

## Topic: Percentage

### Percentage

#### Points to Remember

1) Y % is expressed as  $\frac{Y}{100}$

2) To find percent of  $\frac{x}{y} = \left( \frac{x}{y} \times 100 \right) \%$

#### Quick Tips and Tricks

##### 1. Prices of Goods

(1) If the price of goods increases by R %, then the **reduction** in consumption so as not to **increase the expenditure** can be calculated using the formula:

$$\left[ \frac{R}{(100 + R)} \times 100 \right] \%$$

(2) If the price of goods decreases by R %, then the increase in consumption so as not to decrease the expenditure can be calculated using the formula:

$$\left[ \frac{R}{(100 - R)} \times 100 \right] \%$$

**2. Numerical on Population:** Population of a city at present is P and it increases at the rate of R% per annum.

**Topic: Percentage**

(1) To find population after n years =  $P \left[ 1 + \frac{R}{100} \right]^n$

----- (After n years population increases, thus  $\left[ 1 + \frac{R}{100} \right]$  is used)

(2) To find population n years ago =  $\frac{P}{\left[ 1 + \frac{R}{100} \right]^n}$

**3. Numerical on Depreciation:** Present value of machine is M, If it depreciates at the rate of R% per annum.

(1) To find value of machine after n years =  $P \left[ 1 - \frac{R}{100} \right]^n$

----- (After n years the value of machine decreases, thus  $\left[ 1 - \frac{R}{100} \right]$  is used)

## Topic: Percentage

(2) To find the value of machine n years ago =  $\frac{P}{\left[1 - \frac{R}{100}\right]^n}$

### Question Variety

Generally 5 types of questions are asked from this chapter. Understanding these concepts will help in solving the problems related to this chapter.

#### 1.1.1) PERCENTAGE FOR COMPARISON:

Percentage helps us to compare between different fractions when the denominator or the total number is different in each case. It is one of the simplest tools for the comparison of data.

Take for example, this table below which shows the marks obtained by a student in 3 different subjects

subject	MarksObtained
History	60
Math	25
English	45

From this data alone, we cannot compare the marks obtained for the various subjects.. Now suppose we have the data of the total marks obtained as follows

Subject	Marks Obtained	Total Marks	Marks Obtained/total marks * 100
---------	----------------	-------------	----------------------------------

## Topic: Percentage

History	60	100	60%
Math	25	25	100%
English	45	90	50%

Now as all the three subjects are represented on a scale of 100, it is easy to compare the marks for the three subjects, and decide which subject has the student scored the maximum in.

### 1.1.2) REPRESENTATIONS OF PERCENTAGES

#### 1) a% of b.

a% of b ( a percent of b) = b% of a

a% of b is represented mathematically as  $(a \times b) / 100$ .

Eg. 24% of 25 =  $[24 \times 25 / 100] = 6$  25% of 24 =  $[(25 \times 24) / 100] = 6$

#### 2) What percentage of a is b

This is represented as  $(b/a \times 100)$

Eg. What percentage of 75 is 25?  $(25/75) \times 100 = 33.33\%$

### 1.1.3) CONVERSIONS

1) To convert a fraction into a percentage

? Multiply and divide by 100.

? Keep the denominator as 100, the numerator you obtain is the required answer.

Take for example

$21/22 = (21/22 \times 100) / 100 = (2100/22) / 100 = 95 \frac{6}{11}\%$

#### 2) To find the fraction equivalent of a percentage

? Divide by 100 (after removing the percentage sign) e.g. )  $11 \frac{3}{8}\% = 91/8 \times 100 = 91/800$

eg)  $25\% = 25/100 = 1/4$

### ILLUSTRATION:

**1. Recently I went to buy a laptop for myself. The dealer said that he has laptops of two companies: HP and Lenevo. He was selling the HP laptop for Rs. 42000 and told me that he will offer me the same at 7/8 of that price while the Lenevo laptop was for Rs. 46000 and he was offering it at**

## Topic: Percentage

7/8<sup>th</sup> of that price. I decided to buy the laptop on which I was getting a better percentage discount. Which one should I buy?

**Solution:**

HP: 7/8 means  $(7 \times 100)/8 = 87.5\%$  means a discount of  $100 - 87.5 = 12.5\%$

LENEVO: 4/5 means  $4 \times 100/5 = 400/5 = 80\%$  means a discount of  $100 - 80 = 20\%$ .

So I should buy the LENEVO laptop.

### 1.1.4) CONCEPT OF CHANGE

There are two types of change

**1. Absolute value change:-** It is the actual change in the quantity. For example, if there are 10 rabbits in the first year and 15 rabbits in the second year, the absolute change in the number of rabbits is 5

**2. Percentage change:-** This can be obtained by calculating the absolute change and dividing it by the initial number of rabbits present e.g. ) percentage change =  $(\text{Absolute value change})/(\text{Original quantity}) \times 100 = 5/10 = 1/2 \times 100 = 50\%$

### 1.1.5) PERCENTAGE CHANGE AND PERCENTAGE POINT CHANGE

If the pass percentage of a class was 75 % in 1991 and 85% in 1992, we can calculate the percentage point change and the percentage change as follows

Percentage point change = Final percentage – Initial percentage =  $85\% - 75\% = 10$

percentage points Percentage change =  $(\text{Final percentage} - \text{Initial percentage})/(\text{Initial percentage}) \times 100 = (85 - 75)/75 \times 100 = 40/3\%$

### 1.1.6) TO INCREASE A NUMBER BY A GIVEN PERCENT

Use the formula:  $(100 + \text{rate})/100$

e.g.) Increase 40 by 20%

Here the rate = 20 Multiply the number by the above formula to get the answer  $40 \times ((100 + 20))/100 = 120 \times 40/100 = 48$ . (We are effectively computing  $(40 + 20/100 \times 40)$ )

It is easier to remember that given the base value =  $x$ , the final value after increase can be found as

20% increase?  $(x + 0.2x = 1.2x)$  30% increase?  $(x + 0.3x = 1.3x)$  5%

increase?  $(x + 0.05x = 1.05x)$

### 1.1.7) TO DECREASE A NUMBER BY A GIVEN PERCENT

Use the formula  $(100 - \text{Rate})/100$

e.g. ) Decrease 40 by 20%

Here the rate = 20. Multiply the number by the above formula to get the answer

## Topic: Percentage

$40 \times ((100 - 20))/100 = 80 \times 40/100 = 32$ . (We are effectively computing  $(40 - 20/100 \times 40)$ )  
It is easier to remember that given the base value =  $x$ , the final value after decrease can be found as

20% decrease?  $0.8 \times (0.8 = 1 - 0.2)$  30% decrease?  $0.7 \times (0.7 = 1 - 0.3)$  5% decrease?  $0.95 \times (0.95 = 1 - 0.05)$

TO FIND THE PERCENTAGE INCREASE OR DECREASE OF A GIVEN NUMBER, WE USE THE CONCEPT OF PERCENTAGE CHANGE AS EXPLAINED ABOVE

1) Percentage Increase =  $(\text{Final Value} - \text{Initial Value}) / (\text{Initial Value}) = (\text{Total Increase}) / (\text{Initial Value}) \times 100\%$

2) Percentage Decrease =  $(\text{Initial Value} - \text{Final Value}) / (\text{Initial Value}) = (\text{Total Decrease}) / (\text{Initial Value}) \times 100\%$

### ILLUSTRATION:

**2. In the IPL match an analysis was done for the two openers of both teams: Delhi Daredevils (DD) and Deccan Chargers (DC). It was found that the two DC openers Gilchrist and Gibbs together scored 20% more than what the two DD openers Sehwag and Gambhir scored. Gambhir scored 30 and Gibbs scored 40. How much percentage less/more did Sehwag score than Gilchrist if Gilchrist scored 80?**

#### Solution:

Say runs scored by Sehwag =  $a$ , Gambhir =  $b$ , Gilchrist =  $c$  and Gibbs =  $d$ .

Then  $(c + d) = 1.2(a + b)$

Also  $b = 30$ ,  $d = 40$ ,  $c = 80$

$80 + 40 = 1.2(a + 30) \Rightarrow 120/1.2 = a + 30 \Rightarrow a = 70$

So Sehwag = 70. So Sehwag scored  $(80 - 70)/80 \times 100 = 10/80 \times 100 = 12.5\%$  less than Gilchrist.

Note: Here we took 80 as the denominator because we need to calculate how much Sehwag scored less "than" Gilchrist. So Gilchrist's score has to be made the denominator as it is the base value we are comparing the difference to.

### 1.1.8) BASIC FORMULA

**a)** If the price of a commodity increases by  $r\%$ , then the reduction in consumption so as to not increase the expenditure is  $r/(100+r) \times 100$ . This formula can also be used to compare incomes between two people.

e.g.) If P's income is  $r\%$  more than Q's income, then Q's income is less than P's income by  $r/(100+r) \times 100$

## Topic: Percentage

b) If the price of a commodity decreases by  $r\%$ , then the increase in consumption so as to not decrease the expenditure is  $\frac{r}{(100-r)} \times 100$ . This formula can also be used to compare incomes between two people.

e.g.) If P's income is  $r\%$  less than Q's income, then Q's income is greater than P's income by  $\frac{r}{(100-r)} \times 100$

c) If there is a consecutive percentage change of  $a\%$  and  $b\%$ , the net change can be calculate as

Net change =  $a + b + \frac{ab}{100}$

ILLUSTRATIONS:

**3. Anil is taking an examination which has two sections A and B. He starts with section A and when he proceeds to section B he realizes that the marks carried for each question has decreased by 40% as compared to section A. How many more questions (in percentage) should he solve in section B as compared to section A if he wants to score same marks in section A and section B?**

**Solution:-**

Given that both sections carry equal marks. Solution: Here marks per question decreases by 40%, so using the formula (b), he should solve  $((\frac{40}{(100-40)}) \times 100)\% = 66.66\%$  more questions in section B if he wants to score same marks.

**4. The petrol prices shot up by 20% due to Iraq War. Amit travels 2000 kms every month and his car gives a mileage of 20 kms per liter. By how many kilometers should he reduce his travel to maintain his expenditure to the previous level.**

**Solution:**

At 20 kms per liter he bought  $2000/20 = 100$  liters of petrol. Now the price the increased by 20%; using formula (a), the consumption has to be reduced by  $(\frac{20}{(100+20)}) \times 100\% = 16.66\%$ .

So, he should reduce his travel by  $(16.66 \times 2000)/100 = 333.33$  kms to maintain the same expenditure level.

**5. After receiving two successive pay hikes if Ashish's salary becomes  $\frac{15}{8}$  of his initial salary. By how much percent was the salary raised the first time if the second raise was twice as high (in %) as the first?**

**a) 15 % b) 20% c) 25% d) 30%**

## Topic: Percentage

### Solution:

We can solve this question using two approaches:

#### Approach 1: (conventional)

Suppose first raise was of  $a\%$  then the second raise =  $2a\%$  Now, using formula (c)  
net change:  $a + b + \frac{ab}{100}$   $a + 2a + \frac{2a^2}{100}$

Now if initial salary was  $X$ , then  $\% \text{ change} = \frac{(15X) - X}{X} \times 100 = 7/8 \times 100$

So  $3a + \frac{2a^2}{100} = 700/8$  solving we get  $a = 25\%$ . So the first raise was of  $25\%$ .

#### Approach 2: (Recommended)

In these types of questions it is quicker to go from the answer options. First calculate the net change ?  $\frac{(15X) - X}{X} \times 100 = 700/8\% = 87.5\%$

Start with option (b)  $20\%$  First year raise  $20\%$  next year raise =  $40\%$  Net change (use formula (c))  $20 + 20 + \frac{400}{100} = 44\%$  With option (d) Net change =  $30 + 60 + \frac{1800}{100} = 108\%$  This way, you will get option (c)  $25\%$  is the correct option.

## Ex-1

### Type 1: Numerical on numbers

**Q 1.** The difference between two numbers is 1550. If  $8\%$  of one number is  $10\%$  of the other number, then find the two numbers

- a. 4973, 6523
- b. 5450, 7000
- c. 6200, 7750
- d. 6500, 4950

**Q 2.** Two numbers  $P$  and  $Q$  are such that, the sum of  $2\%$  of  $P$  and Sum of  $2\%$  of  $Q$  is two-third of the sum of  $2\%$  of  $P$  and  $6\%$  of  $Q$ . Find the ratio of  $P$  and  $Q$ .

- a.  $2 : 5$
- b.  $3 : 1$
- c.  $1 : 4$
- d.  $5 : 1$



## Topic: Percentage

**Q 3.** 50 % of a number is 18 less than two-third of that number. Find the number.

- a. 123
- b. 119
- c. 115
- d. 108

**Q 4.** When 35 is subtracted from a number; it reduces to its 80 %. Find the four-fifth of that number.

- a. 140
- b. 125
- c. 137
- d. 129

### Type 2: Numerical on Depreciation

**Q 5.** The value of lathe machine depreciates at the rate of 10 % per annum. If the cost of machine at present is Rs. 160,000, then what will be its worth after 2 years?

- a. Rs. 122,365
- b. Rs. 153,680
- c. Rs. 129,600
- d. Rs. 119,900

**Q 6.** The value of Xerox machine depreciates at the rate of 10 % per annum. If the cost of machine at present is Rs. 75,000 then what was the value of machine before 2 years?

- a. Rs. 90,000
- b. Rs. 92,600
- c. Rs. 93,800
- d. Rs. 95,000

### Type 3: Numerical on Population

**Q 7.** The current birth rate per thousand is 30, whereas corresponding death rate is 10 per thousand. Find the net growth rate in terms of population increase in percent.

- a. 1.5 %
- b. 2 %

**Topic: Percentage**

c. 2.5 %

d. 3%

**Q 8.** The total population of a city is 6500. The number of males and females increases by 5 % and 10 % respectively and consequently the population becomes 7000. Find the number of males in the village.

a. 4000

b. 3000

c. 3500

d. 2950

**Q 9.** The present population of a country is 10 crores. If it rises to 17.28 crores during next 3 years, then find uniform rate of growth in population.

a. 20 %

b. 30 %

c. 40 %

d. 60 %

**Q 10.** The population of different trees in a field increased by 10 % in first year, increased by 8 % in second year and decreased by 10 % in third year. If at present the number of trees is 26730, then find the number of trees in the beginning.

a. 30000

b. 25000

c. 27000

d. 27865

## Topic: Percentage

### Type 4: Numerical on Prices of Goods

**Q 11.** The price of diesel increases by 50 %. Find by how much percent a truck owner must reduce his consumption in order to maintain the same budget?

- a. 11.11 %
- b. 22.22 %
- c. 33.33 %
- d. 44.44 %

**Q 12.** The price of rice falls by 15 %. By what percentage a person can increase the consumption of rice so that his overall budget does not change?

- a. 10.74 %
- b. 17.64 %
- c. 20.46 %
- d. 21.90 %

### Type 5: Numericals based on Marks of students

**Q 13.** In an examination, P scored 30 % marks and failed by 15 marks. Q scored 40 % marks and obtained 35 marks more than those required to pass. Find the pass percentage.

- a. 30 %
- b. 33 %
- c. 35 %
- d. 40 %

## Topic: Percentage

**Q 14.** In a science examination, the average obtained by entire class was 80 marks. If 10 % of students scored 92 marks and 20 % of students scored 90 marks, then what was the average of remaining students?

- a. 65.32
- b. 70.56
- c. 75.43
- d. 77.96

**Q 15.** A student attempts x number of questions. He answers 15 correctly out of first 20 questions and of the remaining questions, he answers  $\frac{1}{3}$  correctly. If all questions have same credit and the student gets 50 % marks, then find the value of x.

- a. 30
- b. 35
- c. 45
- d. 50

## Solution

1. Correct Option: (c)

Let two numbers be x and y.

**It is given that, 8 % of x = 10 % of y**

Therefore,

$$x = \frac{10}{8} y = \frac{5}{4} y$$

## Topic: Percentage

Difference between two numbers  $(x - y) = 1550$

Substituting the value of  $x$ , we get

$$\frac{5}{4} - y = 1550$$

$$\frac{y}{4} = 1550$$

$$y = 1550 \times 4 = 6200$$

$$x = \frac{5}{4} \times 6200 = 7750$$

**The two numbers whose difference is 1550 are 6200 and 7750.**

2. Correct Option: (b)

The sum of 2 % of P and Sum of 2% of Q is two-third of the sum of 2 % of P and 6 % of Q.

This sentence means that,

$$2\% \text{ of } P + 2\% \text{ of } Q = \frac{2}{3} (2\% \text{ of } P + 6\% \text{ of } Q)$$

$$\frac{2}{100} P + \frac{2}{100} Q = \frac{2}{3} \left( \frac{2}{100} P + \frac{6}{100} Q \right)$$

$$\frac{1}{50} P + \frac{1}{50} Q = \left( \frac{1}{75} P + \frac{1}{25} Q \right)$$

$$\left[ \frac{1}{50} - \frac{1}{75} \right] P = \left[ \frac{1}{25} - \frac{1}{50} \right] Q$$

$$\frac{1}{150} P = \frac{1}{50} Q$$

$$\frac{P}{Q} = \frac{150}{50} = \frac{3}{1}$$

## Topic: Percentage

### Alternate method

$$\frac{2}{100}P + \frac{2}{100}Q = \frac{2}{3} \left( \frac{2}{100}P + \frac{6}{100}Q \right)$$

Simply eliminate 100 from both the sides, we get

$$3(2P + 2Q) = 2(2P + 6Q)$$

$$6P + 6Q = 4P + 12Q$$

$$6P - 4P = 12Q - 6Q$$

$$2P = 6Q$$

$$\frac{P}{Q} = \frac{6}{2} = \frac{3}{1}$$

3. Correct Option: (d)

### Let the number be x.

It is given that, **50 % of a number is 18, less than two-third of that number.** This means that,

$$\frac{2}{3}x - (50\% \text{ of } x) = 18$$

$$\frac{2}{3}x - \frac{50}{100}x = 18$$

$$50x = 5400$$

$$x = 108$$

**The number is 108**

4. Correct Option: (a)

We are given, 35 when subtracted from a number, reduces to its 80 %.

Therefore,

Let the number be x.

$$x - 35 = \frac{80}{100}x$$

Solving, we get the value of x

## Topic: Percentage

$$x - \frac{80}{100}x = 35$$

$$x = \frac{35 \times 100}{20} \quad x = 175$$

Now, we are asked to find the four-fifth of that number i.e x

$$\frac{4}{5}x = \frac{4}{5} \times 175 = 140$$

**Hence, the number is 140.**

5. Correct Option: (c)

**Hint:** Present value of machine is M. If the cost depreciates at the rate of R% per annum, then

$$\text{The value of machine after } n \text{ years} = P \left[ 1 - \frac{R}{100} \right]^n$$

In this numerical, we are given the present cost of the machine i.e 160,000 and the cost decreases by 10 % per annum. We have to find the cost of this machine after 2 years. We can solve this numerical in a minute, if we know the trick used to solve such numerical related to depreciation of cost.

**Given:**

Present amount = Rs. 1,60,000

Rate of depreciation = 10 %

Substituting the given values, we get

$$\text{The value of machine after } n \text{ years} = P \left[ 1 - \frac{R}{100} \right]^n$$

$$= 1,60,000 \times \left[ 1 - \frac{10}{100} \right]^2$$

$$= \text{Rs. } 129,600$$

**After 2 years, the cost of machine = Rs. 129,600**

## Topic: Percentage

6. Correct Option: (b)

**Hint:** Present value of machine is M. If the cost depreciates at the rate of R% per annum, then

$$\text{The value of machine } n \text{ years ago} = \frac{P}{\left[1 - \frac{R}{100}\right]^n}$$

**Given:**

Cost of Xerox machine at present = Rs. 75,000

Rate of depreciation = 10 %

Substituting the given values, we get

$$\text{The value of machine } n \text{ years ago} = \frac{P}{\left[1 - \frac{R}{100}\right]^n}$$

$$= \frac{75000}{\left[1 - \frac{10}{100}\right]^2}$$

=Rs.92592.60

Therefore, the value of machine before 2 years = Rs. 92592.60

**But this value is not available in the given options. Hence, select the nearby value to the amount of Rs. 92592.60. Among the listed options option (b) is the correct answer.**

7. Correct Option: (b)

**We are given that,**

1) Current birth rate per thousand is 30



## Topic: Percentage

2) Corresponding death rate is 10 per thousand

Hence, net growth on 1000 = Current birth rate - death rate  
= 30 - 10 = 20

We are asked to find, **net growth rate in terms of population increase in percent (which means net growth on 100)**

$$\text{Net worth on 100} = \frac{\text{Net worth on 1000}}{1000} \times 100$$

$$\text{Net worth on 100} = \frac{20}{1000} \times 100 = 2\%$$

**8. Correct Option: (b)**

**We are given that,**

- 1) Total population of city = 6500
- 2) Increase in male and female population = 5 % & 10% respectively.
- 3) Final population of city = 7000

Hence,

Let's assume that number of males = x

Number of female = 6500 - x

**Therefore, after increase in 5 % male and 10 % female, the population becomes 7000**

**5 % male +10 % female = Difference between new and original population**

$$\frac{5}{100}x + \frac{10}{100}(6500 - x) = 7000 - 6500$$

$$5x + 65000 - 10x = 50000$$

$$5x = 15000$$

$$x = 3000$$

**Number of males = 3000**

**Number of females = 3500**

## Topic: Percentage

9. Correct Option: (a)

Hint:

$$\text{To find population after } n \text{ years} = P \left[ 1 + \frac{R}{100} \right]^n$$

Here, we know

1) Present population of country = 10 crores

2) After 3 years, population of country = 17.28 crores

To find: Rate of growth R%

After 3 years, the population is 17.28 crores. Therefore,

$$P \left[ 1 + \frac{R}{100} \right]^n = 17.28$$

$$10 \left[ 1 + \frac{R}{100} \right]^3 = 17.28$$

$$\left[ 1 + \frac{R}{100} \right]^3 = \frac{17.28}{10} = \frac{1728}{1000} = \left[ \frac{12}{10} \right]^3$$

$$\left[ 1 + \frac{R}{100} \right] = \frac{12}{10}$$

$$\left[ 1 + \frac{R}{100} \right] = 1 + \frac{2}{10}$$

$$\frac{R}{100} = \frac{2}{10}$$

$$R = 20\%$$

Rate of growth in population = 20 %

10. Correct Option: (b)

Hint:

To find population n years ago =

P

## Topic: Percentage

$$\left[ 1 + \frac{R}{100} \right]^n$$

We are given, number of trees increased in

- 1) First year = increased by 10 %
- 2) Second year = increased by 8 %
- 3) Third year = decreased by 10 %

Therefore, to find number of trees in the beginning use the trick.

$$\begin{aligned} \text{Population } n \text{ years ago} &= \frac{26730}{\left[ 1 + \frac{10}{100} \right] \left[ 1 + \frac{8}{100} \right] \left[ 1 + \frac{10}{100} \right]} \\ &= 26730 \times \frac{10}{11} \times \frac{25}{27} \times \frac{10}{9} \\ &= 25000 \end{aligned}$$

### 11. Correct Option: (c)

**Hint:** If the price of goods increases by R %, then the **reduction** in consumption so as not to **increase the expenditure** can be calculated using the formula:

$$\begin{aligned} &\left[ \frac{R}{(100 + R)} \times 100 \right] \% \\ &= \left[ \frac{50}{(100 + 50)} \times 100 \right] \% \\ &= 33.33 \% \end{aligned}$$

**The truck owner must reduce its consumption in order to maintain the same budget by 33.33 %**

## Topic: Percentage

### 12. Correct Option: (b)

**Hint:** If the price of goods decreases by R %, then the increase in consumption so as not to decrease the expenditure can be calculated using the formula:

$$\left[ \frac{R}{(100 - R)} \times 100 \right] \%$$

**Using this trick, we can easily solve such type of numerical.**

The price of rice falls by 15 %, therefore substituting this value, we get

$$\left[ \frac{15}{(100 - 15)} \times 100 \right] \% = 17.64 \%$$

**Therefore, the person can increase his consumption by 17.64 %**

### 13. Correct Option: (b)

We have to calculate the pass percentage.

**In case of P:** He scores 30 % out of total marks, but fails by 15 marks. Hence, the simple equation formed is **(30 % of x) + 15**

**In case of Q:** He scores 40 % out of total marks, but gets 35 marks more than required to pass. Hence, the simple equation formed is **(40 % of x) – 35**

1) First calculate total marks.

Let total marks be x.

$$(30 \% \text{ of } x) + 15 = (40 \% \text{ of } x) - 35$$

$$\frac{30}{100} \times x + 15 = \frac{40}{100} \times x - 35$$

$$35 + 15 = \frac{40}{100} \times x - \frac{30}{100} \times x$$

$$50 = \frac{1}{10} x$$

$$x = 500$$

Total marks = 500

## Topic: Percentage

2) As we know the total marks, we can calculate the passing.

$$\text{Passing Marks} = \frac{30}{100} \times x + 15$$

$$\text{Passing Marks} = \frac{30}{100} \times 500 + 15 = 165$$

Therefore,

$$\text{Passing Percentage} = \frac{165}{500} \times 100 = 33\%$$

**Required pass percentage = 33 %**

**14. Correct Option: (c)**

**Here, we do not know the number of students in the class. So let the number of students be 100 and the required average is  $y$ .**

- 1) 10 % of students scored 92 marks
- 2) 20 % of students scored 90 marks
- 3) Therefore, from 100 students, the remaining students are 70
- 4) Average obtained by 100 students = 80 marks

**Considering the given parameters, form the equation.**

$$(10 \times 92) + (20 \times 90) + (70 \times y) = (100 \times 80)$$

$$70y = 8000 - (1800 + 920)$$

$$y = 75.43$$

The average of remaining students = 75.43

**15. Correct Option: (d)**

**Given:**

- 1) Student attempts  $x$  questions.
- 2) Out of 20 questions he answers 15 correctly and of  $(x - 20)$  questions he answered  $\frac{1}{3}$  correctly.
- 3) The student gets 50 % marks.

Therefore,

**Topic: Percentage**

$$15 + \frac{1}{3}(x - 20) = 50\% \text{ of } x$$

$$15 + \frac{1}{3}(x - 20) = \frac{50}{100} \times x$$

$$15 + \frac{1}{3}(x - 20) = \frac{x}{2}$$

$$90 + 2(x - 20) = 3x$$

Solving this equation, we get

$$x = 50$$

**Hence, the number of question attempted by the students = 50**