savvy) who can afford only a 10% increase in expenditure :
- 22%
 - 12%
 - 15%
 - 9.09%
46. The average earning of each member of the Ambani family is 20% less than the average earning of each member of the Sahara family and the total earning of Ambani's family is 20% more than the total earning of Saharas's family. The no. of family members in the Sahara is what per cent of the no. of family members of Ambani :
- 25%
 - 20%
 - 66.66%
 - none of these
47. From 2000 onwards, till 2003 the price of computers increased every year by 10%. After that due to government subsidy the price of computers decreases every year by 10%. The price of a computer in 2006 will be approx. how much per cent less than the price in 2000 if the same pattern of price is continued :
- 2
 - 3
 - 4
 - none of these
48. A book consists of 30 pages, 25 lines on each page and 35 characters on each line. If this content is written in another note book consisting of 30 lines and 28 characters per line, then the required no. of pages will how much per cent greater than the previous pages?
- 4.16%
 - 5%
 - 6.66%
 - none of these
49. The rate of increase of the price of sugar is observed to be two per cent more than the inflation rate expressed in percentage. The price of sugar on January 1, 2004 is Rs. 20 per kg. The inflation rates of the years 2004 and 2005 are expected to be 8% each. The expected price of sugar on January 1, 2006 would be :
- Rs. 23.60
 - Rs. 24.00
 - Rs. 24.20
 - Rs. 24.60
50. A club has raised 75% of the amount it needs for a new building by receiving an average donation of Rs. 600 from the people already solicited. The people already solicited represents 60% of the people the club will ask for donations. If the club is to raise exactly the amount needed for the new building, what should be the average donation from the remaining people to be solicited?
- 250
 - 300
 - 400
 - 600
51. A number x is mistakenly divided by 10 instead of being multiplied by 10. What is the percentage error in the result?
- 99%
 - + 99%
 - 100%
 - + 100%
42. What is the percentage change in the result when we add 50 to a certain number x , instead of subtracting 50 from the same number x ?
- 50%
 - 100%
 - 300%
 - can't be determined
43. In the Regional Science Centre, Lucknow the rate of ticket is increased by 50% to increase the revenue, but simultaneously 20% of the visitors decreased. What is percentage change in the revenue of Regional Science Centre. If it is known that the centre collects the revenue only from the visitors and it has no other financial supports :
- + 20%
 - 25%
 - + 30%
 - can't be determined
44. Recently when I visited a show room of shoes shopkeeper told me that he could reduce the price of Bata shoes by 49% and if I were to purchase woodland shoes he could reduce the price to 51% of the original price. If the marked price (i.e., printed price) of both the shoes was same, then which shoes was cheap to buy :
- Wood land
 - Bata
 - both
 - can't say
45. Selling price of a shirt and a coat is Rs. 4000. The cost price of a shirt is 58.33% of the cost price of a coat and so amount of profit on both the shirt and coat is same, then the price of the shirt could be :
- Rs 2100
 - Rs. 2525
 - Rs. 2499
 - Rs. 1120
46. On the April 1, 2005 my salary increased from Rs. 10,000 to Rs. 16,000. Simultaneously the rate of income tax decreased by 37.5%, So the amount of income tax paid by me remains constant what is the value of income tax paid by me :
- Rs. 3000
 - Rs. 6000
 - Rs. 1600
 - can't be determined
47. In the previous question, if the difference in the rate of income tax be 9 (in percent) then the income tax paid by me :
- Rs. 2000
 - Rs. 2400
 - Rs. 1600
 - none of these
48. The average of a set of whole numbers is 27.2. When the 20% of the elements (ie numbers) are eliminated from the set of numbers then the average becomes 34. The number of elements in the new set of numbers can be :
- 27
 - 35
 - 52
 - 63
49. In a class, the no. of boys is more than the no. of girls by 12% of the total strength. The ratio of boys to girls is :
- 15 : 11
 - 11 : 14
 - 14 : 11
 - 8 : 11
50. The population of a village is 5000 and it increases at the rate of 2% every year. After 2 years, the population will be :
- 5116
 - 5202
 - 5200
 - 5204
51. A customer asks for the production of x number of goods. The company produces y number of goods daily. Out of which $z\%$ are unfit for sale. The order will be completed in :
- $\frac{x}{100y(1-z)}$ days
 - $\frac{100yz}{x}$ days
 - $\frac{100x}{y(100-z)}$ days
 - $\frac{100}{y(z-1)}$ days

LEVEL (2)

1. In the Awadh school Gomti Nagar, there are 500 students. 60% of the students are boys, 40% of whom play hockey and the girls don't play hockey. 75% of girls play badminton. There are only two games to be played. The number of students who don't play any game is :
 (a) 10% (b) 36%
 (c) 46% (d) can't be determined
2. A fraction in reduced form is such that when it is squared and then its numerator is increased by 25% and the denominator is reduced to 80% it results in $\frac{5}{8}$ of the original fraction. The product of the numerator and denominator is :
 (a) 6 (b) 12
 (c) 10 (d) 7
3. In the Chidambaram's family the ratio of expenses to the savings is 5 : 3. But his expenses is increased by 60% and income increases by only 25% thus there is a deficit of Rs. 3500 in the savings. The increased income of Mr. Chidambaram's family is :
 (a) Rs. 35,000 (b) Rs. 28,000
 (c) Rs. 25,000 (d) Rs. 18,500
4. In the Presidency College two candidates contested a presidential election. 15% of the voters did not vote and 41 votes were invalid. The elected contestant got 314 votes more than the other candidate. If the elected candidate got 45% of the total eligible votes, which is equal to the no. of all the students of the college. The individual votes of each candidate are :
 (a) 2250 and 1936 (b) 3568 and 3254
 (c) 2442 and 2128 (d) 2457 and 2143
5. The annual earning of Mr. Sikkawala is Rs. 4 lakhs per annum for the first year of his job and his expenditure was 50%. Later on for the next 3 years his average income increases by Rs. 40,000 per annum and the saving was 40%, 30% and 20% of the income. What is the percentage of his total savings over the total expenditure if there is no any interest is applied on the savings for these four years :
 (a) $49\frac{37}{87}\%$ (b) $41\frac{73}{83}\%$
 (c) 53% (d) none of these
6. In an election only two candidates contested 20% of the voters did not vote and 120 votes were declared as invalid. The winner got 200 votes more than his opponents thus he secured 41% votes of the total voters on the voter list. Percentage votes of the defeated candidate out of the total votes casted is :
 (a) 47.5% (b) 41%
 (c) 38% (d) 45%
- Directions for questions 7, 8 and 9:** Pujari ji, the chief of a temple's trust, has a beautiful daughter Nirjala and a son in law, Radhey. Pujarin, the wife of Pujariji, lives her own life by receiving the alms from the devotees and receives 9.09% earning of her husband and the daughter together. The earning of Nirjala in each month is Rs. 8000 less than her husband Radhey. The earning of Pujariji and Radhey together is Rs. 30,000 per month. The earning of Radhey and Nirjala together is Rs. 133.33% greater than that of Pujariji.
7. The average earning of each Pujari ji, Nirjala and Radhey is :
 (a) Rs. 13333.33 (b) Rs. 888.88
 (c) Rs. 15,000 (d) none of these
8. What is the earning of Pujarin from the alms?
 (a) Rs. 1800 (b) Rs. 2000
 (c) Rs. 3600 (d) can't be determined
9. The earning of Radhey is how much per cent greater than that of his wife?
 (a) 50% (b) 80%
 (c) $\frac{11}{13}\%$ (d) none of these
10. A sales executive gets 20% bonus of the total sales value and 10% commission besides the bonus on the net profit after charging such commission. If the total sales value be Rs. 10 lakh per annum and the total profit of the company be Rs. 1.32 lakh, then his total earning per annum will be, given that he is not entitled to receive any fixed salary from the company :
 (a) 2.3 lakh (b) 3.2 lakh
 (c) 2.32 lakh (d) 2.12 lakh
11. Mr Scindia after selling 5.5% stock at Rs. 92 realizes Rs. 32200. Then he invested $\frac{1}{3}$ of the amount in 4.5% stock at Rs. 92, $\frac{2}{5}$ of the amount at Rs. 115 in 5% stock and the remaining in 6% stock at Rs. 56. The change in his income is :
 (a) Rs. 56 loss (b) Rs. 78 profit
 (c) Rs. 80 profit (d) Rs. 70 loss
12. Each edge of a cube is increased by 20% then the percentage increase in surface area of the cube is :
 (a) 144% (b) 40%
 (c) 44% (d) 72.8%
- Directions for question number 13 and 14:** Pati, Patni and Woh (the three persons) were playing a game. At the beginning of the game Pati and Patni together had 100% more money than Woh. Patni and Woh together had 300% more than Pati. By the end of the game Pati and Patni together had 100% more money than Woh had and Pati had 12.5% less money than Patni and Woh together had. Finally Pati gained Rs. 800 by the end of the game.
13. Who has suffered the loss?
 (a) Patni (b) Woh
 (c) Patni and Woh both (d) can't be determined
14. The percentage change of money of Patni is :
 (a) 40% (b) 30%
 (c) 57.1428% (d) 42.857%
15. The raw material and manufacturing cost formed individually 70% and 30% of the total cost and the profit percentage is 14.28% of the raw material. If the cost of raw material increase by 20% and the cost of manufacturing is increased by 40% and the selling price is increased by 80% then the new profit percentage is :
 (a) 57% (b) 65.8%
 (c) 60% (d) can't be determined

16. A, B, C and D purchased a cinema multiplex for Rs. 56 lakhs. The contribution of B, C and D together is 460% that of A, alone. The contribution of A, C and D together is 366.66% that of B's contribution and the contribution of C is 40% that of A, B and D together. The amount contributed by D is :
 (a) 10 lakh
 (b) 12 lakh
 (c) 16 lakh
 (d) 18 lakh

17. In a village three people contested for the post of village pradhan. Due to their own interest, all the voters voted and no one vote was invalid. The losing candidate got 30% votes. What could be the minimum absolute margin of votes by which the winning candidate led by the nearest rival, if each candidate got an integral per cent of votes?
 (a) 4
 (b) 2
 (c) 1
 (d) none of these

18. Every day a mango seller sells half his stock, 10% of the stock overnight gets spoiled. If 1983 mangoes rotted over 3 nights then how many did he start with on the first day?
 (a) 25,000
 (b) 24,000
 (c) 30,000
 (d) 32,000

19. A man lost half of his initial amount in the gambling after playing 3 rounds. The rule of gambling is that if he wins he will receive Rs. 100, but he has to give 50% of the total amount after each round. Luckily he won all the three rounds. The initial amount with which he had started the gambling was :
 (a) $\frac{500}{3}$
 (b) $\frac{700}{3}$
 (c) 300
 (d) 600

20. In a factory there are three types of Machines M_1 , M_2 and M_3 which produces 25%, 35%, and 40% of the total products respectively. M_1 , M_2 and M_3 produces 2%, 4% and 5% defective products, respectively. What is the percentage of non-defective products?
 (a) 89%
 (b) 97.1%
 (c) 96.1%
 (d) 86.1%

21. A company has 12 machines of equal efficiency in its factory. The annual manufacturing expenses are Rs. 24,000 and the establishment charges are Rs. 10,000. The annual output of the company is Rs. 48,000. The annual output and manufacturing costs are directly proportional to the no. of machines while the share holders get the 10% profit, which is directly proportional to the annual output of the company. If 8.33% machines remained close throughout the year. Then the percentage decrease in the amount of Share holders is :
 (a) 16.66%
 (b) 14.28%
 (c) 8.33%
 (d) none of these

22. In every month Ravindra consumes 25 kg rice and 9 kg wheat. The price of rice is 20% of the price of wheat and thus he spends total Rs. 350 on the rice and wheat per month. If the price of wheat is increased by 20% then what is the percentage reduction of rice consumption for the same expenditure of Rs. 350? Given that the price of rice and consumption of wheat is constant :
 (a) 36%
 (b) 40%
 (c) 25%
 (d) 24%

23. My friend Siddhartha Ghosh is working in the life insurance Corporation of India (LIC). He was hired on the basis of commission and he got the bonus only on the first years commission. He got the policies of Rs. 2 lakh having maturity period of 10 year. His commission in the first second, third, fourth and for the rest of the years is 20%, 16% 12% 10% and 4% respectively. The bonus is 25% of the commission. If the annual premium is Rs. 20,000 then what is his total commission if the completion of the maturity of all the policies is mandatory :
 (a) Rs. 174,00
 (b) Rs. 23,600
 (c) Rs. 15,000
 (d) Rs. 15,500

24. **Directions for question number 24 and 25:** DELL Computer has two branches : One in Ohio and second in Texas : The total no. of employees in Ohio office grew this year by 25% to 750 but the ratio of male to female employees is same as in the previous year. The no. of employees in the Texas office grew this year by 9.09% to 1200. The ratio of male to female employees last year in the Texas office was 5 : 6 and the no. of male employees in the Ohio office was 20% less than that of Texas office.

24. The total no. of female employees this year in both the offices is :
 (a) 654
 (b) 546
 (c) 950
 (d) can't be determined
25. The total no. of employees in both the offices last year was :
 (a) 1500
 (b) 1700
 (c) 1650
 (d) can't be determined
26. A shepherd had n goats in the year 2000. In 2001 the no. of goats increased by 40%. In 2002 the no. of goats declined to 70%. In 2003 the no. of goats grew by 30%. In 2004, he sold 10% goats, then he had only 34,398 goats. The percentage increase of the no. of goats in this duration was :
 (a) 14.66%
 (b) 16.66%
 (c) 20%
 (d) 33.33%

27. In the above question in which year the no. of goats was minimum?
 (a) 2000
 (b) 2001
 (c) 2002
 (d) 2004

28. **Directions for questions number 28, 29 and 30:** In the IGNOU (Indira Gandhi National Open University) there are total 16,000 students pursuing MBA, which offers the specialization only in Finance, HR and Marketing. IGNOU accepts only Science, Commerce and Engineering students for the two years course of MBA. The number of science students is 166.66% of the Commerce students. Number of Engineering students is equal to the number of Science and Commerce students together. Each student can specialize in only one of the marketing, HR and Finance. 20% of Science students opted the Finance, which is 16.66% less than the no. of Commerce students who opted Finance. The total Finance students is equal to 18% the total strength of the MBA students. 32% of Science students opted HR. Commerce students who opted HR is equal to 25% of total students specializing in Finance and Engineering students equal to 6.5% of the total strength of the MBA students opted HR.

28. The number of Engineering students who opted marketing is :
 (a) 7850 (b) 7500
 (c) 8850 (d) none of these

29. The percentage of Commerce students who opted HR over the total strength of the MBA students is :
 (a) 6.6% (b) 42.5%
 (c) 4.5% (d) 62.5%

30. The most preferable course among the MBA students is :
 (a) Finance (b) HR
 (c) Marketing (d) I. T and systems

31. $P\%$ of the students of a class passed the exam. $g\%$ of the passed students are girls and $b\%$ of the fail students are boys. The percentage of passed boys over the failed girls is :
 (a) $\left(\frac{bg}{p} \times 100 \right)$ (b) $\frac{100(100-g)p}{(100-p)(100-b)}$
 (c) $\frac{(100-g)(100-b)}{(100-p)}$ (d) none of these

2. In the Polo hospital some patients who were suffering from the Hepatitis-B were admitted for the treatment, but 9% of the patients were died within half an hour. After treatment, the percentage of patients cured out of the remaining was only 80%. Out of these patients only 70% are completely cured out and the remaining were partially cured out which were equal to 153 patients. The no. of patients (approx.) who were admitted for the treatment for the same was :
 (a) 400 (b) 678
 (c) 560 (d) 700

The total cost of setting up a sugar cane factory is Rs. 1 crore, which produces 5000 ton per annum. Sugar is being sold at Rs. 18 per kg. Manufacturing cost including raw material is Rs. 3.2 per kg, labour and packing charges are Rs. 1.8 per kg. Maintenance and utilities expenses are Rs. 2 per kg and the general expenses (ie all the rest charges) are Rs. 3 per kg, 20% taxes are being paid of the gross annual earnings, then the net profit of the production of the factory per annum is :
 (a) Rs. 4.2 crore (b) Rs. 3.2 crore
 (c) 5.4 crore (d) none of these

A student appeared in the Mock CAT. The test paper contained 3 sections namely QA, DI and VA. The percentage marks in VA was equal to the average of the percentage marks in all the 3 sections. Coincidentally, if we reverse the digits of the percentage marks of QA we get the percentage marks of DI. The percentage marks in VA scored by the student could be :
 (a) 48 (b) 66
 (c) 69 (d) 81

The pressure of a definite mass of a gas is directly proportional to the temperature and inversely proportional to the volume under the given conditions. If temperature is increased by 40% and the volume is decreased by 20% then the new pressure will:
 (a) be increased by 75% (b) reduce to 25%
 (c) be increased by 20% (d) increase by 28%

A computer typist types a page with 20 lines in 10 minutes but leaves 8% margin on the left side of the page. Now he has

to type 23 pages with 40 lines on each page which he leaves 25% more margin than before. How much time is required to type these 23 pages

37. A company made a cuboidal box of size $16 \times 12 \times 5$ to sell the ice cream, but later on it was found that the capacity of the box was 14.28% less than the required capacity while the height of the box was correct, which is 5 inches. As per the requirement he had to increase the length and breadth of the box in equal amount then the percentage increase in the area of the base of the box is

(a) 12.5% (b) 6.66%
(c) 16.66% (d) none of these

38. In Sabarmati Express, there are as many wagons as there are the no. of seats in each wagon and not more than one passenger can have the same berth (seat). If the middlemost compartment carrying 25 passengers is filled with 71.428% of its capacity, then find the maximum no. of passengers in the train that can be accommodated if it has minimum 20% seats always vacant

(a) 500 (b) 786
(c) 980 (d) can't be determined

39. The prepaid card of Reliance Infocom gives 19% less talktime than the prepaid card of Tata Indicom, having same price. Again the post-paid card of same price of Tata Indicom gives 10% less talktime than its prepaid card. Similarly the post paid card of same price of Reliance gives 11.11% less talk time than its prepaid card. How much percent less talk time we get from the Reliance post paid card than the post paid card of Tata Indicom?

(a) 21.11% (b) 20%
(c) 30.11% (d) none of these

40. In the half yearly exam only 70% of the students were passed. Out of these (passed in half yearly) only 60% student are passed in annual exam. Out of those who did not pass the half yearly exam, 80% passed in annual exam. What per cent of the students passed the annual exam?

(a) 42% (b) 56%
(c) 66% (d) none of these

41. The marks obtained by the students of a school is given below : maximum marks are 50.

Marks	Percentage of Students
< 10	15%
< 20	32%
< 30	40%
< 40	70%
< 50	100%

The ratio of no. of boys to no. of girls who passed the exam is 7 : 6. It is known that a student can pass the exam only when he obtained at least 20 marks in the exam. The total no. of students in the school if the no. of girls who are passed is 408.

(a) 1100 (b) 1200
(c) 1300 (d) 1430

Direction for question number 42 to 45: After defeating Ravana, Ram and his family won a lot of valuable assets in the war. It consists of horses, chariots and some land of Ravans's kingdom. The cost of each horse and chariot was Rs. 20,000 and Rs. 8,000 respectively while the cost of 1 acre land was Rs. 5000. All the property was shared among the four persons in such a way that Ram and Sita got together the same wealth as Laxman and Urmila got together. Ram got more than Sita and Laxman got more than Urmila. Ram got $\frac{1}{3}$ rd horses and 20%

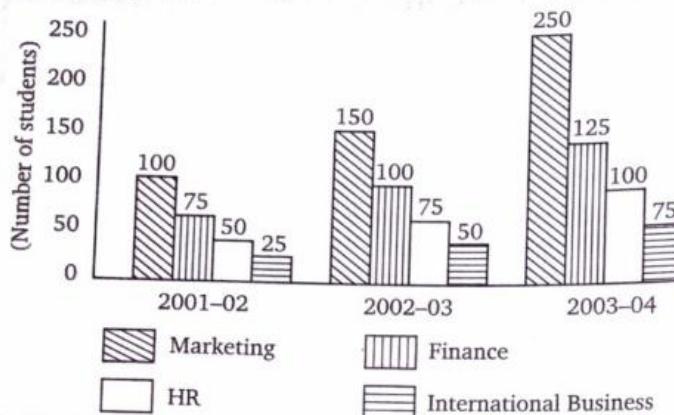
chariots while Laxman received 50% chariots as the 50% of his total wealth. The no. of horses that Ram and Sita got together was 50% more than that of Laxman and Urmila together had. Sita got 8 horses and Urmila got 7 horses but the Ram and Sita got equal no. of Chariots and Urmila got 20 chariots less than that of Laxman. Urmila got twice the land than that of Sita but 20% less than Laxman.

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(The first stage of entrance into IIMs) but coincidentally the no. of boys who qualified the CAT was equal to the no. of girls. Besides these boys and girls got the calls from only IIM Ahmedabad and IIM Bangalore, but each of these from both the IIMs. 60% of the boys failed in the group discussion (the second phase of the selection process) and thus equal no of boys (but distinct) appeared for the personnel interview of IIM-A and IIM-B (interview is the third and final stage of selection of a candidate) but 20% of the boys who appeared for the interview of IIM-A and 60% of the boys who appeared for the interview of IIM-B failed. If it is possible that a candidate can receive the calls from more than one IIMs but he/ she can face the interview of only one IIM. Given that only 24 boys from our coaching institute were selected by the IIM-A and IIM-B also a candidate can appear for the next stage only if he/she qualifies the previous stage of the exam, then find the no. of girls who qualified the CAT (Common Admission Test).

Final Round

Directions for question number 1, 2 and 3: The bar graph shown below reveals the data about the no. of students in different disciplines of MBA at a prominent Business School in India.



- The growth rate of Finance compared to that of marketing is:
 - less
 - equal
 - greater
 - none of these
- Total no. of MBA students in the session of 2004-05 if the no. of students in 2004-2005 is increasing by 9.09% over the previous year :
 - 555
 - 600
 - 777
 - none of these
- In the session of 2002-03 what percentage of MBA students are studying International Business?
 - 13.33%
 - 25%
 - 6.66%
 - 24%

Directions for question number 4 to 7: The following table gives the sales details of the books for CAT written by Sarvesh.

Year	Quant. Aptitude	Data Interpretation	Verbal Ability	Log. Reasoning
2000	4000	3750	4140	4350
2001	4200	3870	4260	4400
2002	4370	3990	4255	4500
2003	4268	3868	5371	4690
2004	4750	4900	5476	4710
2005	4800	5000	5500	4800

- What is the growth rate of sales of Quantitative Aptitude from 2000 to 2005?
 - 8%
 - 25%
 - 20%
 - 40%
- Which of the categories shows the lowest growth rate from 2000 to 2005?
 - Q.A
 - DI
 - VA
 - LR
- Which category had the highest growth rate in the period?
 - QA
 - DI
 - VA
 - LR

7. Which of the categories had either a consistent growth or consistent decline in the period shown?
- QA
 - DI
 - VA
 - LR

Directions for question number 8 to 10: In India there were only three bicycle making companies in the given period. The following table shows the production of units (in 000).

Year	HERO	ATLAS	AVON
1990	2.97	1.75	3.77
91	4.22	2.48	4.55
92	5.95	3.14	4.5
93	6.28	3.01	4.76
94	6.33	4.12	4.74
95	8.50	4.21	4.26

UPTREND IN BICYCLES PRODUCTION IN INDIA

- The simple average rate of growth of production of Hero cycles from 1990-95 :
 - 37%
 - 42%
 - 27%
 - 31.5%
- Which of the following statements is/are correct ?
 - Atlas cycles have recorded the fastest growth rate.
 - Total bicycles production was the highest in 1993
 - Hero cycles on an average account for 48% of total bicycles production
 - I only
 - II only
 - III only
 - none of these
- Atlas cycles on an average account for what percentage of the total bicycles production :
 - 15%
 - 23.4%
 - 34.5%
 - 29%

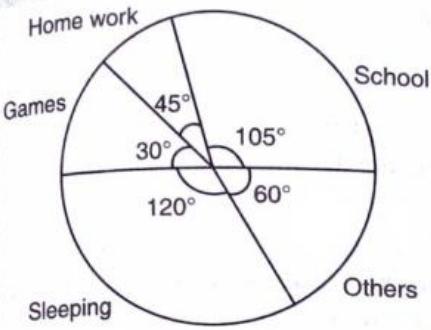
Directions for question number 11 to 14: Answer the questions based on the following information, which gives data about certain butter producer companies in India.

Name of the Company	Production ('000 tonnes)	Capacity Utilisation (%)	Sales ('000 tonnes)	Total sales value (in crore)
Amul	1.54	59.35	1.47	17.45
Nestle	1.64	64.80	1.26	15.25
Parag	2.48	71.20	2.03	26.75
Amrit	2.97	76.50	2.55	31.15
Total (including others)	11.60	61.30	10.67	132.80

- What is the maximum production capacity (in '000 tonnes) of Nestle for Butter?
 - 2.53
 - 2.84
 - 2.07
 - 2.97
- Which company out of the four companies mentioned above has the maximum unutilised capacity in ('000 tonnes)?
 - Amul
 - Nestle
 - Parag
 - Amrit

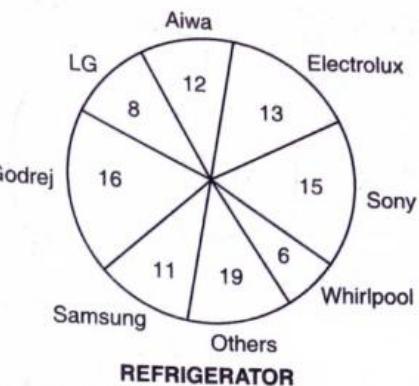
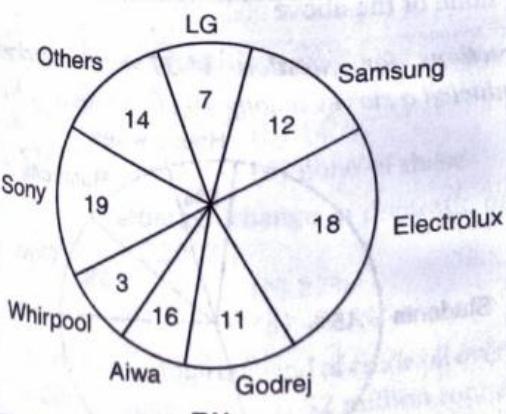
13. What is the approximate total production (in tonnes) for butter in India?
 (a) 7.8
 (b) 18.9
 (c) 11.60
 (d) data insufficient
14. What per cent of the total market share (by sales value) is controlled by others?
 (a) 32%
 (b) 83%
 (c) 67%
 (d) data insufficient

Directions for (Q. no. 15 to 19): The following pie chart shows the hourly distribution of all the major activities of a student.



15. The percentage of time which he spends in school is :
 (a) 38%
 (b) 30%
 (c) 40%
 (d) 25%
16. How much time (in per cent) he spends in games in comparison to sleeping?
 (a) 30%
 (b) 40%
 (c) 25%
 (d) none of these
17. If he spends the time in games equal to the home work and remains constant in other activities, then the percentage decrease in time of sleeping :
 (a) 15%
 (b) 12.5%
 (c) 20%
 (d) none of these
18. What is the difference in time (in hours) spends in school and in home work :
 (a) 2
 (b) 3
 (c) 4
 (d) 8
19. If he spends $\frac{1}{3}$ rd time of home work in Mathematics then the no. of hours spends in rest of the subjects in homework :
 (a) 1
 (b) 2
 (c) 3
 (d) 4

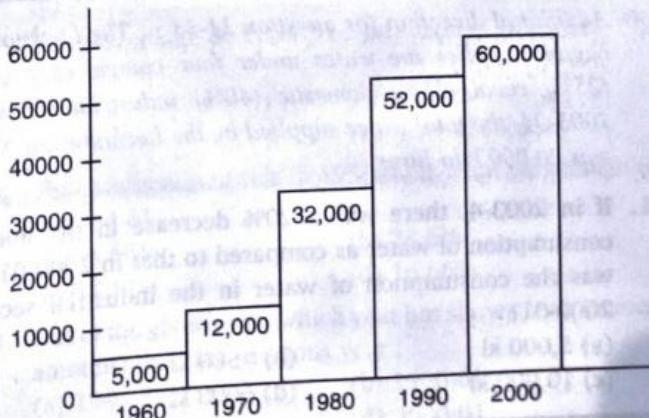
Directions for question number 20 to 23 : The two pie charts show the market share of different companies which produces TV and Refrigerator (both) in the first quarter of 2005-06.



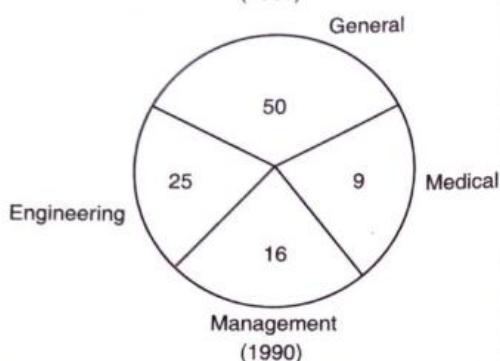
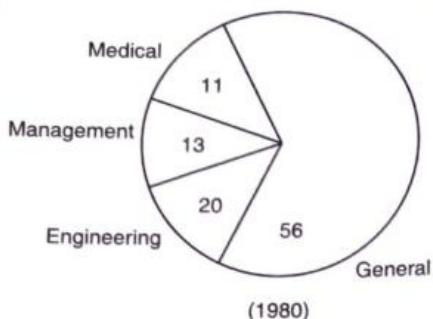
NOTE The graph is not shown to scale.

20. The difference in the angle subtended by Sony TV. and refrigerator is :
 (a) 7.2°
 (b) 14.4°
 (c) 21.6°
 (d) none of these
21. If the turn over of Samsung TV is Rs. 31 crores and of Samsung refrigerator is Rs. 9 crore, then what is the overall market share of Electrolux TV and refrigerator combined?
 (a) 33.33%
 (b) 28%
 (c) 16.7%
 (d) 65%
22. If the turnover in the first quarter of 2005-06 of Electrolux TV and Refrigerator is Rs. 42 crores and Rs. 6 crores respectively, then what is the average annual turnover of Godrej and Aiwa in both the product categories together?
 (a) Rs. 304 crores
 (b) Rs. 284 crores
 (c) RS. 178 crores
 (d) none of the above
23. Which of the following can't be deduced from the given data :
 (a) The angular difference between Samsung TV and Electrolux refrigerator is 3.6° .
 (b) Sony is the market leader in the TV and Refrigerator segment combined.
 (c) For every Rs. 100 turnover of Whirlpool Refrigerator, the difference in the turnover of Electrolux and Samsung Refrigerator is Rs. 33.34 crore
 (d) none of the above

Directions for question number 24 to 28 : Number of different colleges in India in different years is given in the graph below. Distribution of different colleges in the years 1980 and 1990 shown in the pie charts below :



NOTE General courses include all the courses except Medical Engineering and management

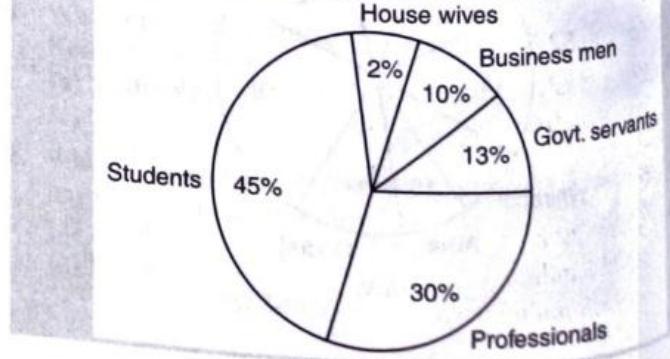


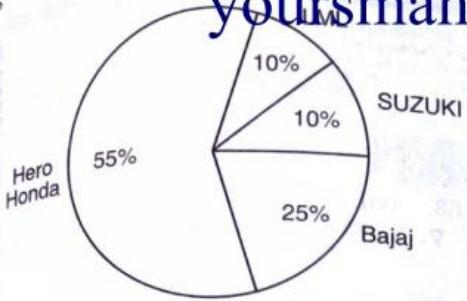
24. What is percentage increase in the number of colleges from 1960 to 1990?
 (a) 1000% (b) 940%
 (c) 1040% (d) 470%
25. The growth rate in no. of medical colleges in 1980 to 1990 is
 (a) 33% (b) 52%
 (c) 36% (d) 39%
26. By what percentage did the no. of Engineering colleges go up from 1960 to 1970?
 (a) 38% (b) 28%
 (c) 42% (d) can't be determined
27. Till 1990 what was the highest increase in the number of colleges in any decade?
 (a) 150% (b) 166.66%
 (c) 200% (d) 140%
28. If the projected increase in the number of colleges in 2000 over 1990 is to be the same in all the categories of colleges, the percentage of Medical colleges in 2000 will be:
 (a) 9% (b) 11%
 (c) 7% (d) 13%

Directions for question number 29 to 33 : Answer the questions based on the following information. The following table gives the tariff (in paisa per kilo-litre) levied by the Lucknow Jal Nigam in 2003-04 in four sectors and the region within them. (Each sector is divided into 5 regions). The table gives the percentage change in the tariff as compared to 2000-01.

	Region 1		Region 2		Region 3		Region 4		Region 5	
	P/kl	%								
Sector 1	1000	+ 25	400	+ 14.28	250	- 16.66	625	+ 4.166	720	+ 20%
Sector 2	800	+ 33.33	375	+ 7.14	350	- 12.5	750	+ 7.14	360	- 10
Sector 3	625	- 16.66	525	- 12.5	400	+ 14.28	240	- 4%	320	- 20
Sector 4	575	- 4.166	800	- 20%	500	- 16.66	360	+ 20%	400	- 11.11

29. If the amount of water consumed by the various regions in sector 1 is the same, then as compared to 2000-01 the net tariff in 2003-04 :
 (a) increased by 20% (b) increased by 13%
 (c) decreased by 12% (d) decreased by 20%
30. What was the approximate average tariff in region 2 in 2000-01?
 (a) 450 (b) 675
 (c) 575 (d) 525
- Additional direction for question 31-33 :** The Lucknow Jal Nigam supplies the water under four categories : Urban (25%) rural (15%) domestic (40%) industrial (20%). In 2003-04, the total water supplied by the Lucknow Jal Nigam was 20,000 kilo-litres.
31. If in 2003-4, there was a 20% decrease in the domestic consumption of water as compared to that in 2000-01 what was the consumption of water in the industrial sector in 2000-01?
 (a) 5,000 kl (b) 7500 kl
 (c) 10,000 kl (d) 6000 kl
32. In the given two years, what is the total tariff paid by the Urban sector?
 (a) Rs. 16,000 (b) Rs. 48,000
 (c) Rs. 23,000 (d) can't be determined
33. Which of the following statements is true?
 (a) The average tariff in region 2 is 625
 (b) The average tariff in region 4 is greater than the average tariff in region 5
 (c) In 2000-01 the industrial sector contributed about 30% of the total revenue from water supply
 (d) none of the above
- Directions for question 34-37 :** A marketing company conducted a survey among 10,000 person in Kanpur :





It was observed that some people have more than one bike but from only one company i.e., a particular person can have more than one bike of Hero Honda, but not from Bajaj etc. and vice versa. Thus there were total 12,000 bikes with 10,000 persons used for survey. There are only four companies operating in this market.

34. If each of Students, Govt. Servants and housewives use a Hero Honda bike (motorcycle), what per cent of the remaining people drive Hero Honda bike?
 (a) 15% (b) 25%
 (c) 20% (d) none of these

35. If the number of people who drive one, two and three bikes are in the ratio 15 : 3 : 1 what is the number of people in the survey who do not drive even a single bike?
 (a) 750 (b) 400
 (c) 600 (d) 500

36. If all the persons driving more than one bike drive only Hero Honda what is the number of people who drive single Hero Honda bike (the data can be used from previous question if necessary)?
 (a) 2400 (b) 2100
 (c) 4200 (d) 2600

37. If 20% of the persons who drive Bajaj's bike also drive another bike. What is the number of people who drive only Bajaj's bike?
 (a) 2400 (b) 2500
 (c) 2660 (d) none of these

38. Directions for question 38-42 : A table below shows the production and imports of crude oil (in '000 tonnes). Domestic production of crude oil is total of on-shore and off-shore production, which is supplemented by imports to meet the total demand of crude oil in the country.

Year	2001	2002	2003
On shore	12,000	11,500	11,000
Off shore	11,000	19,000	16,000
Imports	21,000	24,000	30,000

(in '000 tonnes)

38. What was the percentage of domestic production of crude oil over imports in 2001?
 (a) 80% (b) 140%
 (c) 109.52% (d) none of these
39. What was the percentage change in domestic production of crude oil from 2001-2003?
 (a) 14% (b) 27%
 (c) 17.4% (d) - 10%
40. What is the average of total demand of crude oil over the period?
 (a) 185 million tonnes (b) 52 million tonnes
 (c) 18.5 million tonnes (d) 35 million tonnes

41. What was the approx-percentage increase in imports of crude oil from 2001 to 2003?
 (a) 49% (b) 65%
 (c) 43% (d) none of these

42. If in the year 2004, off-shore production declines by 12.5% production on-shore remains the same and total demand increases by 2% what will be the imports of crude oil in 2004?
 (a) 33.14 million tonnes (b) 63 million tonnes
 (c) 39 million tonnes (d) 25 million tonnes

43. Directions : (Q. no. 43 to 50) Solve the following question on the basis of given data in the following table :

Production of Rice in India

Year	Quantity (in tonnes)	Percentage change over the previous year
1920-21	1,34,300	+ 06.25%
1930-31	10,97,172	+ 12.50%
1940-41	2,64,280	+ 11.11%
1950-51	1,27,890	- 09.09%
1960-61	2,01,924	+ 20.00%
1970-71	1,12,325	- 16.66%
1980-81	2,13,465	- 25.00%
1990-91	1,69,368	+ 33.33%
2000-01	100,956	+ 50.00%
2010-11	23,800	- 83.33%

43. What is the production of rice in 1959-60?
 (a) 1,84,250 (b) 1,68,270
 (c) 242308.8 (d) none of these
44. What is the production of rice in 1949-50?
 (a) 116263.63 (b) 1,23,460
 (c) 1,40,679 (d) none of these
45. What is the total production of rice in 1919-20 and 1929-30 and 1939-40?
 (a) 13,26,400 (b) 13,39,516
 (c) 1142693.75 (d) can't be determined
46. The production of rice in 2000-01 forms what percentage of total production out of the given years?
 (a) 3.12% (b) 3.23%
 (c) 4.128% (d) 6.45%
47. What is the difference in production of rice in 1969-70 and 1979-80?
 (a) 149830 (b) 175752
 (c) 53,890 (d) none of these
48. The percentage decrease in production of rice from 1929-30 to 1949-50
 (a) 88.3% (b) 85.57%
 (c) 66.66% (d) none of these
49. The production of rice in 1959-60 is what percentage of rice in 1960-61.
 (a) 86.66% (b) 75.6%
 (c) 83.33% (d) 16.66%
50. Out of the given years which year has shown least increase (in amount) over the previous year?
 (a) 1940-41 (b) 1960-61
 (c) 1920-21 (d) 2000-01



Answers

INTRODUCTORY EXERCISE-5.1

1. (i) 50, (ii) 54, (iii) 112.5, (iv) 400, (v) 2 quintal, (vi) 544.5, (vii) 88, (viii) 6 minutes, (ix) 200, (x) 2 lakh rupees
 2. Rs. 4,500 3. 28 metres 4. 750 5. 190 and 1520 6. 750 7. 102 km/hr 8. Rs. 2200 9. 75 10. 750
 11. 60000 12. 255

INTRODUCTORY EXERCISE-5.2

1. (i) 5%, (ii) 15.625, (iii) 33.33%, (iv) 24%, (v) 20%, (vi) 150%, (vii) 66.66%, (viii) 43.75%
 2. (i) 4%, (ii) 75%, (iii) 6.25%, (iv) 33.33%, (v) 0.4166%, (vi) 7.5%
 3. 85.33% 4. 70% 5. 97% 6. 150% 7. $33\frac{1}{3}\%$ 8. 90% 9. 12.5% 10. 4%

INTRODUCTORY EXERCISE-5.3

1. (b)	2. (b)	3. (b)	4. (c)	5. (c)	6. (c)	7. (d)	8. (c)	9. (a)	10. (b)
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LEVEL-1

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

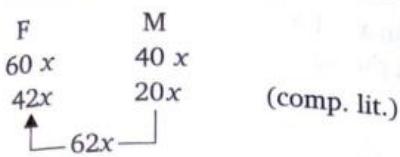
LEVEL-2

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

FINAL ROUND

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

LEVEL 1



(comp. lit.)

$$\therefore \text{Female comp. literate } 1600 \times \frac{42}{100} = 672$$

$$2. (10,00,000) \times 0.75 \times 0.80 \times 0.85 = \text{Rs. } 5,10,000$$

$$3. 2000 \times \frac{x}{100} + 4000 \times \frac{y}{100} = 320$$

$$\text{and } 2000 \times \frac{x}{100} + 10,000 \times \frac{y}{100} = 680$$

$$x = 4 \text{ and } y = 6$$

$$x - y = -2$$

$$4. \text{ Go through option } (40 \times 0.4) + (40)^2 = 1616$$

$$\left(100 \times \frac{1616}{40} = 4040 \right)$$

$$\text{Alternatively: } (x \times 0.4) + x^2 = \frac{x \times 4040}{100}$$

$$\Rightarrow x^2 = 40x \Rightarrow x = 40$$

5. Can't be determined. We don't know whether there are some male employees who have exactly Rs. 8000 per month as their salary or not.

	Physics	Chemistry
Failed	35%	45%
Passed	65%	55%

Passed in both = 22% of total student

Percentage of students who are passed in any of the Physics or Chemistry or both = $(65 + 55) - 22 = 98\%$

So, the percentage of students who are failed in both = 2%

Therefore total failed (in both the subject) students = 12

	History	Geography
Pass	$70x$	$50x$
Fail	$30x$	$50x$

both $20x$

$$\therefore \text{Total failed candidates} = (30x + 50x) - 20x = 60x$$

$$\text{Passed in both} = (100x - 60x) = 40x = 500$$

$$\therefore x = \frac{25}{2}$$

$$\text{Therefore total students} = 100x = 1250$$

My salary = 100

Salary of my brother = 110

Salary of my sister = 120

$$\text{Salary of my wife} = 230 - \left(230 \times \frac{1300}{23 \times 100} \right) = 100$$

$$56 \frac{12}{23} = \frac{1300}{23}$$

$$9. \frac{60 \times 8 + 16 \times 30}{16 \times 60 \times 60} \times 100 = 1.66\%$$

$$10. \text{ Total land of Sukhiya} = \frac{480x}{0.6} = 800x$$

$$\therefore \text{Cultivated land of village} = 384000x$$

$$\therefore \text{Required percentage} = \frac{800x}{384000} \times 100 = 0.20833$$

$$11. \text{ Area} = l \times b$$

$$l = 1 \times 1$$

$$l = 0.8 \times 1.25$$

So the area remained constant

12. Cost of fresh Mangoes + Packaging cost = Total cost

$$\begin{array}{rcl} 1 & + & 0.4 \\ 1.3 & + & 0.2 \end{array} = 1.4 \quad = 1.5$$

$$\text{Percentage increase in cost} = \frac{0.1}{1.4} \times 100 = 7.14\%$$

$$13. \frac{80}{100} + \frac{66}{100} + \frac{x}{200} = \frac{320}{400}$$

$$\Rightarrow x = 174 \Rightarrow 87\%$$

$$14. \begin{array}{rcl} \text{Male} & & \text{Female} \\ 55x & & 45x \\ \Rightarrow & & \\ 10x & = & 72 \end{array}$$

$$x = 7.2$$

$$100x = 7.2 \times 100$$

15. Let the total votes be x ,

$$\text{Polled votes} = 0.75x$$

$$\text{valid votes} = 0.70x$$

$$A + B + C = 0.70x$$

$$2450$$

$$0.4x$$

It means $B + C = 0.3x$ since given that $A = 0.4x$

Hence A is the winner.

$$16. \begin{array}{rcl} \text{Bike} & & \text{Car} \\ x & & 5x \\ 1.2x & & 5.75x \end{array}$$

$$\text{Initially total cost} = 25x + 10x = 35x$$

$$\text{Changed cost} = 28.75x + 12x = 40.75x$$

$$\text{Percentage change} = \frac{5.75}{35} \times 100 = 16 \frac{3}{7}\%$$

18. Go through option

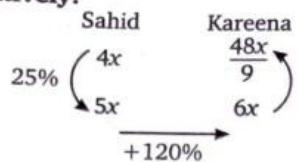
S	K
15,000	18,000
12,000	16,000

Going in the reverse direction.

Hence, the presumed option is correct.

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Alternatively:



$$\Rightarrow \text{Initially } S : K = 4x : \frac{48x}{9} = 3 : 4$$

$$\Rightarrow \text{Sahid's initial salary} = 12,000 \\ \text{Sahid's changed salary} = 15000$$

19. Let the smaller number be x and larger number be y

$$0.8x + 4 = 0.4y$$

$$\Rightarrow 4y - 8x = 40$$

$$\text{and } y - x = 85$$

$$\Rightarrow x = 75 \text{ and } y = 160$$

$$\therefore x + y = 235$$

$$20. \frac{x \times 220}{100} = 44$$

$$\Rightarrow x = 20 \text{ So } \frac{20 \times 44}{100} = 8.8$$

21. Quantity \times Rate = Price

$$1 \times 1 = 1$$

$$0.7 \times 1.25 = 0.875$$

$$\therefore \text{Decrease in price} = \frac{0.125}{1} \times 100 = 12.5\%$$

22. Go through options

P Q

In the 1st government $275 \leftarrow 225$ Difference = 50

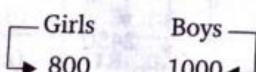
In the 2nd government $200 \leftarrow 300$ Difference = 100
Hence, the presumed option (d) is correct

NOTE It can also be solved through the equation and variables

23. Passing marks are $0.6x$

$$\text{So } 0.3x + 30 = 0.6x \Rightarrow x = 100$$

24. Go through options

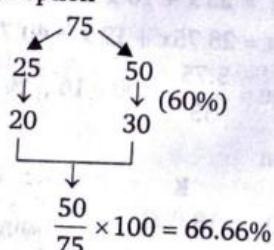


$$\text{Now, } 0.95 \times 800 + 1000 = 0.96 \times 1000 + 800$$

Hence the presumed option is correct.

$$25. \begin{array}{ccc} H & E & U \\ 0.6x & 0.24x & \rightarrow 0.16x \\ \downarrow & & \\ 3600 & \longrightarrow 2400 & (\because E : U = 24 : 16 = 3 : 2) \end{array}$$

26. Go through option



Hence, the presumed option is correct.

$$27. \begin{array}{ccc} \text{Science} & \text{Commerce} & \text{Arts} \\ \frac{x}{6} & + \frac{x}{8} & + \frac{x}{15} \\ \hline K \end{array}$$

$$\text{No. of Engineering student} = 1 - \left(\frac{x}{6} + \frac{x}{8} + \frac{x}{15} \right) = k = \frac{77x}{120}$$

When $x = 120$ (the least possible number)
then the no of Engineering students = 77

$$28. \begin{array}{ccc} \text{Copper} & & \text{Aluminium} \\ 7 & : & 4 \\ 21 \text{ kg} & & 12 \text{ kg} \\ \hline \end{array} \rightarrow 33 \text{ kg}$$

$$\text{Required total alloy} = \frac{33}{0.88} = 37.5 \text{ kg}$$

$$29. \begin{array}{c} 1.08x = 1404 \\ x = 1300 \end{array}$$

Therefore reduction in price = $1404 - 1300 = \text{Rs. 104}$

$$\left[\text{Since } 1300 + 1300 \times \frac{8}{100} = 1404 \right]$$

So you can solve it by using options.

30. Very fundamental question.

$$31. \begin{array}{c} 8x + 9x + 10x = 810 \\ \Rightarrow x = 30 \end{array}$$

Total marks in QA $\longrightarrow 240$

$$\begin{array}{c} \text{DI} \longrightarrow 270 \\ \text{VA} \longrightarrow 300 \\ \hline \text{RC} \end{array}$$

$$\text{Now her score in QA} \longrightarrow \frac{240}{1.2} = 200$$

$$\text{Her score in DI} = \frac{270}{1.08} = 250$$

$$\text{Her score in VA} = \frac{300}{1.0714} = 280$$

$$\text{Her total score} = 200 + 250 + 280 = 730$$

$$32. \text{Commission up to } 10000 = 10000 \times \frac{9}{100} = 900$$

Again after 10000,

Commission : Bonus

$$\begin{array}{c} 9 : 3 \\ 3x : x \end{array}$$

$$\therefore \text{Bonus} = (1380 - 900) \times \frac{1}{4} = \text{Rs. 120}$$

33.

Men Women
600x 400x

$$\text{Total Engineer} = 480x$$

$$\text{Male Engineer} = 480x \times 0.66 = 320x$$

$$\therefore \text{Women who are Engineers} = 160x$$

$$\therefore \text{Women who are not Engineers} = 400x - 160x = 240x$$

$$\text{Required percentage} = \frac{240}{400} \times 100 = 60\%$$

34.

	Veer	Zara
In the last month	160	100
After the first change	200	75
After final change	120	120

Time \times Rate = Total charges
 $1 \times 1 = 1$
 $x \times 1.25 = 1.1$
 $x = \frac{1.1}{1.25} \times 100 = 88\%$

Thus decrease in time = 12%

Average earning	Ambani	Sahara
No. of family members	$4x$ k $6y$	$5x$ 1 $5y$
Total earning	$6y$	$5y$

Average earning \times Number of family members = Total earning

$$l = \frac{5y}{5x} = \frac{y}{x}$$

$$k = \frac{6y}{4x}$$

$$\text{Required percentage} = \frac{l}{k} \times 100 = \frac{\frac{y}{x}}{\frac{6y}{4x}} \times 100$$

$$= \frac{4}{6} \times 100 = 66.66\%$$

Alternatively : After some steps you can use the options.

Year	Value
2000	100
2001	110
2002	121
2003	133.1
2004	119.79
2005	107.811
2006	97.0299

HINT $(100) \times 1.1 \times 1.1 \times 1.1 \times 0.9 \times 0.9 \times 0.9 = 97.0299$

Now, $\frac{100 - 97.0299}{100} \times 100 \approx 3\%$

30 \times 25 \times 35 = $x \times 30 \times 28$

$\Rightarrow x = 31.25$

It means 32 pages.

So, the percentages increase in the no. of pages

$$= \frac{2}{30} \times 100 = 6.66\%$$

Rate of increase of the price

$$= (\text{rate of inflation} + 2)\% = 8 + 2 = 10\%$$

Jan 2004	Jan 2005	Jan 2006
20	20	22
$\left. \begin{array}{l} \\ +2 \end{array} \right\} \rightarrow$	$\left. \begin{array}{l} \\ +2.2 \end{array} \right\} \rightarrow$	$\left. \begin{array}{l} \\ +2.2 \end{array} \right\} 24.2$

Alternatively: Expected price after 2 years

$$= 20 \times 1.1 \times 1.1 = 24.2$$

Let the total number of people = x
then the amount donated by $0.6x$ people

$$= 600 \times 0.6x = 360x$$

Now since Rs. $360x$ is equal to 75% of the required amount.
Hence we need only 25% more amount from the rest of the people i.e., from $0.4x$ people

$$\text{Hence average requirement} = \frac{120x}{0.4x} = 300$$

$$\text{Alternatively: } (600 \times 0.6 + k \times 0.4) \frac{3}{4} = 600 \times 0.6$$

$$\Rightarrow k = 300$$

41. By mistake $= \frac{x}{10}$

$$\text{Actual value} = x \times 10$$

$$\% \text{ change} = \frac{10x - \frac{x}{10}}{10x} \times 100 = \frac{99}{100} \times 100$$

$$= 99\% \text{ (negative)}$$

Since actual value is greater than the wrong value

Alternatively :

$$\text{Actual result} = 10 \times 10 = 100 \quad (\text{suppose } x = 10)$$

$$\text{wrong result} = \frac{10}{10} = 1$$

$$\% \text{ change} = \frac{100 - 1}{100} \times 100 = 99\%$$

NOTE Percentage error is always calculated on the basis of actual (i.e., correct) value.

42. Use some different values for x then verify.

$$\text{Let } x = 150 \text{ then } \% \text{ error} = \frac{200 - 100}{100} \times 100 = 100\%$$

$$\text{Again if } x = 100 \text{ then } \% \text{ error} = \frac{150 - 50}{50} \times 100 = 200\%$$

Hence, we cannot determine.

43. Number of visitors \times Rate = Revenue collected

$$\left(\begin{array}{ccccc} 1 & \times 1 & = 1 \\ -20\% & & & +50\% \\ 0.8 & \times 1.5 & = 1.2 \end{array} \right)$$

Therefore percentage change in the revenue

$$= \frac{1.2 - 1}{1} \times 100 = 20\%$$

44. Bata Woodland

M.P.	Bata	Woodland
100	100	51

(Since the marked prices are same)

NOTE M.P. \rightarrow Marked price, S.P. \rightarrow Selling price
decreased by 49% = reduced to 51%

45. Selling price = cost price + profit

$$\text{Shirt} = 7y + x$$

$$\text{Coat} = 12y + x$$

Since, the profit is same, so the selling price of shirt will certainly be less than Rs. 2000 (which is half of the total value) as it is clear that cost price of shirt is less than the cost price of coat.

NOTE If selling price of shirt is equal to or greater than the selling price of coat then the C.P. of coat will be equal to or less than the C.P. of shirt which is wrong. Hence the only possible choice is (d).

46. Since we don't have sufficient data. Further any value is possible as the required income tax.

Since the no. of boys are greater than the no. of girls by 12 i.e., 12% Hence correct.

Alternatively :

Let the no. of boys and girls be x and y respectively
then $(x - y) = \frac{12 \times (x + y)}{100}$

$$\Rightarrow \frac{x}{y} = \frac{14}{11}$$

$$50. \text{ Population after 2 years} = 5000 \left(1 + \frac{2}{100}\right)^2$$

$$5000 \times \frac{51}{50} \times \frac{51}{50} = 5202$$

$$51. \text{ Daily supply} = (100 - z)\% \text{ of } y = \frac{(100 - z)y}{100}$$

$$\therefore \text{Required no. of days} = \frac{x \times 100}{(100 - z)y}$$

47. 2004 $\rightarrow 10000 \times x\% = k$

$$2005 \rightarrow 16000 \times \frac{5}{8} x\% = k$$

$$\text{but } x - \frac{5}{8} x = 9 \Rightarrow x = 24\%$$

So, the income tax = 2400.

48. Only (c) is correct since it is divisible by 4.

Let the original number of element be x then the new no. of elements will be

$$\frac{4x}{5} = K$$

So K must be divisible by 4

$$\text{Since, } x = \frac{K \times 5}{4}$$

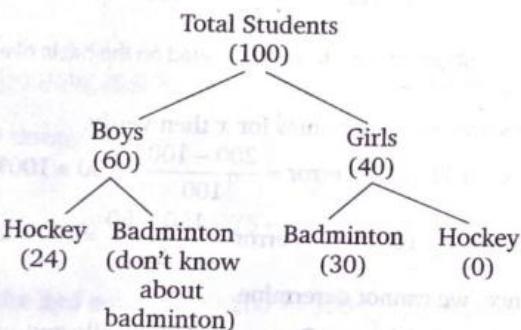
49. Go through option

Boys	Girls	Total
14	11	25
56	44	100

(12)

LEVEL (2)

1.



Since we do not have information that whether the rest of the boys playing badminton or not. So we can not determine the total no. of students who are not playing any of the two games.

2. Go through option. Let us assume option (c)

$$10 = 2 \times 5 = 5 \times 2 = 1 \times 10 \times 10 \times 1$$

$$\text{Consider the proper fraction} = \frac{2}{5}$$

[Since the given percentage values are 25% and 20% that's why we have picked up option (c)].

$$\frac{2}{5} \rightarrow \frac{4}{25} \rightarrow \frac{5}{20}$$

$$\text{To verify: } \frac{2}{5} \times \frac{5}{8} = \frac{1}{4} = \frac{5}{20}$$

Hence presumed option is correct

$$\text{Alternatively: } \frac{x}{y} \rightarrow \frac{x^2}{y^2} \rightarrow \frac{1.25 x^2}{0.8 y^2} = \frac{25 x^2}{16 y^2}$$

$$\text{Now since } \frac{25 x^2}{16 y^2} = \frac{5}{8} \left(\frac{x}{y}\right)$$

$$\Rightarrow \frac{x}{y} = \frac{2}{5}$$

3. Income = Expenditure + Savings

$$\begin{aligned} 8x &= (5x + 3x) \\ 10x &= (8x + 2x) - x \end{aligned}$$

$$\text{Now the deficit} = (3x - 2x) = x = 3500$$

and \therefore the new salary = $10x = 35,000$

Alternatively : Go through options.

4. Go through options

$$2457 - 2143 = 314$$

$$\text{Again } (2457 + 2143) + 41 = 4641$$

$$\text{Now } \frac{4641}{0.85} \rightarrow 5460$$

$$\text{Again } \frac{5460 \times 45}{100} = 2457$$

Hence the presumed option is correct.

Alternatively: Let there be total x eligible voters, and the no. of votes goes to loser is k then

$$0.85x - 41 = 2k + 314$$

$$k + 314 = 0.45x$$

$$x = 5460$$

$$\text{then, } 5460 \times 0.85 = 4641$$

$$\text{Again } 4641 - 41 = 4600$$

$$\text{Again } k + (k + 314) = 4600$$

$$\Rightarrow k = 2143$$

$$\text{and } k + 314 = 2457$$

5. Income \rightarrow 4 4.4 4.8 5.2] 18.4 lakh

Saving \rightarrow 2 1.76 1.44 1.04] 6.24 lakh

Exp. \rightarrow 2 2.64 3.36 4.16] 12.16 lakh

So, $\frac{6.24}{12.16} \times 100 = 51 \frac{6}{19} \%$

6. Let there be x voters and k votes goes to loser then

$$0.8x - 120 = k + (k + 200)$$

$$k + 200 = 0.41x$$

$$\Rightarrow k = 1440$$

$$\text{and } (k + 200) = 1640$$

$$\text{Therefore } \frac{1440}{3200} \times 100 = 45\%$$

Percentages
Solutions for 7-9:

$$P + R = 30,000$$

$$N = R - 8000$$

... (1)

$$(R + N) = 233.3 (P)$$

... (2)

$$3(R + N) = 7P$$

... (3)

$$6R - 7P = 24,000$$

... (4)

$$R = 18,000$$

$$P = 12,000$$

$$N = 10,000$$

$$7. \frac{P + R + N}{3} = \frac{40,000}{3} = 1333.33$$

Can't be determined

$$8. \frac{8}{10} \times 100 = 80\%$$

$$9. \text{ (Bonus) Commission} = \frac{20 \times 10,00,000}{100} = 2 \text{ lakh}$$

$$\text{but total profit} = \text{net profit} + \frac{10}{100} \times \text{net profit}$$

$$1.32 \text{ lakh} = 1.1 \times \text{net profit}$$

$$\Rightarrow \text{net profit} = 1.2 \text{ lakh} = 1,20,000$$

$$\therefore \text{commission} = \text{total profit} - \text{net profit}$$

$$= 1,32,000 - 1,20,000 = 12,000$$

$$\text{hence total earning} = 2,00,000 + 12,000 = 2,12,000$$

$$11. \text{ Let Mr. Scindia has } x \text{ shares of } 5.5\%$$

$$x \times 92 = 32,200$$

$$\Rightarrow x = 350 \text{ shares}$$

$$\text{Income} = 350 \times 5.5 = 1925$$

Now, after investment his income is

$$\left(\frac{1}{3} \times \frac{32200}{92} \times 4.5 \right) + \left(\frac{2}{5} \times \frac{32200}{115} \times 5 \right) + \left(\frac{4}{15} \times \frac{32200}{56} \times 6 \right)$$

$$= 525 + 560 + 920 = 2005$$

$$\text{Profit} = 2005 - 1925 = \text{Rs. } 80$$

$$12. \text{ The surface area of a cube} = 6a^2 = 6 \times (\text{side})^2$$

$$\text{New surface area} = 6 \times 1.44 a^2$$

$$\frac{0.44 a^2}{a^2} \times 100 = 44\%$$

13. Solution for 13 and 14 :

Pati \rightarrow Pt, Patni \rightarrow Pn, Woh \rightarrow W

$$(Pt + Pn) = 2W \quad \dots (i)$$

$$(Pn + W) = 4 Pt \quad \dots (ii)$$

Solving equation (i) and (ii) we get

$$\frac{Pn}{W} = \frac{7}{5} \text{ and } \frac{Pt}{W} = \frac{3}{5}$$

$$Pt : Pn : W = 3 : 7 : 5 \quad \dots (iii)$$

$$(Pt + Pn) = 2W \quad \dots (iv)$$

$$(Pn + W) \times 7 = 8 \times Pt$$

$$\frac{Pn}{W} = \frac{3}{5}, \frac{Pt}{W} = \frac{7}{5}$$

$$Pt : Pn : W = 7 : 3 : 5$$

$$\text{Gain of Pati} = 7x - 3x = 4x = 800$$

\Rightarrow

$$x = 200$$

$$\text{Amount at the begining of Game} = 600 \quad 1400 \quad 1000$$

$$\text{Amount at the end of the game} = 1400 \quad 600 \quad 1000$$

13. Only Patni has suffered the loss

$$14. \frac{1400 - 600}{1400} \times 100 = 57.1428\%$$

15.

$$\text{RM} + \text{MC} = \text{Total cost}$$

$$\text{Total cost} + \text{Profit} = \text{Sale price}$$

$$70 + 30 = 100 \quad 100 + 10 = 110 \quad 84 + 42 = 126 \quad 126 + 72 = 198 \quad + 80\%$$

$$\text{Therefore profit \%} = \frac{72}{126} \times 100 = 57.14\%$$

16.

$$A + B + C + D = 56$$

$$B + C + D = 4.6A$$

$$\Rightarrow A + B + C + D = 5.6A \text{ (adding } A \text{ in both sides)}$$

$$56 \text{ lakh} = 5.6A$$

$$\Rightarrow A = 10 \text{ lakh}$$

$$\text{Similarly } A + C + D = \frac{11}{3} B$$

$$\Rightarrow A + B + C + D = \frac{14}{3} B$$

$$\Rightarrow B = 12 \text{ lakh}$$

$$\text{Similarly } 4(A + B + D) = C$$

$$\Rightarrow A + B + D = 2.5C$$

$$\Rightarrow A + B + C + D = 3.5C$$

$$\Rightarrow C = 16 \text{ lakh}$$

$$\text{Therefore } D = (A + B + C + D) - (A + B + C) = 18 \text{ lakh}$$

$$17. \text{ Losing candidate} = 0.3x$$

$$\therefore \text{Other two candidates} = 0.7x$$

$$\text{The share of winning candidate} = 0.36x$$

$$\text{and the second ranker} = 0.34x$$

$$\therefore \text{Margin (min. possible)} = 0.02x$$

$$\Rightarrow 2\% \text{ of } x$$

Let the minimum possible voters be 50 then

$$\frac{2 \times 50}{100} = 1$$

Hence the minimum possible margin of votes = 1

Day	Initial amount	Sales	Remaining over night	Rotten	Stock for next day
I	x	0.5x	0.5x	0.05x	0.45x
II	0.45x	0.225x	0.225x	0.0225x	0.2025x
III	0.2025x	0.10125x	0.10125x	0.010125x	

$$\therefore \text{Total rotten amount} = 0.082625x = 1983$$

$$x = 24,000$$

\Rightarrow

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19. Check through option

Alternatively : Let the initial amount be x (with gambler), then

$$\left(\left((x + 100) \frac{1}{2} + 100 \right) \frac{1}{2} + 100 \right) \frac{1}{2} = \frac{x}{2}$$

$$\Rightarrow x = \frac{700}{3}$$

20. Non-defective products

$$\frac{25 \times 0.98 + 35 \times 0.96 + 40 \times 0.95}{100} \times 100 = 96.1$$

No. of Machines	Output	Manf. cost	Est. cost	Total cost	Profit
12	48,000	24,000	10,000	34,000	14,000
11	44,000	22,000	10,000	32,000	12,000

$$\begin{aligned} \text{Profit} &= \text{out put} - \text{Total cost} \\ &= 44,000 - 32,000 = 12,000 \\ \text{Initial value of share holders} &= 14,000 \times \frac{10}{100} = 1400 \\ \text{Changed value of share holders} &= 12,000 \times \frac{10}{100} = 1200 \\ \% \text{ decrease} &= \frac{200}{1400} \times 100 = 14.28\% \end{aligned}$$

$$\begin{array}{rcl} \text{Rice} & & \text{Wheat} \\ 25 & & 9 \\ \times x & & \times 5x \\ 25x & & 45x \\ 70x = 350 & & \\ \Rightarrow x = 5 & & \end{array}$$

Hence the price of Rice = Rs. 5 per kg

Price of wheat = Rs. 25 per kg

Now, the price of wheat = Rs. 30 per kg

Let the new amount of Rice be M kg, then

$$M \times 5 + 9 \times 30 = 350$$

$$M = 16$$

Hence decrease (in%) of amount of rice

$$= \frac{25 - 16}{25} \times 100 = 36\%$$

Year	Rate of Commission	Commission in values
1	20%	$0.2 \times 20,000 = 4000$
	25% (bonus)	$0.25 \times 4000 = 1000$
2	16%	$0.16 \times 20,000 = 3200$
3	12%	$0.12 \times 20,000 = 2400$
4	10%	$0.1 \times 20,000 = 2000$
5-10	4%	$6 \times 0.04 \times 20,000 = 4800$

Total commission

$$= (4000 + 3200 + 2400 + 2000 + 4800) + (1000) = 17,400$$

Solution for 24-25

	OHIO	TEXAS
Last year :	$600 \leftarrow (2:1)$	$(M:F) \rightarrow 1100$
This year :	$750 \leftarrow (2:1)$	$(\text{unknown}) \rightarrow 1200$

24. Since we don't know the number of female employees in Texas office this year so we can't determine

$$25. 1100 + 600 = 1700$$

26. There is no need to use the no. of goats i.e., initially there be 1000 goats then $1000 \rightarrow 1400 \rightarrow 980 \rightarrow 1274 \rightarrow 1146.6$

$$\text{Thus the \% increase} = \frac{1146.6 - 1000}{1000} \times 100 = 14.66\%$$

27. In 2002 (980 goats) as per the flow chart

Optional	Science	Commerce	Engineering	Total
	5000	3000	8000	
Finance	1000	1200	680	16,000
HR	1600	720	1040	2880
Marketing	2400	1080	6280	3360
				9760

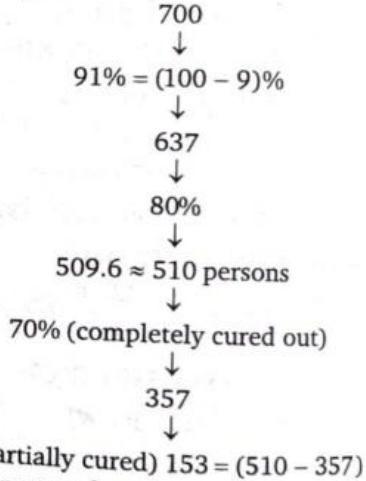
28. 6280 Students of Engineering opted marketing

$$29. \frac{720}{16,000} \times 100 = 4.5\%$$

30. Marketing, since maximum students have opted marketing

31. Consider some values and then verify the option.

32. Go through option :



33. Total expenditure per kg

$$= 3.2 + 1.8 + 2 + 3 = 10 = \text{cost price}$$

Selling price = Rs. 18 (per kg)

Gross profit = Rs. 8 per kg = $(18 - 10)$

$$\text{Net profit} = 8 \times \frac{80}{100} \text{ (since 20\% is tax)} = \text{Rs. } 6.4$$

Hence the net profit of the factory = $6.4 \times 50,00,000$

$$= \text{Rs. } 3,20,00,000 = \text{Rs. } 3.2 \text{ crore}$$

34. Let the percentage marks in QA = $(10a + b)\%$

Let the percentage marks in DI = $(10b + a)\%$

Let the percentage marks in VA = $x\%$

$$\text{then } \frac{(10a + b) + x + (10b + a)}{3} = x$$

$$\Rightarrow 11a + 11b + x = 3x$$

$$\Rightarrow x = \frac{11}{2}(a + b)$$

Thus the percentage of the VA section is a multiple of 11

$$P_1 = k \frac{T}{V}$$

$$P_2 = k \frac{1.4T}{0.8} = K \frac{7T}{4V}$$

$$\frac{P_2 - P_1}{P_1} = \frac{\frac{7T}{4V} - \frac{T}{V}}{\frac{T}{V}} = \frac{\frac{3T}{4V}}{\frac{T}{V}} = \frac{3}{4}$$

Hence, the new pressure will be increased by 75%.

$$\text{Q. } 20 \times 0.92 \Rightarrow 10 \text{ minutes.}$$

$$\frac{23 \times 40 \times 0.90}{20 \times 0.92} = 45$$

Thus the required time is 45 times than the previous time

$$\text{Hence, } 450 \text{ minutes} = 7 \frac{1}{2} \text{ hrs.}$$

$$\text{Q. Original volume} = 16 \times 12 \times 5 = 960 \text{ (inch)}^3$$

$$\text{Required capacity} = 1120 \text{ (inch)}^3$$

$$\text{Increase in area} = \frac{1120}{5} - 16 \times 12$$

$$= 224 - 192 = 32 \text{ (inch)}^2$$

$$\% \text{ increase} = \frac{32}{192} \times 100 = 16.66\%$$

$$\text{Q. The total passengers in each compartment} = 25 \times \frac{7}{5} = 35$$

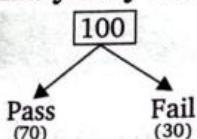
$$\text{Total no. of seats} = (35)^2 = 1225$$

$$\text{Maximum available capacity} = 1225 \times \frac{80}{100} = 980 \text{ seats}$$

	Tata	Reliance
Prepaid	100	81
Postpaid	90	72

$$\text{Thus the \% decrease in talk time} = \frac{90 - 72}{90} \times 100 = 20\%$$

40. **Half yearly exam**



Annual exam

$$\underbrace{70 \times 0.6}_{42} + \underbrace{30 \times 0.8}_{24}$$

$$\therefore \text{Total pass in annual exam} = 42 + 24 = 66$$

$$\text{Q. Percentage of passed students} = 68\% [100 - 32]\%$$

$$\text{Number of girls passed the exam} = 408$$

$$\text{Number of boys passed the exam} = 476$$

$$\text{Total passed students} = 884$$

$$\text{Therefore total no. of students} = \frac{884}{68} \times 100 = 1300$$

Solution for 42- 45 :

Name	Horse	Chariot	Land	Total (in Rs.)
Ram	2 lakh (10)	80,000 (10)	20 acre = 1 lakh	3.8 lakh
Sita	1.6 lakh (8)	80,000 (10)	8 acre = 40,000	2.8 lakh
Laxman	1 lakh (5)	2 lakh (25)	20 acre = 1 lakh	4 lakh
Urmila	1.4 lakh (7)	40,000 (5)	16 acre = 80,000	2.6 lakh

$$1. R + S = L + U \text{ and } R > S \text{ and } L > U$$

$$2. \text{Horses} \rightarrow (R + S) : (L + U) = 3x : 2x = 18x : 12x$$

Again Ram have $\frac{1}{3}$ rd horses

$$\text{Therefore } 30x \times \frac{1}{3} = 10x$$

$$\text{Therefore the horse of Sita} = 18x - 10x = 8x$$

$$\Rightarrow x = 1$$

$$\text{Therefore the horse of Ram} = 10 \text{ and Laxman} = 5$$

$$\text{No. of chariots of Sita} = \text{No. of chariots of Ram} = \frac{K}{5}$$

$$\text{and} \quad \text{no. of chariots of Laxman} = \frac{K}{2}$$

$$\text{Hence the no. of chariots of Urmila} = K - \left(\frac{K}{5} + \frac{K}{5} + \frac{K}{2} \right) = \frac{K}{10}$$

$$\text{Again} \quad \frac{k}{2} - \frac{k}{10} = 20 \Rightarrow k = 50 \text{ chariots}$$

$$\text{Now the 50\% property of Laxman} = 25 \text{ chariots} = 2,00,000$$

$$\text{Hence the total property of Laxman} = 4,00,000$$

$$\text{Thus the area of Land of Laxman} = \frac{2,00,000 - 5 \times 20,000}{5000}$$

$$= 20 \text{ acre} = (1 \text{ lakh})$$

$$\text{Total property of Urmila}$$

$$= 1,40,000 + 40,000 + 80,000 = 2,60,000$$

$$\text{Thus the total property of Laxman and Urmila} = 6.6 \text{ lakh}$$

$$42. 3.8 - 2.6 = 1.2 \text{ lakh}$$

$$43. \text{Value of chariots of Laxman} = 2 \text{ lakh}$$

Now since only Ram has the horses of worth Rs. 2 lakh. So only Ram can exchange with Laxman.

$$45. \frac{7.2 - 6.0}{6.0} \times 100 = 20\%$$

$$46. \text{Total cubes} 160 + 56 = 216$$

Therefore the side of cube = 6 unit

$$\text{No. of cubes without any exposure} = (6 - 2)^3 = 64$$

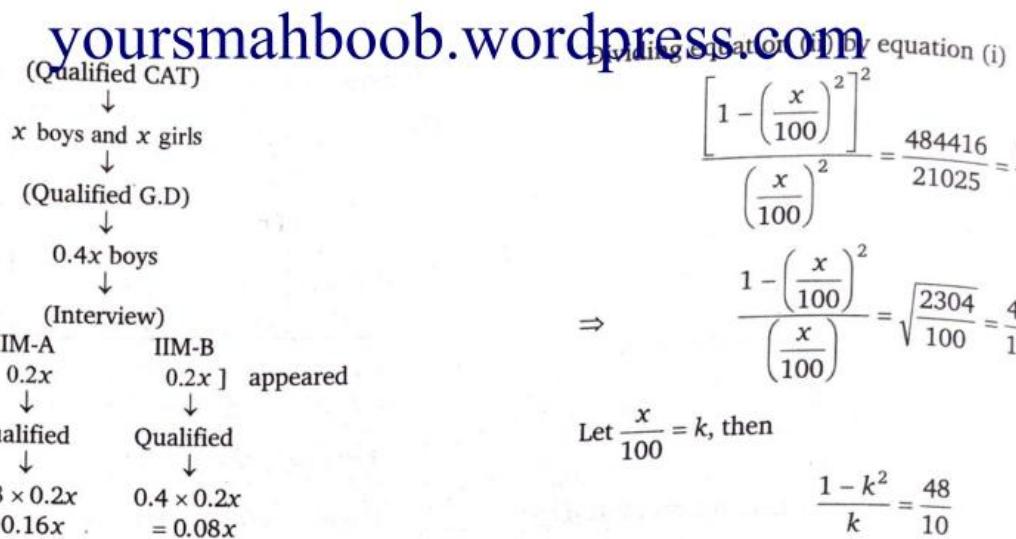
Thus 64 cubes will be inside of the big cube

$$\text{Now rest of the cubes} = 160 - 64 = 96$$

Again the no. of cubes with one face outside

$$= 6 \times (4 \times 4) = 96$$

$$\text{Hence the required percentage} = \frac{96}{216} \times 100 = 44.44\%$$



Total boys qualified the final stage = 0.24%

Thus $0.24x = 24$
 \Rightarrow $x = 100$

48. Go through option and consider some appropriate values

Alternatively : $\frac{p}{100+p} = \frac{q}{100}$
 $\Rightarrow 100(p-q) = pq$
 $\Rightarrow (p-q) = \frac{pq}{100}$

49. Let the original price be P , then the decrease in value of P after one cycle

$$= P \left(\frac{x}{100} \right)^2 = 21025 \quad \dots (i)$$

Again the final value after second cycle

$$\Rightarrow P \left(1 + \frac{x}{100} \right) \left(1 - \frac{x}{100} \right) \left(1 + \frac{x}{100} \right) \left(1 - \frac{x}{100} \right) = 484416$$

$$\Rightarrow P \left[1 - \left(\frac{x}{100} \right)^2 \right]^2 = 484416 \quad \dots (ii)$$

Putting value of (ii) in equation (i)

$$\left[1 - \left(\frac{x}{100} \right)^2 \right]^2 = \frac{484416}{21025} = \frac{2304}{100}$$

$$\Rightarrow \frac{1 - \left(\frac{x}{100} \right)^2}{\left(\frac{x}{100} \right)^2} = \sqrt{\frac{2304}{100}} = \frac{48}{10}$$

Let $\frac{x}{100} = k$, then

$$\frac{1 - k^2}{k^2} = \frac{48}{10}$$

$$\Rightarrow 10k^2 + 48k - 10 = 0$$

$$\Rightarrow 5k^2 - 24k - 5 = 0$$

$$\Rightarrow k = 5 \text{ or } k = -\frac{1}{5} \quad \text{(inadmissible value)}$$

So $x = 20\%$

Hence, $P \left(\frac{x}{100} \right)^2 = 21025$
 $\Rightarrow P = 525625$

50. Men × Time = Work

100 × 1 = 100 unit

150 × 1 = 150 unit

Extra man power required = 50

but since new workers are $\frac{5}{4}$ times as efficient as existing workers.

∴ Actual no. of workers = $\frac{50}{5/4} = 40$ men

Hence, required percentage = $\frac{40}{100} \times 100 = 40\%$

Final Round

1. Growth rate of Finance

$$= \frac{125 - 75}{75} \times 100 = \frac{2}{3} \times 100 = 66.66\%$$

Growth rate of Marketing = $\frac{250 - 100}{100} \times 100 = 150\%$

2. Total no. of students in 2003-04 is

$$= (250 + 125 + 100 + 75) = 550$$

No. of student in 2004-05

$$= 550 \left(1 + \frac{1}{11} \right) = 600 \text{ students}$$

3. $\frac{50}{(150 + 100 + 75 + 50)} \times 100 = \frac{50}{375} \times 100 = 13.33\%$

4. $\frac{4800 - 4000}{4000} \times 100 = 20\%$

5. $\frac{450}{4350} \times 100 = 10.34\%$, which is lowest in comparison to others

Thus the growth rate of logical reasoning book is lowest.

6. DI $\rightarrow \frac{5000 - 3750}{3750} \times 100 = 33.33$

and VA $\rightarrow \frac{5500 - 4140}{4140} \times 100 = 32.85\%$

7. Only LR has consistent growth, others have been fluctuating (QA - 2003, DI - 2003, VA - 2002)

$$\frac{8.5 - 2.97}{2.97} \times 100 = 37.23\%$$

8. Growth rate of Hero = 37.23%

Growth rate of Atlas = 28.1%

Avon is least which is clear from the data.

Total bicycle production is highest in 95 hence false

Hero cycle's share = $\frac{2.97 + 4.22 + \dots + 8.5}{79.84} = 43\%$

Hence, (d) since none of (a), (b) and (c) is correct.

Percentages
 $10. \frac{1.75 + 2.48 + \dots + 4.21}{79.84} = 23.4\%$

11. $\frac{1.64}{64.8} \times 100 = 2.53$

12. Amul has max. unutilised capacity

HINT $\left(\frac{1.54}{59.35} \times 100 \right) - 1.54 = 1.05$

Similarly for others can also be find out

13. $\frac{11.6}{61.3} \times 100 \approx 18.9$

14. $\frac{42.20}{132.8} \times 100 = 31.81\%$

15. $\frac{105}{360} \times 100 = \frac{7}{24} \times 100 = 29.166\%$

16. $\frac{30}{120} \times 100 = 25\%$

17. $\frac{15}{120} \times 100 = 12.5\%$

18. $105 - 45 = 60^\circ = 4$ hours

19. $15^\circ = 1$ hour (Maths)

$30^\circ = 2$ hour (other subjects)

20. Sony TV $\rightarrow 19\%$

Sony Refrigerator $\rightarrow 15\%$

difference = $4\% = 14.4^\circ$

(Since $1\% = 3.6^\circ$)

21. $12\% \rightarrow$ Samsung TV = 31 crore

$18\% \rightarrow$ Electrolux TV = 46.5 crore

$100\% \rightarrow$ Total market = 258 crore

$11\% \rightarrow$ Samsung Refrg. = 9 crore

$13\% \rightarrow$ Electrolux Refrg. = 10.6 crore

$100\% \rightarrow$ Total market = 81.8 crore

Market share = $\frac{46.5 + 10.6}{258 + 81.8} \approx 16.7\%$

22. $18\% =$ Rs. 42 crores, so $27\% (= 16 + 11) =$ Rs. 63 crore

$13\% =$ Rs. 6 crore, so $28\% (= 12 + 16) =$ Rs. 13 crore

Total Rs. 76 crores

\therefore Annual approx. turnover = $4 \times 76 =$ Rs. 304 crores

23. (a) $(13 - 12) = 1\% = 3.6$

(b) We don't know the turnover of TV and refrigerator market for each brand.

(c) 6% total refrigerator market = 100 crore

\Rightarrow Total refrigerator market ≈ 1667 crore

\therefore Difference = 2% of 1667 = 33.34 crore

Thus, (b) can't be inferred.

24. $\frac{52,000 - 5,000}{5000} \times 100 = 9.4 \times 100 = 940\%$

25. Medical college in 1980 = $\frac{11}{100} \times 32,000 = 3520$

$1990 = \frac{9}{100} \times 52,000 = 4680$

$\frac{4680 - 3520}{3520} \times 100 = 32.95$

26. We don't have the information about the proportion (share) of Engineering colleges in the given years.

27. $\frac{32,000 - 12,000}{12,000} \times 100 = 166.66\%$

28. Number of medical colleges in 1990

$= \frac{52,000 \times 9}{100} = 4680$

Increase in the total no. of colleges

$= 60,000 - 52,000 = 8000$

Increase in the no. of medical colleges = $\frac{8000}{4} = 2000$

Therefore, percentage of medical colleges in 2000

$= \frac{4680 + 2000}{60,000} \times 100 = 11\%$

29. If the amount of water consumed of sector 1 is the same then we can directly compare the tariffs to the two years.

	Tariff 2003-04	% change	Tariff 2000-01
Region 1	1000	+ 25%	800
Region 2	400	+ 14.28%	350
Region 3	250	-16.66%	300
Region 4	625	+ 4.166%	600
Region 5	720	+ 20%	600
	2995		2650

$\frac{2995 - 2650}{2650} \times 100 = \frac{345}{2650} \times 100$

= 13.01%

30.

	Tariff 2003-04	% change over 2000-01	Tariff 2000-01
Sector 1	400	+ 14.28%	350
Sector 2	375	+ 7.14%	350
Sector 3	525	-12.5%	600
Sector 4	800	-20%	1000
	2100		2300

Average tariff = $\frac{2300}{4} = 575$

31. In 2003-04 the water consumed by various sectors out of 20,000 kilo-litres can be given as follow:

Category	Percentage	Consumption in 2003-04
Domestic	40	8,000
Urban	25	5,000
Rural	15	3,000
Industrial	20	4,000
		20,000

Since there was a 20% decrease in the domestic consumption in 2003-04 the domestic consumption in 2000-01 = $\frac{8,000}{0.8} = 10,000$

But this constitutes 40% of total water consumed in 2000-01 and the industrial consumption constitutes 20% of total water in 2000-01. Hence in 2000-01 the industrial consumption = $10,000 \times \frac{20}{40} = 5,000$ kilo-liters

32. We do not know the category-wise break up of tariffs ie the rates of Urban sector is unknown.

33. The average of Region 2 = $\frac{400 + 375 + 525 + 800}{4} = 525$

Average tariff in region 4 = $\frac{62.5 + 750 + 240 + 360}{4} = 487.5$

Average tariff in region 5 = $\frac{220 + 360 + 320 + 400}{4} = 450$

Statements (c) can not be determined

34. Total number of people = 10,000

Business men	10%	1000	LML	1200
Govt. Servant	13%	1300	SUZUKI	1200
Professionals	30%	3000	BAJAJ	3000
Students	45%	4500	HERO HONDA	6600
Housewives	2%	200		

The total number of Hero Honda bikes = 6600

Total numbers of Government servants housewives and students = 6000

Total no. of Businessmen and professional = 4000

∴ Percentage of remaining (i.e., Businessmen and prof.)

$$\text{driving Hero Honda} = \frac{600}{4000} \times 100 = 15\%$$

35. Let the no. of people who drive one two and three bikes be $15k$, $3k$ and k respectively.

Number of bikes which are being driven

$$= 15k + 2(3k) + 3(k) = 24k$$

Since LML and Suzuki can not be driven by same person and a person can drive maximum 3 bikes.

Total bikes which are being used to drive = 12,000

$$\therefore 24k = 12,000 \Rightarrow k = 500$$

Total number of people driving the bikes

$$= 15k + 3k + k = 19k = 9500$$

∴ Number of people who do not drive any bike

$$= 10,000 - 9500 = 500$$

36. From the previous solution, number of people who drive more than 1 bike i.e., 2 bikes and 3 bikes are 1500 and 500 respectively.

These people have total 4500 bikes

$$= 1500 \times 2 + 500 \times 3$$

Hence, the remaining Hero Honda bikes

$$= 6600 - 4500 = 2100$$

Thus, the number of persons who drive single Hero Honda

$$= 2100$$

37. Since 20% drive other bikes 80% drive only bajaj bike

$$= 0.8 \times 3000 = 2400$$

38. $\frac{11000 + 12000}{21,000} \times 100 = 109.52\%$

39. $\frac{27,000 - 23,000}{23,000} \times 100 = 17.4\%$

40. Demand = Domestic Production + Imports

Average demand = $\frac{44 + 54.5 + 57}{3} \approx 52$ million tonnes

41. (c) $\frac{30,000 - 21,000}{21,000} \times 100 \approx 43\%$

42. Offshore production in 2004 = $16,000 \times 0.875$
 $= 14,000$ thousand tonnes

Onshore production = 11,000 thousand tonnes

Demand in 2004 = $57,000 \times 1.02 = 5814$ thousand tonnes
 $\text{imports} = 33.14$ million tonnes
 $(\because 1 \text{ million} = 10^6)$

43. $201924 \times \frac{5}{6} = 33654 \times 5 = 168270$

44. $127890 \times \frac{11}{10} = 140679$

45. $126400 + 975264 + 237852 = 1339516$

46. $\frac{100956}{2445480} \times 100 = 4.128\%$

Alternatively: $\frac{1}{24} \times 100 \approx 4.16\%$

47. $1969 - 70 \rightarrow 134790$
 $1979 - 80 \rightarrow 284620 \rightarrow 149830$

48. $1929 - 30 \rightarrow 9,75,264$

$1949 - 50 \rightarrow 1,40,679$

% decrease = $\frac{975264 - 140679}{975264} \times 100 = 85.57\%$

49. $1959 - 60 \rightarrow 1960 - 61$

$168020 \xrightarrow{+ 20\%} 201924$

Therefore $\frac{168020}{201924} \times 100 = 83.33\%$

Alternatively: From percentage charge graphic

Increase	Decrease
20%	16.66%
1/5	1/6

∴ The required value = $83.33\% (100 - 16.66\%)$

Alternatively: $x \times \frac{6}{5} = k$

$\Rightarrow x = \frac{5k}{6}$

$(x)\% = \frac{5k}{6} \times 100 = 83.33\% \text{ of } k$

50. Only 7,900 tonnes increase over the 1919 - 20.

6

PROFIT, LOSS AND DISCOUNT

This chapter is as much important as other chapters in the arithmetic section, since it is a chapter of applications by which we calculate profit, loss, discount in day-to-day business. So in the entrance exams of MBA it plays a crucial role in determining the selection of an aspirant. Particularly in CAT the questions asked in QA are very logical in nature, apart from the simple application in Data interpretation (D.I.) and Data sufficiency (D.S.). Entrance exams like FMS, IIFT, NIFT and MAT ask plethora of questions. Infact a normal question paper seems to be incomplete without having the problems based on profit, loss and discount.

THEORY AND CONCEPTS

In day-to-day life we sell and purchase the things as per our requirement. A customer can get things in the following manner :

```

  Manufacturer → Whole-saler → (Shopkeeper)
  (or producer)   (dealer)      → Retailer
                           (or sales person)
                           → Customer
  
```

TERMINOLOGY

Cost price (CP) : The money paid by the shopkeeper to the manufacturer or whole-saler to buy the goods is called the cost price (CP) of the goods purchased by the shopkeeper.

NOTE If an article is purchased for some amount and there are some additional expenses on transportation labour, commission etc., these are to be added in the cost price. Such expenses are called overhead expenses or overheads.

EXAMPLE 1 A fruit seller buys 300 oranges at 5 for Rs. 8 and sold 2 for Rs. 5. Find :

- the cost price of each orange
- the selling price of each orange
- profit or loss on selling one orange
- his total profit or loss on selling all the oranges.

SOLUTION (i) Since the cost price of 5 oranges = Rs. 8
 Cost price of one (or each) orange = $Rs. \frac{8}{5} = Rs. 1.60$

Selling Price (SP) : The price at which the shopkeeper sells the goods is called the selling price (SP) of the goods sold by the shopkeeper.

Profit : If the selling price of an article is more than its cost price, then the dealer (or shopkeeper) makes a profit (or gain)

$$i.e., \quad \text{Profit} = SP - CP; \quad SP > CP$$

Loss : If the selling price of an article is less than its cost price, then the dealer suffers a loss.

$$i.e., \quad \text{Loss} = CP - SP; \quad CP > SP$$

Important Formulae

$$(i) \quad \text{Profit} = SP - CP$$

$$(ii) \quad \text{Loss} = CP - SP$$

$$(iii) \quad \text{Profit percentage} = \frac{\text{profit}}{\text{cost price}} \times 100$$

$$(iv) \quad \text{Loss percentage} = \frac{\text{loss}}{\text{cost price}} \times 100$$

$$(v) \quad SP = \left(\frac{100 + \text{gain \%}}{100} \times CP \right) = \left(\frac{100 - \text{loss \%}}{100} \times CP \right)$$

$$(vi) \quad CP = \left(\frac{100}{100 + \text{gain \%}} \times SP \right) = \left(\frac{100}{100 - \text{loss \%}} \times SP \right)$$

$$(vii) \quad SP = (100 + k)\% \text{ of } CP; \text{ when profit} = k\% \text{ of } CP$$

$$(viii) \quad SP = (100 - k)\% \text{ of } CP; \text{ when loss} = k\% \text{ of } CP$$

NOTE Profit or loss is always calculated on the basis of cost price unless otherwise mentioned in the problem.

(ii) Since the selling price of 2 oranges = Rs. 5

∴ the selling price of one orange = $Rs. \frac{5}{2} = Rs. 2.50$

(iii) Since SP is more than CP, there is a profit.

So profit on selling one orange = $SP - CP$
 $= 2.5 - 1.6 = Re. 0.90$

(iv) Profit on selling all the oranges

$$= Rs. (0.90 \times 300) = Rs. 270$$

Hence the total profit on selling all oranges = Rs. 270

EXAMPLE 2 A shopkeeper buys 100 eggs at Rs. 1.20 per piece. Unfortunately 4 eggs got spoiled during transportation. The shopkeeper sells the remaining eggs at Rs. 15 a dozen. Find his profit or loss.

SOLUTION Cost price of all eggs = Rs. $100 \times 1.2 = \text{Rs. } 120$

$$\text{Selling price of one egg} = \frac{15}{12} = \text{Rs. } 1.25$$

$$\therefore \text{Selling price of 96 eggs} = 96 \times \frac{15}{12} = \text{Rs. } 120$$

HINT After spoiling 4 eggs, only 96 eggs are left.

Now, since the total selling price and total cost price is same, the shopkeeper neither makes a profit nor suffers a loss.

EXAMPLE 3 Aviral purchased a computer for Rs. 47,000. He had to sell it for Rs. 45,800. Find his profit or loss per cent.

SOLUTION Since $SP < CP$, there will be loss

$$\text{loss (\%)} = \frac{\text{loss}}{\text{CP}} \times 100 = \frac{47000 - 45800}{47000} \times 100 \\ = \frac{1200}{47000} \times 100 = 2 \frac{26}{47} \%$$

EXAMPLE 4 A dealer sold 600 quintals of sugar at a profit of 7%. If a quintal of sugar cost him Rs. 1600, find his total profit and the selling price.

SOLUTION $CP = 1600 \times 600 = \text{Rs. } 9,60,000$

Rate of Profit = 7%

$$\text{Profit} = 9,60,000 \times \frac{7}{100} = \text{Rs. } 67200$$

$$\therefore SP = CP + \text{Profit} = \text{Rs. } 9,60,000 + \text{Rs. } 67,200 \\ = \text{Rs. } 1027200$$

Thus profit = Rs. 67200 and selling price = Rs. 10,27,200

EXAMPLE 5 A dealer buys 200 quintals of wheat at Rs. 1200 a quintal. He spends Rs. 10,000 on transportation and storage. Then he sells the wheat at Rs. 13 per kg. Find his profit or loss. Also calculate it as a percentage.

1. A towel is sold for Rs. 198 at a gain of 10%. What is the cost price of the towel? At what price must it be sold to gain 25%?

2. A man sold a watch at Rs. 6000, at a loss of $33 \frac{1}{3} \%$. Find the cost price?

3. By selling a shirt for Rs. 285 a shopkeeper loses 5%. At what price should he sell the shirt so as to gain 15%?

MARK UP AND DISCOUNT

Marked price: Basically to avoid loss due to bargaining by the customer and to get the profit over the cost

SOLUTION $CP = 1200 \times 200 = \text{Rs. } 2,40,000$

Transportation and storage cost = Rs. 10,000

$$\text{Total CP} = 2,40,000 + 10,000$$

$$= \text{Rs. } 2,50,000$$

$$\text{Total SP} = 13 \times 200 \times 100$$

$$= \text{Rs. } 2,60,000$$

\therefore Now, since $SP > CP$, hence there will be profit.

$$\text{Profit} = SP - CP = \text{Rs. } (2,60,000 - 2,50,000) = \text{Rs. } 10,000$$

$$\text{Profit (\%)} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$= \frac{10,000}{2,50,000} \times 100 = 4\%$$

EXAMPLE 6 Find the cost price of an article which is sold for Rs. 220 at a loss of 12%.

SOLUTION $SP = \text{Rs. } 220$, Loss = 12%

$$\text{Let CP} = \text{Rs. } x$$

$$\text{then SP} = 88\% \text{ of CP}$$

$$220 = \frac{88}{100} \times x$$

$$\Rightarrow x = 250$$

Therefore cost price = Rs. 250

EXAMPLE 7 By selling a colour TV for Rs. 23520, a dealer suffers loss of 4%. What is the cost price of the colour TV? At what price should he sell it to gain 8%?

SOLUTION $SP = 96\% \text{ of CP}$ $\therefore (\text{loss is } 4\%)$

$$23520 = \frac{96}{100} \times CP$$

$$CP = 24500$$

$$\text{Now gain \%} = 8\%$$

$$\therefore \text{New selling price} = (100 + 8)\% \text{ of CP}$$

$$= \frac{108}{100} \times 24500 = \text{Rs. } 26460$$

INTRODUCTORY EXERCISE-6.1

1. A towel is sold for Rs. 198 at a gain of 10%. What is the cost price of the towel? At what price must it be sold to gain 25%?
2. A man sold a watch at Rs. 6000, at a loss of $33 \frac{1}{3} \%$. Find the cost price?
3. By selling a shirt for Rs. 285 a shopkeeper loses 5%. At what price should he sell the shirt so as to gain 15%?
4. Sufyan bought 1200 eggs at Rs. 16 a dozen. At what price per hundred must he sell the eggs so as to earn a profit of 15%?
5. Ram Singh purchased two camels for Rs. 18,000 and Rs. 15,000 respectively. He sold them at a loss of 15% and a gain of 19% respectively. Find the selling price of each camel. Also find the overall gain or loss per cent in the transaction.

price trader increases the cost price by a certain value, the increase in value over cost price is known as markup and the increased price (i.e., $CP + \text{Markup}$) is called the marked price or printed price or list price of the goods.

$$\text{Marked price} = \text{CP} + \text{Markup}$$

$$\text{Marked price} = \text{CP} + (\% \text{ markup on CP})$$

Generally goods are sold at marked price, if there is no further discount, then in this case selling price equals to marked price.

Discount: Discount means reduction of marked price to sell at a lower rate or literally discount means concession. Basically it is calculated on the basis of marked price.

$$\text{Selling price} = \text{Marked price} - \text{Discount}$$

$$\text{Selling price} = \text{Marked price (MP)} - (\% \text{ discount on MP})$$

EXAMPLE 8 If the cost price of an article is Rs. 300 and the per cent markup is 20%. What is the marked price?

SOLUTION $\text{MP} = \text{CP} + \% \text{ markup on CP}$

$$= 300 + 300 \times \frac{20}{100}$$

$$\text{MP} = \text{Rs. } 360$$

Alternatively: $\text{SP} = 300 \times 1.2 = 360$

EXAMPLE 9 If the marked price of an article is Rs. 450 and markup percentage is 12.5%, what is the cost price?

SOLUTION $\text{MP} = 112.5 \text{ of CP}$

$$450 = \frac{112.5}{100} \times \text{CP}$$

$$450 = \frac{9}{8} \times \text{CP}$$

$$\Rightarrow \text{CP} = \text{Rs. } 400$$

Alternatively: Change your outlook to visualize the problem differently for smarter calculation.

You can see that MP is 12.5% (i.e., $\frac{1}{8}$ times) greater than CP.

So CP will be $\frac{1}{9}$ times less than MP. This percentage (or fraction) change rule has been thoroughly discussed through different illustrations in percentage chapter. In my opinion if you change your observation i.e., you mould your thinking in a CAT oriented approach you will not change only your attitude and aptitude but the whole scenario will be changed. So look this problem like me:

$$\begin{array}{ccc} & 1/8 \uparrow & \\ \text{CP} & \curvearrowright & \text{MP} \\ & 1/9 \downarrow & \end{array} \quad \left(\frac{n}{d+n} \right) \begin{array}{l} n \rightarrow \text{numerator} \\ d \rightarrow \text{denominator} \end{array}$$

So, the CP will be $\frac{1}{9}$ times less than MP, which is rather too much easier to calculate than the traditional method given at the beginning of the solution.

EXAMPLE 10 If the marked price of an article is Rs. 660 and the discount is 10%, then what is the selling price of the article?

SOLUTION **General Solution :**

$$\text{SP} = \text{MP} - \text{Discount}$$

Since marked price = $\text{CP} + \% \text{ markup on CP}$

Remember **markup** is calculated on the basis of CP while **discount** is calculated on the basis of MP.

In general, $\text{CP} < \text{SP} < \text{MP}$ at profit

$\text{CP} = \text{SP} < \text{MP}$ at no profit no loss

$\text{SP} < \text{CP} < \text{MP}$ at loss

Also

and



NOTE You will find wide application of percentage calculation, percentage change graphic etc. so to move further you must know the concepts of percentages.

$$\text{SP} = 660 - 660 \times \frac{10}{100}$$

$$\text{SP} = 594$$

Alternatively: $\text{SP} = 90\% \text{ of MP}$

$$\text{SP} = 0.9 \times 660$$

$$\text{SP} = 594$$

Alternatively: We can see that when SP is 10% (i.e., $\frac{1}{10}$)

less than MP, it means MP is $\frac{1}{9}$ times greater than SP.

$$\text{Therefore } \text{MP} = \frac{10}{9} \text{ SP} \quad \left(1 + \frac{1}{9} = \frac{10}{9} \right)$$

Ultimately I would like to say that you should see the core of the problem and solution both, instead of taking help from any formula. In other words formulae make you logically blind particularly in context of CAT where your intelligence is tested rather than your memory and theory of the maths.

EXAMPLE 11 If the markup percentage of an article is 50% and discount percentage is also 20%, then the profit percentage will be :

- (a) 10% (b) 0% (c) 30% (d) 20%

SOLUTION See the smartest calculation technique and follow me to be smarter.

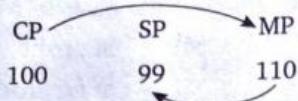
$$\begin{array}{ccc} \text{CP} & \text{SP} & \curvearrowright \text{MP} \\ 100 & 120 & \curvearrowleft 150 \\ \text{Therefore profit} = 20\% & & \left(\frac{120 - 100}{100} \times 100 = 20\% \right) \end{array}$$

Explanation: $\text{MP} = 150\% \text{ of CP}$ (\because markup is 50%)
 $\text{SP} = 80\% \text{ of MP}$ (\because discount is 20%)

Once again I am reiterating on the gist of this chapter. What is that gist? The gist is that this chapter test nothing but your grip on the concepts of percentage change. I think CP, SP, MP etc., are just the words, the crux is that how CP, SP and MP etc., change with respect to each other. So those students who have grasped and internalised the most important concept of percentage change, they will not find any difficulty in understanding the concept of the profit-loss problems. Believe me when your visualisation will be improved, you will be master on this chapter. So try to have a different approach.

EXAMPLE 12 A trader markup the goods by 10% and then gives a discount of 10%. What is the profit or loss percentage?

SOLUTION



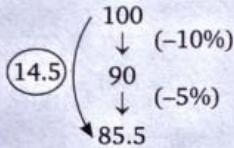
So there is a loss of 1%.

Explanation: $MP = 110\% \text{ of } CP$ (10% markup)
 $SP = 90\% \text{ of } MP$ (10% discount)

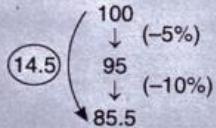
EXAMPLE 13 Successive discount of 10% and 5% is equivalent to :

- (a) 16.5% (b) 15%
 (c) 15.5% (d) 14.5%

SOLUTION



NOTE There is no difference in two different cases i.e., either you decrease 100 at first by 10% and then by 5% or decrease 100 at first by 5% and then by 10%.



Explanation : $100 \times 0.9 \times 0.95 = 85.5$

\therefore Single discount equivalent to 10% and 5% is 14.5%
 $(100 - 85.5)\%$

or $(100 \times 0.95 \times 0.9 = 85.5)$

Some Important Concepts

(1) When two articles are sold at same price but one of them at a profit and another at a loss and the percentage profit is the same as the percentage loss. In this case there is always a loss.

$$\text{loss (\%)} = \left(\frac{\text{Common gain or loss}}{10} \right)^2$$

EXAMPLE 14 A man sells two wrist watches one at a profit of 10% and another at a loss of 10%, but the selling price of each watch is Rs. 200. Find the :

- (1) percentage profit or loss
 (2) net amount of profit or loss

SOLUTION (1) Since there is always loss.

Logic: To get the logic you should refer the percentage chapter)

$$\text{Now, loss \%} = \left(\frac{\text{Common gain or loss}}{10} \right)^2 \%$$

$$\text{loss \%} = \left(\frac{10}{10} \right)^2 \% = 1\%$$

(2) Amount of loss.

$$\text{Total SP} = \text{Rs. 400}$$

$$\text{again, total SP} = 99\% \text{ of CP} \quad (200 + 200) \quad (1\% \text{ loss})$$

$$400 = \frac{99}{100} \times \text{CP}$$

EXAMPLE 15 If the selling price of 10 articles is same as the cost price of 12 articles. What is the profit or loss per cent?

SOLUTION

$$x \times \frac{120}{100} = (500 - x) \frac{80}{100}$$

$$\Rightarrow x = 200$$

So, the CP of profit yielding article = Rs. 200

and the CP of loss giving article = Rs. 300

and the common SP = Rs. 240 = $(200 \times 1.2 = 300 \times 0.8)$

So the loss = $CP - SP$

$$= 500 - 2 \times 240 = \text{Rs. 20}$$

(2) When the selling price of 'm' articles is same as the cost price of 'n' similar articles.

EXAMPLE 16 If the cost price of 15 apples is same as the selling price of 20 apples. What is the gain or loss per cent?

SOLUTION CP of 15 apples = SP of 20 apples

$$\Rightarrow CP \times 15 = SP \times 20$$

$$\Rightarrow \frac{CP}{SP} = \frac{4}{3}$$

So you can see that $CP > SP$, therefore, there will be loss.

Now consider $CP = 4$, then $SP = 3$

$$\therefore \text{loss} = 1$$

$$\therefore \text{loss (\%)} = \frac{\text{loss}}{CP} \times 100$$

$$= \frac{1}{4} \times 100 = 25\%$$

$$\text{loss} = 25\%$$

EXAMPLE 17 If the selling price of 10 CDs is the same as the cost price of 12 CDs. What is the profit or loss per cent?

SOLUTION SP of 10 CDs = CP of 12 CDs

$$\Rightarrow SP \times 10 = CP \times 12$$

$$\Rightarrow \frac{SP}{CP} = \frac{12}{10} = \frac{6}{5}$$

$\Rightarrow SP > CP$, therefore there will be a profit

$$\text{Profit (\%)} = \frac{(SP - CP)}{CP} \times 100$$

$$= \frac{(6 - 5)}{5} \times 100 = 20\% \text{ (profit)}$$

(3) When a person recovers the cost price of 'm' articles by selling 'n' articles ($n < m$), then

$$\text{Profit (\%)} = \frac{\text{goods left}}{\text{goods sold}} \times 100$$

$$= \frac{m - n}{n} \times 100$$

Profit, Loss and Discount

In this case money is equated in terms of no. of (or amount) articles.

For your convenience always assume the CP of an article is Re 1. (or Rs. 100)

EXAMPLE 18. A dealer by selling 12 oranges gets the cost price of 15 oranges. What is the percentage profit?

$$\text{SOLUTION} \quad \text{Profit (\%)} = \frac{\text{goods left}}{\text{goods sold}} \times 100 = \frac{15 - 12}{12} \times 100 = 25\%$$

Alternatively : Suppose CP of one orange = Re. 1
then CP of 12 oranges = Rs. 12
and SP of 12 oranges = CP of 15 oranges = Rs. 15
 $\therefore \text{profit} = \frac{15 - 12}{12} \times 100 = 25\%$

EXAMPLE 19. By selling 8 bananas, a fruit seller gains the selling price of 1 banana. Calculate his gain per cent.

SOLUTION Let the SP of one banana = Re. 1

SP of 8 bananas = Rs. 8

profit = Re. 1

CP = 8 - 1 = Rs. 7

$$\therefore \text{profit \%} = \frac{1}{7} \times 100 = 14 \frac{2}{7}\%$$

EXAMPLE 20. By selling 18 chocolates, a vendor loses the selling price of 2 chocolates. Find his loss per cent.

SOLUTION Let the SP of 1 chocolate = Re. 1

SP of 18 chocolates = Rs. 18

and

loss = Rs. 2

CP = SP + loss

$$= 18 + 2 = \text{Rs. 20}$$

$$\therefore \text{Percentage loss} = \frac{\text{loss}}{\text{CP}} \times 100$$

$$= \frac{2}{20} \times 100 = 10\%$$

EXAMPLE 21. A trader sell all his articles at the cost price but gives 10% less amount as he should give. What is his percentage profit?

$$\begin{aligned} \text{SOLUTION} \quad \text{Profit (\%)} &= \frac{\text{goods left}}{\text{goods sold}} \times 100 \\ &= \frac{10}{90} \times 100 = 11 \frac{1}{9}\% \end{aligned}$$

Since if we assume that the CP of 1 article is Re. 1.

Now since he gives only 90% article instead of 100% and save 10% article. So his profit will be the equal to the remaining articles (over the sold articles).

It means when he sells the articles (actually) worth Rs. 90 then he gains by articles worth Rs. 10.

$$\text{Hence profit \%} = \frac{10}{90} \times 100 = 11 \frac{1}{9}\%$$

$$(\text{The selling price} = \frac{100}{90} = \frac{10}{9} = \text{Rs. 1.11})$$

EXAMPLE 22. A trader by means of his false balance defrauds to the extent of 10% in buying goods and also defrauds to 10% in selling. Find his gain per cent.

SOLUTION Let the actual CP of an article be Re. 1, then the effective CP = $\frac{100}{110} = \frac{10}{11}$

(Since he purchases 110 articles by paying Rs. 100)

$$\text{again SP} = \frac{100}{90} = \frac{10}{9}$$

(Since he sells only 90 articles charging the CP of 100 articles)

$$\begin{aligned} \therefore \text{Gain \%} &= \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100 = \frac{\frac{10}{9} - \frac{10}{11}}{\frac{10}{11}} \times 100 \\ &= \frac{20}{99} \times \frac{11}{10} \times 100 \\ &= \frac{200}{9} = 22 \frac{2}{9}\% \end{aligned}$$

INTRODUCTORY EXERCISE-6.2

- The cost price of a scooter is Rs. 20,000 and the profit percent is 12%. What is the selling price?
 - 2400
 - 22040
 - 2600
 - 22400
- The SP of an article is Rs. 3200 and the profit per cent is $33\frac{1}{3}\%$. Find the cost price.
 - Rs. 20000
 - Rs. 2000
 - Rs. 2400
 - Rs. 3000
- The CP of an article is $\frac{5}{6}$ th of the SP. What is the percentage profit or loss?
 - 20% loss
 - 16.66% profit
 - 16.66% loss
 - 20% profit

- The MP of a camera is $\frac{3}{2}$ of the CP and SP is $\frac{9}{10}$ of MP. Find the percentage profit or loss.
 - 25% profit
 - 35% profit
 - 33.33% loss
 - none of these
- The MP of an article is 30% higher than its CP and 20% discount is allowed on this article then the profit percentage :
 - 10%
 - 14%
 - 4%
 - 26%
- An article is sold for Rs. 1980 at 10% profit. What is the cost price?
 - Rs. 198
 - Rs. 1800
 - Rs. 1900
 - Rs. 1600

