

PERCENTAGES

Concept Base

Percent:

The term per cent means for every hundred. A fraction whose denominator is 100 is called a percentage and the numerator of the fraction is called the rate per cent. It is denoted by the symbol %.

I. Any percentage can be expressed as a decimal fraction by dividing the figure by 100.

1. **To express X% as a fraction:** We have, $x\% = x/100$.

Thus, $20\% = 20/100 = 1/5$; $48\% = 48/100 = 12/25$, etc.

2. **To express a/b as a percent:** We have, $a/b = (a/b * 100)\%$.

Thus, $1/4 = (1/4 * 100)\% = 25\%$; $0.6 = 3/5 = (3/5 * 100)\% = 60\%$.

II. **PERCENTAGE INCREASE** or **DECREASE** of a quantity is the ratio expressed in percentage of the actual increase or decrease of the quantity to the original amount of the quantity.

PERCENTAGE INCREASE
 $= (\text{Actual increase/original quantity}) * 100$

PERCENTAGE DECREASE
 $= (\text{Actual decrease/original quantity}) * 100$

III. If the price of a commodity increases by R%, then the reduction in consumption so as not to increase the expenditure is $(\frac{R}{(100+R)} * 100)\%$

If the price of a commodity decreases by R%, then the increase in consumption so as not to decrease the expenditure is $(\frac{R}{(100-R)} * 100)\%$

IV. Results on Population:

Let the population of a town be P now and suppose it increases at the rate of R% per annum, then:

1. Population after n years $= P (1 + \frac{R}{100})^n$.

2. Population n years ago $= P / (1 + \frac{R}{100})^n$.

V. Results on Depreciation:

Let the present value of a machine be P. Suppose it depreciates at the rate of R% per annum.

Then:

1. Value of the machine after n years

$$= P (1 - \frac{R}{100})^n$$

2. Value of the machine after n years ago

$$= P / (1 - \frac{R}{100})^n$$

VI. If A is R% more than B, then B is less than

$$A \text{ by } (\frac{R}{(100+R)} * 100)\%$$

If A is R% less than B, then B is more than

$$A \text{ by } (\frac{R}{(100-R)} * 100)\%.$$

Example 1

In a class, 60% of the students in Section A are girls, while in Section B only 30% of the students are girls. The number of students in Section B is 50% more than that in Section A. If Section A has 80 students, the number of girl students of Section B is what percentage of the number of girl students in Section A?

Solutions:

Number of students in Section A = 80.

Number of students in Section B

$$= 80 + (80 \times 0.5) = 120.$$

Number of girl students in Section A

$$= 80 \times 0.6 = 48.$$

Number of girl students in Section B

$$= 120 \times 0.3 = 36.$$

Number of girl students in Section B as a percentage of the number of girl

$$\text{Students in Section A} = (36/48) \times 100 = 75\%.$$

$$70\% \text{ of a number } n \text{ is } 350 \Rightarrow 0.7n$$

$$= 350 \text{ or } n = 350/0.7 = 500.$$

So, if 70% of a quantity is 350, the quantity is 500. Or in general,

$$\text{If } x\% \text{ of } y \text{ is } z, y = (z/x) \times 100.$$

Example 2

A Person spends 40% of his salary on food and 20% on house rent. If he is left with Rs. 8000, what is his salary?

Solution:

Total spent is 60% and left over is 40%

Therefore 40% of salary is 8000

$$\text{Salary} = (8000/40) \times 100 = \text{Rs. } 20000$$

Example 3:

A buys a shirt from a shop offering three successive discounts of 20%, 10% and 5%. B purchases from a shop giving 25%, 5% and 5% successively. Who gets better deal A or B?

Solution:

Let m be the marked price.

For A: First discounted price = $0.8m$.

Second discounted price = $0.9 \times 0.8m = 0.72m$.

Final discounted price = $0.95 \times 0.72m$
 $= 0.684m$.

The total discount = $1 - 0.684$

$= 0.316$ or 31.6% .

For B:

First discounted price = $0.75m$.

Second discounted price = $0.95 \times 0.75m$
 $= 0.7125m$.

Final discounted price = $0.95 \times 0.7125m$
 $= 0.676875m$.

The total discount = $1 - 0.676875$

$= 0.323125$ or 32.31% .

Clearly B gets a better deal.

Example 4:

When the price on Tuesday is 60% more than the Monday price and the Wednesday price is 40% more than the Tuesday price, then the Wednesday price is

- 100% more than the Monday price
- More than double the Monday price
- Less than double the Monday price
- none of the above

Solution:

The most popular wrong answer would be (a).

But the correct answer is (b).

$60\% \text{ over } 40\% = 1.6 \times 1.4 = 2.24$.

So, the Wednesday price is 124% more than the Monday price \Rightarrow more than double.

Example 5:

A fruit vendor buys some apples at 6 for Rs.100 and an equal number of a different variety at 4 for Rs.50. If she sells the entire stock at 15 for Rs.200, what is her profit or loss percent?

Solution:

Let the number of apples of each variety be n .

Then, total cost price = $\{(100n/6) + (50n/4)\}$
 $= (200n + 150n)/12 = 350n/12$.

Noting that the entire stock is $2n$ apples, the total selling price = $400n/15$.

Since $350/12 > 400/15$, the net is loss.

The loss = $(350n/12) - (400n/15)$

$= (1750n - 1600n)/60$

$= 150n/60 = 5n/2$.

Loss percent

$= \{(5n/2) / (350n/12)\} \times 100$

$= 60/7\% = 84/7\%$.

Alternatively, by *Speed Maths* method:

When equal quantities are bought and prices are expressed as certain number for certain amount, calculations can be done faster by taking the common quantity as the LCM of those numbers.

In the present case, the numbers are 6, 4 and 15, LCM of which is 60.

Cost price of 60 apples at 6 for Rs.100 = 1000.

Cost price of 60 apples at 4 for Rs.50 = 750.

Total cost price of 120 apples = 1750.

Selling price of 120 apples at 15 for Rs.200 = 1600.

Loss = $1750 - 1600 = 150$.

Loss percentage = $(150/1750) \times 100 = 84/7\%$.

Successive discounts are given on discounted price only.

Guard Against the Probable Errors

- x as a percentage of y is **not** the same as y as a percentage of x .
- An annual increase of 60% in a year followed by an annual fall of 10% in the next year does **not** give annual growth rate of $\{60 + (-10)\}/2 = 25\%$.

The actual growth rate is 20% per annum.

To offset a fall of 20%, an increase of 20% is **not** sufficient – 25% is required

PROFIT AND LOSS

Concept Base

In any business commercial environment the most important concern is about the profit/loss of the transaction conducted.

1. Cost Price:

The price at which an article is purchased, is called its cost price, abbreviated as C.P.

2. Selling Price:

The price at which an article is sold, is called its selling price, abbreviated as S.P

3. Profit or Gain

If S.P. is greater than C.P., the seller is said to have a profit or gain.

4. Loss

If S.P. is less than C.P., the seller is said to have incurred a loss.

FORMULAE

1. Gain = (S.P.) – (C.P.)

2. Loss = (C.P.) – (S.P.)

3. Loss or gain is always reckoned on C.P.

4. $\text{Gain \%} = \left(\frac{\text{Gain} \times 100}{\text{C.P.}} \right)$
5. $\text{Loss \%} = \left(\frac{\text{Loss} \times 100}{\text{C.P.}} \right)$
6. $\text{S.P.} = \frac{(100 + \text{Gain}\%)}{100} \times \text{C.P.}$
Ex: If an article is sold at a gain of say, 35%, then S.P. = 135% of C.P.
7. $\text{S.P.} = \frac{(100 - \text{Loss}\%)}{100} \times \text{C.P.}$
Ex: If an article is sold at a loss of say, 35%, then S.P. = 65% of C.P.
8. $\text{C.P.} = \frac{100}{(100 + \text{Gain}\%)} \times \text{S.P.}$
9. $\text{C.P.} = \frac{100}{(100 - \text{Loss}\%)} \times \text{S.P.}$
10. When a person sells two similar items, one at a gain of say, x%, and the other at a loss of x%, then the seller always incurs a loss given by:
$$\text{Loss\%} = \left(\frac{\text{Common Loss and Gain \%}}{10} \right)^2 = (x/10)^2$$
11. If a trader professes to sell his goods at cost price, but uses false weights, then
$$\text{Gain\%} = \left(\frac{\text{Error}}{(\text{True value}) - (\text{Error})} \times 100 \right) \%$$

Example 1:

If a merchant offers a discount of 40% on the marked price of his goods and thus ends up selling at cost price, what was the % mark up?

Solution:

If the merchant offers a discount of 40% on the marked price, then the goods are sold at 60% of the marked price.

The question further states that when the discount offered is 40%, the merchant sells at cost price.

Therefore, selling @ 40% discount = 60% of marked price (M) = cost price (C)
i.e., a mark up 66.66%

Example 2:

A shopkeeper bought an almirah from a wholesale dealer for Rs 4500 and sold it for Rs 6000. Find his profit or loss percent.

Solution:

Here C.P. of the almirah = Rs 4500

S.P. of the almirah = Rs 6000

Since S.P. > C.P., there is a profit

Profit = S.P. - C.P.

= Rs 6000 - Rs 4500

= Rs 1500

Profit % = $1500/4500 = 33.33\%$.

Example 3:

A trader professes to sell his goods at a loss of 8% but weights 900 grams in place of a kg weight. Find his real loss or gain per cent?

Solution:

The trader professes to sell his goods at a loss of 8%.

Therefore, Selling Price

= (100 - 8) % of Cost Price or SP = 0.92CP

But, when he uses weights that measure only 900 grams while he claims to measure 1 kg.

Hence, CP of 900gms = 0.90 * Original CP

So, he is selling goods worth 0.90CP at 0.92CP

Therefore, he makes a profit of 0.02 CP on his cost of 0.9 CP profit % = 2.22%

Example 4:

A retailer buys a cooler for Rs 3800 and overhead expenses on it are Rs 50. If he sells the cooler for Rs 4400, determine his profit percent?

Solution:

Here, C.P. of the cooler = Rs (3800 + 50)

= Rs 3850

S.P. of the cooler = Rs 4400

Since S.P. > C.P., there is a profit

Profit = Rs 4400 - Rs 3850

= Rs 550

Profit % = 14.27%.

Example 5:

The cost price of 40 articles is equal to the selling price of 35 articles. What is the profit/loss percent?

Solution:

Let the cost price of one article be \$1, then the cost price of 40 articles is \$40

The question states that the selling price of 35 articles = cost price of 40 articles = \$40

Therefore, now we know the selling price for 35 articles

Now, let us find the cost price for 35 articles.

We have assumed the cost of 1 article = \$1.

Therefore, cost price of 35 articles = \$35

Therefore, the profit/loss made on 35 articles

= S.P of 35 articles - C.P of 35 articles

i.e., \$40 - \$35 = \$5, or a profit of \$5

Hence, % Profit = 14.28%

Guard Against the Probable Errors

1. A mark-up of 40% followed by a 10% discount does **not** yield a profit of 30% - the actual profit is only 26%.
2. Selling two articles at the same price, incurring 10% loss in one and making 10%

- profit on the other does **not** lead to no-profit-no-loss situation – reality is 1% loss. [No profit - no - loss is the right answer had the two articles been bought, and **not sold**, at the same price.]
3. Doubling the price and then reducing it by 50% does **not** yield 50% profit – the net effect is no-profit-no-loss.
 4. Successive discounts of 10%, 20% and 30% does **not** yield an overall 60% discount – the actual total is only 49.6%.
 5. Successive discounts of 25%, 10% and 5% is **not** the same as successive discounts of 20%, 15% and 5% although both add up to 40%. The actual total discounts are 35.875% and 35.4% respectively.

Questionnaire for Practice

PERCENTAGES

1. Mr. Abhimanyu Banerjee is worried about the balance of his monthly budget. The price of petrol has increased by 40%. By what percent should he reduce the consumption of petrol so that he is able to balance his budget?
a. 33.33 **b. 28.56** c. 25 d. 14.28
2. A number is mistakenly divided by 5 instead of being multiplied by 5. Find the percentage change in the result due to this mistake.
a. **96%** b. 95%
c. 2400% d. 200%
3. The length, breadth and height of a room in the shape of a cuboid are increased by 10%, 20% and 50% respectively. Find the percentage change in the volume of the cuboid.
a. 77% b. 75%
c. 88% **d. 98%**
4. $\frac{4}{5}$ th of the voters in Bellary promised to vote for Sonia and the rest promised to vote for Sushma. Of these voters, 10% of the voters who had promised to vote for Sonia, did not vote on the election day, while 20% of the voters who had promised to vote for Sushma did not vote on the election day. What is the total number of votes polled if Sonia got 216 votes?
a. 200 **b. 300** c. 264 d. 100
5. In an examination, 48% students failed in Hindi and 32% students in History, 20% students failed in both the subjects. If the number of students who passed the examination was 880, how many students appeared in the examination if the examination consisted only of these two subjects?
a. 2000 b. 2200 c. 2500 d. 1800
6. The salary of Anuj is 20% lower than Bhuwan's salary and the salary of Chauhan is 56.25% greater than Anuj salary. By how much percent the salary of Bhuwan is less than the salary of Chauhan?
a. **20%** b. -20%
c. 25% d. Data Insufficient
7. The price of a certain article was raised by 10% in India. The consumption of the same article was increased from 200 tons to 225 tons. By how much percent will the expenditure on the article rise in the Indian economy?
a. 24.25% b. 22.5%
c. 23.75% d. 26%
8. In a class, 25% of the students were absent for an exam. 30% failed by 20 marks and 10% just passed because of grace marks of 5. Find the average score of the class if the remaining students scored an average of 60 marks and the pass marks are (counting the final scores of the candidates).
a. 37.26 **b. 37.6**
c. 37.8 d. 36.93
9. After receiving two successive raises, Hursh's salary became equal to $\frac{15}{8}$ times of his initial salary. By how much percent was the salary raised the first time if the second raise was twice as high (in percent) as the first?
a. 15% b. 20%
c. 25% d. 30%
10. The hourly wages of a female labor was increased by 12.5%, whereas the weekly working hours are reduced by 8%. Find the percentage change in the weekly wages if she was getting Rs. 1200 per week for 50 hours previously.
a. 3.5% b. 4%
c. 4.5% d. None of these

11. According to a recent survey report issued by commerce Ministry, Govt of India, 30% of the total FDI goes to Gujarat and 20% of this goes to rural areas. If Gujarat FDI, which goes to urban areas, is \$72m, find FDI in rural AP, which gets 50% of AP FDI, which accounts for 20% of the total FDI?
a. **\$30m** b. \$60m
c. \$9m d. \$40m
12. A person saves 6% of his income. Two years later, his income shoots up by 15% but his savings remains the same. Find the hike in his expenditure.
a. **15.95%** b. 15%
c. 14.8% d. 15.5%
13. In order to maximize his gain, a theatre owner decides to reduce the price of tickets by 20% and as a result of this, the sales of tickets increase by 40%. If, as a result of these changes, he is able to increase his weekly collection by Rs. 1,68,000, find by what value did the gross collection increase per day.
a. 14000 b. 18000
c. **24000** d. 20000
14. A shopkeeper announces a discount scheme as follows: for every purchase of Rs. 3000 to Rs. 6000, the customer gets a 15% discount or a ticket that entitles him to get a 7% discount on a further purchase of goods costing more than Rs. 6000. The customer, however, would have the option of reselling his right to the shopkeeper at 4% of his initial purchase value (as per the right refers to the 7% discount ticket). In an enthusiastic response to the scheme, 10 people purchase goods worth Rs. 4000 each. Find the maximum possible revenue for the shopkeeper.
a. **38400** b. 38000
c. 39400 d. 39000
15. For the above question, find the maximum possible discount that the shopkeeper would have to offer to the customer.
a. 1600 b. 2000 c. **6000** d. 4000
16. A 14.4 kg gas cylinder runs for 104 hours when the smaller burner on the gas stove is fully opened while it runs for 80 hours when the larger burner on the gas stove is fully opened. Which of these values are the closest to the percentage difference in the usage of gas per hour, between the smaller and the larger burner?
a. 26.23% b. **30%** c. 32.23% d. 23.07%
17. For the above question, assume that the rate of gas dispersal is directly proportional to the degree of opening of the aperture of the gas. If we are given that the smaller burner is open to 60% of its maximum and the larger burner is open to 50% of its maximum, the percentage decrease in the percentage difference between the smaller burner and the larger burner (in terms of hours per kg) is,
a. 72.22% b. 73.33%
c. 66.66% d. None
18. Of the adult population in Nagpur, 45% of men and 25% of women are married. What percentage of the total population of adults is married (assume that no man marries more than one woman and vice versa)?
a. 33.33% b. **32.14%**
c. 31.1% d. None of these
19. Abhimanyu and Banerjee has 72% vision in his left eye and 68% vision in his right eye. On corrective therapy, he starts wearing contact lenses, which augment his vision by 15% in the left eye and 11% in the right eye. Find out the percentage of normal vision that he possesses after corrective therapy. (Assume that a person's eyesight is a multiplicative construct of the eyesight's of his left and right eyes)
a. 52.5% b. **62.5%**
c. 72.5% d. 68.6%

PROFIT AND LOSS

1. A shopkeeper bought 240 chocolates at Rs. 9 per dozen. If he sold all of them at Rs. 1 each, what was his profit percent?
a. $66\frac{1}{6}\%$ b. **$33\frac{1}{3}\%$**
c. 24% d. 27%
2. A cellular phone when sold for Rs. 4600 fetches a profit of 15%. Find the cost price of the cellular phone.
a. 4300 b. 4150
c. **4000** d. 4500

3. A manufacturer estimates that on inspection 12% of the articles he produces will be rejected. He accepts an order to supply 22,000 articles at Rs. 7.50 each. He estimates the profit of his outlay including the manufacturing of rejected articles, to be 20%. Find the cost of manufacturing each article.

a. 6 b. 5.50
c. 5 d. 4.50
4. A pet shop owner sells two puppies at the same price. On one he makes a profit of 20% and on the other he suffers a loss of 20%. Find the loss or gain percent on the whole transaction.

a. Gain of 4% b. No profit or loss
c. Loss of 10% d. Loss of 4%
5. The printed price of a calculator is Rs. 180. A retailer pays Rs. 137.7 for it by getting successive discounts of 10% and another rate which is illegible. What is the second discount rate?

a. 12% b. 12.5%
c. 15% d. 20%
6. The cost price of 50 mangoes is equal to the selling price of 40 mangoes. Find the percentage profit.

a. 20% b. 25%
c. 30% d. None of these
7. Advertising worth Rs. 50,000 is done for the sales promotion of A/C rooms (advertising as 20% reduction in the bill for A/C rooms). This leads to a doubling of the occupancy rate of A/C rooms. Besides, it also has an effect of increasing non-A/C room occupancy by 20%. Is this advised?

a. Yes b. No
c. Indifferent d. Cannot be Determined
8. 'A' sells a car priced at Rs. 36,000. He gives a discount of 8% on the first Rs. 20,000 and 5% on the remaining Rs. 16,000. His competitor B sells a car of the same make, priced at Rs. 36,000. If A wants to be competitive what percent discount should 'B' offer on the marked price?

a. 5% b. 5.5%
c. 6.6% d. 8.33%
9. st dealer professes to sell at cost price but uses a 900 gram weight instead of a 1 kilogram weight. Find the percent profit to the dealer.

a. 10% b. 11.11%
c. 12.5% d. None of these
10. After selling a watch, Shyam found that he had made a loss of 10%. He also found that had he sold it for Rs. 27 more, he would have made a profit of 5%. The actual initial loss was what percentage of the profit earned, had he sold the watch for a 5% profit?

a. 23% b. 150%
c. 200% d. 180%

SPEED TIME DISTANCE

Concept Base

In this chapter, we will look at problems in the following different areas:

- General problems on Time, Speed and Distance
- Relative Speed
- Boats and Streams
- Races and Circular Tracks

Before we look at problems in various areas, Let us first look at some basic concepts pertaining to speed, time and distance.

I. SPEED

Distance covered per unit time is called speed.

i.e., Speed = Distance/Time

$$S = D/T$$

From this, we get

$$T = D/S$$

$$D = S \times T$$

Note:

- a. D and S are directly proportional, but T and S are inversely proportional.
- b. Distance is normally measured in Kilometres, metres or Miles; time in hours or seconds and Speed in Km/hour (also denoted by kmph), miles/hour (also denoted by mph) or metres/second (denoted by m/s).

Some Important Results

- a. To convert speed in kmph to m/sec, multiply it with 5/18.
- b. To convert speed in m/sec to kmph, multiply it with 18/5.

Q1. A car and a bike start from the same point at 9 a.m. and reach the same destination at 10 a.m. and 10:30 a.m. respectively. If the average speed of the car is 60 kmph, what is the average speed of the bike?

Solution:

If d is the distance covered, $d = 60$ km

Since the car took 1 hour to cover the speed is 60 kmph

The bike took 1.5 hours to cover the same distance.

So, Speed = Distance/Time

$$\text{Speed} = 60/1.5 = 40\text{kmph.}$$

II. Average Speed

Average Speed = Total Distance/Total Time

If the time is constant, the average speed is the arithmetic mean of the speeds and if the distance is constant, the average speed is the harmonic mean of the speeds.

Given two numbers a and b , their

- a. Arithmetic mean (AM) = $(a+b)/2$,
- b. Harmonic mean (HM) = $2ab/(a+b)$
- c. Also $AM > HM$

Q2. A car covered a certain distance at 90 kmph and return back at 60 kmph. Find its average speed for the entire journey?

Solution:

Let x km be the distance to be covered, each way.

Total time of travel (in hours)

$$x/90 + x/60 = 5x/180 = x/36$$

Average speed (in km/hr)

$$= \text{Total distance travelled/Total time taken} \\ = 2x/(x/36) = 72$$

Q3. Find the length of the platform which a train. 400 m long, travelling at 45 kmph can cross in 40 seconds ?

Solution:

$$\text{Speed of the train} = (45)(5/18) = 12.5 \text{ m/sec}$$

Length of the platform

$$= \text{Distance travelled by the train} - \\ \text{Length of the train}$$

$$= (12.5)(40) - 400 = 100 \text{ m}$$

Q4. Ashok would reach this office 15 minutes early if he walked at 4 kmph from his house. He would reach it 45 minutes late if he walked at 3 kmph from his house. Find the distance between his house and office.

Solution:

Let the distance be x km.

Time taken by Ashok If he walked at 4 kmph = $x/4$ hours.

Time taken by Ashok if he walked at 3 kmph = $x/3$ hours.

In this case he would take one hour more to reach his office compared to the time taken if he had walked at 4 kmph.

Therefore,

$$x/3 - x/4 = 1$$

$$x = 12.$$

Note:

In general, if a person travelling between two points reaches p hours late travelling at a speed of u kmph and reaches q hours early travelling at v kmph, the distance between the two points is given by $\frac{vu}{(v-u)} \cdot (p+q)$.

III. Relative Speed

Relative speed is the rate at which the distance between two moving particles increases or decreases and depends on the direction in which the particles are moving.

To find relative speed,

- Sum of speeds if the particles move in opposite directions
- Difference in speeds if the particles move in the same direction

Steps to solve problems:

- a. Determine the initial distance between the particles.
 - i. If both particles move simultaneously, the distance between them is the initial distance
 - ii. If they do not start at the same time
 1. Calculate the distance between them when the late starter begins to move
 2. Consider it as the initial distance.
- b. Evaluate the relative speed.
- c. Calculate the time taken for the two particles to meet or cross each other as the ratio of initial distance to the relative speed.

Note:

The relative speed concept can also be employed to determine the distance between two moving particles at any given time by the following rule:

Required distance = initial distance \pm (time lapse \times relative speed).

- Q5. Two trains running at 36 kmph and 45 kmph cross each other in 20 seconds when they run in opposite directions. When the trains run in the same direction, a person in the faster train observed that he overtook the slower train in 48 seconds. Find the length of the trains.

Solution:

Let the lengths of the faster and slower train be f and s respectively.

Given that, $f+s/(36+45)(5/18) = 20$

$f+s = 450 \dots \dots \dots (1)$

When they run the same direction, the time taken by the person in the faster train to cross the slower train

$$= s/(45-36)(5/18) = 48$$

$$S = 120$$

$$\text{From (1), } f = 330$$

- Q6. Two trains have lengths of 300 m and 200 m. When they run in the same direction, the faster train will take 100 seconds to cross the slower train. When they run in the opposite directions, they will take 20 seconds to cross each other. Find the speeds of the trains.

Solution:

Let the speeds of the trains be x m/sec and y m/sec where $x > y$.

$$(300+200)/(x-y) = 100$$

$$5 = x-y \dots \dots \dots (1)$$

$$(300+200)/(x+y) = 20$$

$$25 = x+y \dots \dots \dots (2)$$

Solving (1) and (2)

$$x = 15 \text{ and } y = 10$$

IV. Boat and Stream Problems

These problems are governed by the following results:

Downstream (along the current) speed (D)

$$= \text{Boat-speed (B)} + \text{Stream speed (C)}$$

$$D = B + C$$

Upstream (against the current) speed (U)

$$= \text{Boat speed} - \text{current (stream) speed.}$$

$$U = B - C$$

Speed of the boat = average of downstream and upstream speeds

$$B = (D + U)/2$$

Speed of the current = half the difference of downstream and upstream speeds

Or as formulae,

$$C = (D - U)/2$$

- Q7. A boat takes 7 hours to go from A to B and 9 hours to return to A. If AB distance is 63 km, find the speed of

(a) the boat (b) the current.

Solution:

Since B to A takes more time, it is upstream and hence AB is downstream.

$$\text{Downstream speed} = 63/7 = 9 \text{ kmph.}$$

$$\text{Upstream speed} = 63/9 = 7 \text{ kmph.}$$

$$\text{Boat speed} = (9 + 7)/2 = 8 \text{ kmph.}$$

$$\text{Current speed} = (9 - 7)/2 = 1 \text{ kmph.}$$

V. RACES

The understanding of the following terminology is essential to solve problems involving races.

1. A beats B by 10 seconds in 100 m race
 \Rightarrow B takes 10 seconds more than A to cover 100 m.
2. A beats B by 10 m in 100 m race
 \Rightarrow B covers only 90 metres when A covers 100 m.
3. A gives a *head start* or simply *start* of 10 seconds to B
 \Rightarrow B can start 10 seconds ahead of A.
4. A gives a *head start* or simply *start* of 10 metres to B
 \Rightarrow B can start from a point 10 metres ahead of the point from where A would start.
5. Dead *heat* implies all runners reach the finishing line at the same time.

Q8. In a 200 m race, A beats B by 10 m or 2 seconds. Find B's speed and A's speed?

Solution:

A beat B by 10 m or 2 seconds.

When A reached the finishing line B was 10 m behind the finishing line and took 2 seconds to cover it.

B's speed = $10/2 = 5$ m/sec

Time taken by B to complete the race = $200 \text{ m} / 5 \text{ m/s}$

= 40 seconds

Therefore, Time taken by A to complete the race

= 38 seconds

A's speed = $200/38 = 100 = 19$ m/sec

Q9. In a 1200 m race, Ram beats Shyam by 300 m. In the same race, Shyam beats Tarun by 400 m. Find the distance by which Ram beats Tarun?

Solution:

Let the speed of Ram, Shyam and Tarun be r m/sec, s m/sec and t m/sec respectively.

$r/s = 1200/(1200-300) = 4/3$

$s/t = 1200/(1200-400) = 3/2$

$r/t = (r/s)(s/t) = 2$

By the time Ram covers 1200 m, Tarun covers 600 m.

Therefore, Ram beats Tarun by $(1200 - 600)$ i.e. by 600 m

VI. CIRCULAR TRACKS

Below things essential to solve problems,

- a. If two runners start at the same time and from the same point, when they meet for the first time, the faster runner would have a lead of one complete round over the other.

The time taken for the first meeting = track length/relative speed.

- b. If two runners start at the same time and from the same point, the time taken for them to meet at the starting point for the first time is the LCM of the time taken by each to complete one round.
- c. When three runners start from the same point at the same time, the time taken for their first meeting is the LCM of the time taken by the fastest runner to get a lead of one complete round over each of the other two.

[Result 'a' above can be used to determine these times.]

Q10. On a circular track of length 1800 m, X and Y start from the same point simultaneously with speeds of 36 kmph and 45 kmph respectively. Find the minimum time after which they will meet if they are running in

- a. The same direction.
- b. Opposite direction to each other.

Solution:

a. Time taken to meet for the first time

= $1800/(45-36)(5/18) = 720$ seconds

b. Time taken to meet for the first time

= $1800/(45+36)(5/18) = 80$ seconds

Q11. In the previous example, find the time after which they will meet at the starting point for the first time?

Solution:

Time taken to meet at the starting point for the first time

= L.C.M($1800/(36)(5/18)$, $1800/(45)(5/18)$)

= LCM (180, 144)

= 720 seconds

Guard Against the Probable Errors

* Average speed is **not** always the average of the speeds – it is so only when the time is constant; if the distance is constant, it is the HM of the speeds.

Questionnaire for Practice

1. A train traveling continuously covers 200 kilometer in 3 hours 30 minutes. If it has covered 40 km each for the first and last half an hour, then at what speed should it travel so as to maintain the same time for the whole distance?
 - a. 50 km/hr
 - b. 60 km/hr
 - c. 64 km/hr
 - d. 48 km/hr**
2. The Jammu and Kashmir Express from Delhi to Srinagar was delayed by snowfall for 16 minutes and made up for the delay on a section of 80 kilometer travelling with a speed 10 km per hour higher than its normal speed. Find the original speed of Jammu and Kashmir Express (according to the schedule)
 - a. 60 km/h
 - b. 66.66 km/h
 - c. 50 km/h**
 - d. 40 km/h
3. Two ants start simultaneously from two ant holes towards each other. The first ant covers 8% of the distance between the two ant holes in 3 hours, the second ant covered $\frac{7}{120}$ of the distance in 2 hours 30 minutes. Find the speed (feet/h) of the second ant if the first ant travelled 800 feet to the meeting point.
 - a. 15 feet/h
 - b. 25 feet/h
 - c. 45 feet/h
 - d. 35 feet/h**
4. Ozair starts for Pune from Mumbai at 2 PM, after reaching Pune he takes 2 hours to finish his work. After finishing his work he starts his return journey at $\frac{4}{5}$ th of his previous speed. He reached Mumbai at 08:30 PM on the same day. If the distance between Pune and Mumbai is 100 kilometers, then find the speed (in km/hr) with which he returns back to Mumbai
 - a. 40 kmph
 - b. 50 kmph
 - c. 35 kmph
 - d. 45 kmph
5. A man is 20 minutes late to office when he travels at a speed of 20 km/hr and 25 minutes early, when he travels at a speed of 80 km/hr. The distance to his office is
 - a. 30 km
 - b. 20 km**
 - c. 25 km
 - d. 45 km
6. Two trains, 200 km apart, are moving toward each other at the speed of 50 km/hour each. A fly takes off from one train flying straight toward the other at the speed of 75 km/hour. Having reached the other train, the fly bounces off it and flies back to the first train. The fly repeats the trip until the trains collide and the bug is squashed. What distance has the fly travelled until its death? => **75kmph**
7. A man jogs at 6 mph over a certain journey and walks over the same route at 4 mph. What is his average speed for the journey?
 - a. 2.4mph
 - b. 4 mph
 - c. 4.8 mph**
 - d. 5 mph
8. A horse chases a dog 2 hours after the dog runs. Horse takes 3 hours to reach the dog. If the average speed of the horse is 81Kmph. Then what is the average speed of the dog?
 - a. 48.6**
 - b. 50
 - c. 40
 - d. None
9. A horse can pull an empty cart at the speed of 18km per hour and the reduction in its speed is directly proportional to the square root of the number of boxes it can carry of equal weight of 10kg each. If the speed of the cart is 12km per hour when 9 boxes are loaded in the cart, find the maximum weight that can be carried if the speed of the cart is to be maintained at least 10km per hour.
 - a. 16 kg
 - b. 160 kg**
 - c. 100 kg
 - d. 159
10. In Kerala, students go to school by boat. The distance between the school and house is 21 km. A boat leaving the students to school returns back in 270 minutes. In which 60 min is taken to drop the students near School. What is speed of boat in still water, if the speed of river is 2.5 km/hr?
 - a. 10.4 km/hr
 - b. 12.5 km/hr
 - c. 22.5 km/hr
 - d. 11.5 km/hr
11. Ferrari S.P.A is an Italian sports car manufacturer based in Maranello, Italy. Founded by Enzo Ferrari in 1928 as Scuderia Ferrari , the company sponsored drivers and manufactured race cars before moving into production of street-legal vehicles in 1947 as Ferraari S.P.A.

- Throughout its history, the company has been noted for its continued participation in racing, especially in Formula One where it has employed great success. Rohit once bought a Ferrari. It could go 4 times as fast as Mohan's old Mercedes. If the speed of Mohan's Mercedes is 46 km/hr and the distance traveled by the Ferrari is 953 km, find the total time taken for Rohit to drive that distance.
- a. 20.72 **b. 5.18**
c. 238.25 d. 6.18
12. The pace length P is the distance between the rear of two consecutive footprints. For men, the formula, $n/P = 144$ gives an approximate relationship between n and P where, n = number of steps per minute and P = pace length in meters. Bernard knows his pace length is 164cm. The formula applies to Bernard's walking. Calculate Bernard's walking speed in kmph.
- a. 23.62** b. 36.4
c. 28.5 d. None
13. Two rifles are fired from the same place at a difference of 11 minutes 45 seconds. But a man who is coming towards the place in a train hears the second sound after 11 minutes. Find the speed of train,
- a. 72 kmph b. 36 kmph
c. 81 kmph d. 108 kmph
14. One bad day, at 7 am I started on my bike at the speed of 36 kmph to meet one of my relatives. After I had travelled some distance, my bike went out of order and I had to stop. After resting for 35 minutes, I returned home on foot at a speed of 14 kmph and reached home at 1 pm. Find the distance from my house at which my bike broke down.
- a. 54 kmph b. 63 kmph
c. 72 kmph **d. None of these**
15. Two sea trawlers left a sea port simultaneously in two mutually perpendicular directions. Half an hour later, the shortest distance between them was 17 km, and another 15 minutes later, one sea trawler was 10.5 km farther from the origin than the other. Find the speed of each sea trawler.
- a. 16kmph, 30kmph** b. 18kmph, 24 kmph
c. 20kmph, 22kmph d. 18kmph, 36 kmph
16. Jaideep travels from Alaska, which is on a highway, to Burgen, which is 60 km from highway. The distance between Alaska and Burgen along a straight line is 34 km. At what point should Jaideep turn from the highway to reach Burgen in the shortest possible time, if his speed along the highway is 10 km/h and 6km/h otherwise.
- a. 30 km away from A
b. 20 km away from A
c. 18 km away from A
d. 15 km away from A
17. Two ships sail in a fog towards each other with the same speed. When they are 4 km apart, the captains decelerate the engines for 4 minutes with a deceleration rate of 0.1 m/s^2 , and then the ships continue sailing with the speeds attained. For what range of values of the initial speed V_0 will the ships avoid collision?
- a. $0 < V_0 < 10 \text{ m/s}$
b. $0 < V_0 < 20 \text{ m/s}$
c. $0 < V_0 < 30 \text{ m/s}$
d. None of these
18. A boat went down the river for a distance of 20km. It then turned back and returned to its starting point, having travelled a total of 7 hours. On its return trip, at a distance of 12 km from the starting point, it encountered a log, which had passed the starting point at the moment at which the boat had started downstream. The downstream speed of the boat is,
- a. 7 kmph b. 13 kmph
c. 16 kmph **d. 10 kmph**
19. Two friends started walking simultaneously from point A and B towards each other. 144 minutes later the distance between them was 20% of the original distance. How many hours does it take the faster walker to cover the distance AB if he needs 8 hours less to travel the distance than his friend (assume all times to be in whole numbers and in hours)?
- a. 3 hrs b. 6 hrs
c. 12 hrs **d. 4 hrs**

TIME AND WORK

Concept and Formulae

- If A can do a piece of work in n days, then
A's 1 day's work = $\frac{1}{n}$.
- If A's 1 day's work = $\frac{1}{n}$, then A can finish the work in n days.
- If A is thrice as good a workman as B, then:
Ratio of work done by A and B = 3 : 1.
Ratio of times taken by A and B to finish a work = 1 : 3.

Pipes And Cisterns

Important Facts And Formulae

- Inlet:** A pipe connected with a tank or a cistern or a reservoir, that fills it, is known as an inlet.
Outlet: A pipe connected with a tank or a cistern or a reservoir, emptying it, is known as an outlet.
- If a pipe can fill a tank in x hours, then :
part filled in 1 hour = $1/x$
 - If a pipe can empty a full tank in y hours, then :
part emptied in 1 hour = $1/y$
 - If a pipe can fill a tank in x hours and another pipe can empty the full tank in y hours (where $y > x$), then on opening both the pipes, the net part filled in 1 hour = $(1/x) - (1/y)$
 - If a pipe can fill a tank in x hours and another pipe can empty the full tank in y hours (where $x > y$), then on opening both the pipes, the net part emptied in 1 hour = $(1/y) - (1/x)$

Example 1:

Worker A takes 8 hours to do a job. Worker B takes 10 hours to do the same job. How long should it take both A and B, working together but independently, to do the same job?

Solution:

$$\text{A's 1 hour's work} = \frac{1}{8},$$

$$\text{B's 1 hour's work} = \frac{1}{10}.$$

$$(\text{A} + \text{B})\text{'s 1 hour's work} = \left[\frac{1}{8} + \frac{1}{10} \right] = \frac{9}{40}.$$

$$\begin{aligned} \therefore \text{Both A and B will finish the work in } & \frac{40}{9} \\ & = 4\frac{4}{9} \text{ days.} \end{aligned}$$

Example 2:

A and B together can complete a piece of work in 4 days. If A alone can complete the same work in 12 days, in how many days can B alone complete that work?

Solution:

$$(\text{A} + \text{B})\text{'s 1 day's work} = \frac{1}{4},$$

$$\text{A's 1 Day's work} = \frac{1}{12}.$$

$$\therefore \text{B's 1 day's work} = \left[\frac{1}{4} - \frac{1}{12} \right] = \frac{1}{6}.$$

B alone can complete the work in 6 days.

Example 3:

A Can do a piece of work in 7 days of 9 hours each and B can do it in 6 days of 7 hours each. How long will they take to do it, working together $8\frac{2}{5}$ hours a day?

Solution:

A can complete the work in $(7 \times 9) = 63$ hours.

B can complete the work in $(6 \times 7) = 42$ hours.

$$\therefore \text{A's 1 hour's work} = \frac{1}{63}$$

$$\text{and B's 1 hour work} = \frac{1}{42}.$$

$$(\text{A} + \text{B})\text{'s 1 hour's work} = \left[\frac{1}{63} + \frac{1}{42} \right] = \frac{5}{126}.$$

$$\therefore \text{Both will finish the work in } \left[\frac{126}{5} \right] \text{ hrs.}$$

Number of days of $8\frac{2}{5}$ hrs each

$$= \left[\frac{126}{5} \times \frac{5}{42} \right] = 3 \text{ days.}$$

Example 4:

A and B can do piece of work in 18 days; B and C can do it in 24 days; A and C can do it in 36 days. In how many days will A, B and C finish it, working together and separately?

Solution:

$$(\text{A} + \text{B})\text{'s 1 days work} = \frac{1}{18}$$

$$(\text{B} + \text{C})\text{'s 1 day's work} = \frac{1}{24}$$

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

$$\text{Adding, we get : } 2(A + B + C)'s\ 1\ day's\ work = \frac{1}{18} + \frac{1}{24} + \frac{1}{36} = \frac{9}{72} = \frac{1}{8}.$$

$$\therefore (A + B + C)'s\ 1\ day's\ work = \frac{1}{16}$$

Thus, A, B and C together can finish the work in 16 days.

Now, A's 1 day's work = [(A + B + C)'s 1 day's work] - [(B + C)'s 1 day's work]

$$= \left[\frac{1}{16} - \frac{1}{24} \right] = \frac{1}{48}$$

\therefore A alone can finish the work in 48 days.

Similarly, B's 1 day's work

$$= \left[\frac{1}{16} - \frac{1}{36} \right] = \frac{5}{144}$$

B alone can finish the work in $\frac{144}{5}$

$$= 28\frac{4}{5}\ \text{days.}$$

$$\text{And, C's 1 day's work} = \left[\frac{1}{16} - \frac{1}{18} \right] = \frac{1}{144}$$

\therefore C alone can finish the work in 144 days.

Example 5:

A is twice as good a workman as B and together they finish a piece of work in 18 days. In how many days will A alone finish the work?

Solution:

(A's 1 day's work) : (B's 1 day's Work) = 2 : 1

$$(A + B)'s\ 1\ day's\ work = \frac{1}{18}$$

Divide $\frac{1}{18}$ in the ratio 2 : 1.

$$\therefore A's\ 1\ day's\ work = \left[\frac{1}{18} \times \frac{2}{3} \right] = \frac{1}{27}$$

Example 6:

A can do certain job in 12 days. B is 60% more efficient than A. How many days does B alone take to do the same job?

Solution:

Ratio of times taken by A and B = 160 : 100 = 8 : 5.

Suppose B alone takes x days to do the job. Then,

$$8:5 :: 12 : x = 8x = 5 \times 12 = x = 7\frac{1}{2}\ \text{days.}$$

Example 7:

A job can be completed by A in 10 hours while B takes only 8 hours to complete the same job. A and B start the work together but A leaves the job after 3 hours. B works alone for 1 hour and then C joins B. Together they complete the job in 1 hour. If C were to work alone, how long would he take to complete the job?

Solution:

Time taken by A to complete the job : 10 hours

Work done by A in one hour: 1/10

Time taken by B to complete the job ; 8 hours

Work done by B in 1 hr ; 1/8

Work done by A and B together in 1hr;

$$(1/10) + (1/8) = 9/40$$

Work done by A and B together in 3 hr; 27/40

Work done by B in next 1 hr; 1/8

Work completed when C joins;

$$(27/40) + (1/8) = 32/40 = 4/5$$

Therefore, the left over work will be ; 1 - (4/5) = 1/5

Work done by B and C together in 1 day; 1/5

Work done by C alone in 1 day ; (1/5) - (1/8) = 3/40

Time taken by C to complete the job ;

$$40/3 = 13\frac{1}{3}\ \text{hrs}$$

Example 8:

5 men or 8 women can complete a work in 4 days. The same work can be completed the by 3 women and 4 boys in 8 days. How long would 1 man, 2 women and 8 boys take to complete the same work?

Solution:

Work done by 5 men in 4 days : 1

Work done by 5 men in 1 day : 1/4

Work done by 1 man in 1 day : (1/5) (1/4) : 1/20

Work done by 8 women in 4 days : 1

Work done by 8 women in 1 day : 1/4

Work done by 1 women in 1 day :

$$(1/8) \times (1/4) : 1/32$$

Work done by 3 woman & 4 boys in 8 days : 1

Work done by 3 woman and 4 boys in 1 days : 1/8

Work done by 3 woman in 1 days : 3/32

Work done by 4 boys in 1 days : 1/8 - 3/32 = 1/128

Work done by 1 man, 2 women and 8 boys (1/20) + (2 x 1/32) + (8 x 1/128)

$$(1/20) + (1/16) + (1/16)$$

$$(4+5+5)/80 = 14/80 = 7/40$$

Number of days required to complete the job:

$$40/7\ \text{days}$$

Example 9:

Two pipes A and B can fill a tank in 36 hours and 46 hours respectively. If both the pipes are opened simultaneously, how much time will be taken to fill the tank?

Solution:

Part filled by A in 1 hour = $(1/36)$;

Part filled by B in 1 hour = $(1/45)$;

Part filled by (A + B) In 1 hour = $(1/36) + (1/45) = (9/180) = (1/20)$

Hence, both the pipes together will fill the tank in 20 hours.

Example 10:

Two pipes can fill a tank in 10 hours and 12 hours respectively while a third, pipe empties the full tank in 20 hours. If all the three pipes operate simultaneously, in how much time will the tank be filled?

Solution:

Net part filled In 1 hour

= $(1/10) + (1/12) - (1/20) = (8/60) = (2/15)$.

The tank will be full in $15/2$ hrs = 7 hrs 30 min.

Example 11:

If two pipes function simultaneously, the reservoir will be filled in 12 hours. One pipe fills the reservoir 10 hours faster than the other. How many hours does it take the second pipe to fill the reservoir?

Solution:

Let the reservoir be filled by first pipe in x hours.

Then, second pipe fill it in $(x+10)$ hrs.

Therefore $(1/x) + (1/(x+10)) = (1/12)$

$\Rightarrow (x+10+x)/(x(x+10)) = (1/12)$.

$\Rightarrow x^2 - 14x - 120 = 0 \Rightarrow (x-20)(x+6) = 0$

$\Rightarrow x = 20$ [neglecting the negative value of x]

So, the second pipe will take $(20+10)$ hrs (i.e) 30 hours to fill the reservoir

Example 12:

A cistern has two taps which fill it in 12 minutes and 15 minutes respectively. There is also a waste pipe in the cistern. When all the 3 are opened, the empty cistern is full in 20 minutes. How long will the waste pipe take to empty the full cistern?

Solution:

Work done by the waste pipe in 1 min

= $(1/20) - (1/12) + (1/15)$

= $-1/10$ [negative sign means emptying]

Therefore the waste pipe will empty the full cistern in 10 min

Example 13:

An electric pump can fill a tank in 3 hours. Because of a leak in, the tank it took $3(1/2)$ hours to fill the tank. If the tank is full, how much time will the leak take to empty it?

Solution:

Work done by the leak in 1 hour

= $(1/3) - (1/(7/2))$

= $(1/3) - (2/7) = (1/21)$.

The leak will empty the tank in 21 hours.

Example 14:

Two pipes can fill a cistern in 14 hours and 16 hours respectively. The pipes are opened simultaneously and it is found that due to leakage in the bottom it took 32 minutes more to fill the cistern. When the cistern is full, in what time will the leak empty it?

Solution:

Work done by the two pipes in 1 hour = $(1/14) + (1/16) = (15/112)$.

Time taken by these pipes to fill the tank = $(112/15)$ hrs = 7 hrs 28 min.

Due to leakage, time taken

= 7 hrs 28 min + 32 min = 8 hrs

Work done by (two pipes + leak) in 1 hour

= $(1/8)$.

Work done by the leak in 1 hour

= $(15/112) - (1/8) = (1/112)$.

Leak will empty the full cistern in 112 hours.

Example 15:

Two pipes A and B can fill a tank in 36 min. and 45 min. respectively. A water pipe C can empty the tank in 30 min. First A and B are opened. after 7 min, C is also opened. In how much time, the tank is full?

Solution:

Part filled in 7 min

= $7 * ((1/36) + (1/45)) = (7/20)$.

Remaining part = $(1 - (7/20)) = (13/20)$.

Net part filled in 1 min. when A, B and C are opened = $(1/36) + (1/45) - (1/30) = (1/60)$.

Now, $(1/60)$ part is filled in one minute.

$(13/20)$ part is filled in $(60 * (13/20)) = 39$ min

Questionnaire for Practice

- A & B can do a piece of work in 48 days; B & C can do it in 60 days; A & C can do it in 80 days. In how many days will A, B & C finish it, all working together?

a. 40 b. 35 c. 20 d. None of these

2. A can do a piece of work in 7 days of 10 hours each & B can do it in 5 days of 12 hours each. How many days will they take to do it, working together $\frac{70}{13}$ hours a day?
a. 4 **b. 6** c. 10 d. 12
3. 24 men can complete a work in 36 days. Twelve days after they started working, 8 men joined them. How many days will all of them take to finish the remaining work?
a. 16 b. 20 c..18 d. None of these
4. If 20 men or 36 boys can do a piece of work in 15 days, then 50 men and 30 boys together will do twice the work in how many days?
a. 6 b. 7 c. 8 **d. 9**
5. X can do a piece of work in 40 days. He works at it for 8 days and then Y finished it in 16 days. How many days will they together take to complete the work?
a. 13 1/3 b.15 c. 20 d.56
6. Kim can do a work in 3 days while David can do the same work in 2 days. Both of them finish the work together and get Rs 150 what is the share of Kim?
a. 50 **b. 60** c. 90 d. 75
7. An engineer undertakes a project to build a road 15 km long in 300 days and employs 46 men for the purpose. After 100 days, he finds only 2.5 km of the road has been completed. Find the number of extra men he must employ to finish the work in time?
a. 46 b. 23 **c. 69** d. 115
8. Working independently, Tina can do a certain job in 12 hours. Working independently, Ann can do the same job in 9 hours. If Tina works independently at the job for 8 hours and then Ann works independently, how many hours will it take Ann to complete the remainder of the jobs?
a. 2/3 b. $\frac{3}{4}$ c. 1 **d. 3**
9. Two pipes can fill a cistern in 14 and 16 hours respectively. The pipes are opened simultaneously and it is found that due to leakage. 32 minutes extra is taken to fill the cistern. In what time will the leak empty the full tank?
a. 114 **b. 112** c. 100 d. 82
10. A can do a certain job in 120 days and B can do the same in 150 days. They together worked for 20 days. Then B leaves and A continues for 20 days. Thereafter C joins and the work is completed in 32 days. In how many days will C alone completed work
a. 80 b. 100 c. 90 **d. 120**
11. 50*35 m fishing pond was dug by 250 workers in 18 days. The numbers of days in which a 70 *40m pond having the same depth can be dug by 300 workers is?
a. 20 b. 22 **c. 24** d. 26
12. Ajay, Vijay and Sanjay are employed to do a piece of work for 529/- Ajay and Vijay together are supposed to do 19/23 of the work and Vijay and Sanjay together 8/23 of the work. How much Ajay should be paid?
a. 245 b. 295 c. 300 **d. 345**
13. The tank full petrol in Ajay's motor cycle lasts for 10 days. If he starts using 25% more every day, how many days will the tank full petrol lasts?
a. 6 **b. 8** c. 10 d. 12
14. A and B completed a work together in 5 days. Had A worked at twice the speed and B at half the speed, it would have taken them 4 days to complete the job. A alone does the work in _____ days?
a. 10 b. 20 c. 25 d. 15
15. The Bubna dam has 4 inlets. Through the first 3 inlets, the dam can be filled in 12 minutes. Through the second, the third and the fourth inlet, it can be filled in 15 minutes; and through the first and fourth inlet, in 20 minutes. How much time will it take all the four inlets to fill up the dam?
a. 8 min **b. 10 min**
c. 12 min d. None of these
16. A tank of 3600 m³ capacity is being filled wherein the discharging tap is 20% more faster than the filling tap. hence its takes 12 minutes more to fill the tank than to empty it. Determine the capacity of discharging tap
a. 40 m³/min b. 50 m³/min
c. 60 m³/min d. 80 m³/min