# **PERCENTAGE** (प्रतिशत)

#### CONCEPT-01

#### (Successive Percentage Change/ क्रमिक प्रतिशत परिवर्तन)

**Ex:** Length and breadth of a rectangle are increased by 10% and 20% respectively. What will be the percentage increase in the area of the rectangle?

एक आयत की लंबाई और चौड़ाई 10% तथा 20% तक बढ़ जाती है। इसके क्षेत्रफल में प्रतिशत वृद्धि ज्ञात कीजिए?

Sol:

By Successive percentage formula %increase = 10 + 20 + By Ratio Method

$$10\% = \frac{+1}{10} \text{ and } 20\% = \frac{+1}{5}$$

$$L : 10 \quad 11$$

$$B : 5 \quad 6$$
Area = L x B \quad 50 \quad 66
$$25 \quad 33$$
% increase =  $\frac{8}{-100} \times 100 = 32\%$ 

**Ex:** The number was first increased by 40% and then decreased by 25%, again increased by 15% and then decreased by 20%. What is the net increase or decrease percent in the number?

एक संख्या में पहले 40% की वृद्धि हुई और फिर 25% की कमी हुई, फिर से 15% की वृद्धि हुई और फिर 20% की कमी हुई। संख्या में कुल वृद्धि या कमी के प्रतिशत को ज्ञात करें।

#### Sol:

इस प्रकार के प्रश्नों को successive percentage के formula से solve करना lengthy होता है इसलिए ratio method का प्रयोग करें।

$$40\% = \frac{+2}{5}, 25\% = \frac{-1}{4}, 15\% = \frac{+3}{20}, 20\% = \frac{-1}{5}$$

$$5 \qquad : \qquad 7$$

$$4 \qquad : \qquad 3$$

$$10 \qquad : \qquad 23$$

$$\frac{5}{500} \qquad 483$$
% decrease =  $\frac{17}{500} \times 100\% = 3.4\%$ 

#### CONCEPT-02

#### (Series Method)

Series method का प्रयोग हम तय करते है जब किसी initial value में successive परिवर्तन करके कोई final value प्राप्त करते है, initial अथवा final में से कोई एक value दी गई होती है और दूसरी पूछी जाती है।

**Ex:-** The population of a city is 25000. If it is increasing at the rate of 10% every year. Then the population of the city after two years is ?

एक शहर की जनसंख्या 25000 है। यदि यह प्रति वर्ष 10% की दर से बढ़ रहा है तो दो साल बाद शहर की आबादी क्या होगी?

Sol:

$$10\% = \frac{1}{10} + \frac{11}{10}$$

Population after 2 year

$$= 25000 \times \frac{11}{10} \times \frac{11}{10} = 30250$$

#### CONCEPT-03

If a number is increased by x% and then it is reduced by x% again, then percentage change will be a decrease of  $\frac{x^2}{3\%}$ 

यदि कोई संख्या x% बढ़ाई जाती है और फिर x% घटायी जाती है, तो प्रतिशत

**Ex:-** X's salary was increased by 20% and then decreased by 20%. What is the change in salary ?

X के वेतन में 20% की वृद्धि हुई और फिर 20% की कमी हुई, वेतन में क्या परिवर्तन हुआ?

Sol:

$$\frac{x^2}{100}$$
% =  $\frac{20 \times 20}{100}$  = 4 % decrease

#### **CONCEPT-04**

#### (Application of AB-rule)

Study the below statements carefully. नीचे दिए गए कथनों को ध्यान पूर्वक पढ़ें।

If the cost of an article is increased by A%, then how the consumption of article, expenditure remains same



is given by

यदि किसी वस्तु की कीमत में A% की वृद्धि की जाती है, तो वस्तु की खपत को कितना कम किया जाए, ताकि व्यय समान रहे

'OR'

If the income of a man is A% more than another man, then income of another man is less in comparison to the 1st man by

यदि एक आदमी की आय दूसरे आदमी की तुलना में A% अधिक है, तो दूसरे आदमी की आय पहले आदमी की तुलना में कितनी कम है?

If the cost of an article is decreased by A%, then the increase in consumption of articles to maintain the expenditure will be?

यदि किसी वस्तु की लागत में A% की कमी की जाती है, तो व्यय को बनाए रखने के लिए वस्तु की खपत में वृद्धि होगी?

'OR'

If 'x' is A% less than 'y'. then y is what % more than 'x' by Required%= (increase)

यदि 'x', 'y' से A% कम है। तो y 'x' से कितने प्रतिशत अधिक है।

In such kinds of questions, apply AB - Rule.

इस प्रकार के प्रश्नों में AB Rule का प्रयोग करें।

Ex:- A's income is 25% more than income of B. Income of B is how much percent less than income of A? A की आय B की आय से 25% अधिक है। B की आय A की आर से कितने

A का आय B का आय स 25% आधक हा B का आय A का आर स कितन प्रतिशत कम है?

Sol:

$$25\% = \frac{+1}{4} = \frac{-1}{5} \times 100$$

 $\rightarrow$  Income of B is 20% less than A.

Ex: Rita's Income is 15% less than Richa's income. What percent is Richa's income more than Rita's income? रीता की आय ऋचा की आय से 15% कम है। ऋचा की आय 'की आय से कितने प्रतिशत अधिक है?

HINTS:

 $15\% = \frac{3}{20} = \frac{+3}{17} \times 100 = \frac{300}{17}\%$ 

CONCEPT-05

# (Price, Consumption & Expenditure)

Price × consumption = Expenditure  $\rightarrow$  If Expenditure is constant then Price  $\propto$  1/Consumption

**Ex:-** The price of rice increases from Rs.45 per kg to Rs.63 per kg. If its consumption is reduced by 20%, then

by what percent does the expenditure on it increase ? चावल की कीमत 45 रुपये प्रति किलो से बढ़कर 63 रुपये प्रति किलो हो गई है। यदि इसकी खपत में 20% की कमी कर दी जाए, तो इस पर होने वाले व्यय में कितने प्रतिशत की वृद्धि होगी ?

<b>Sol:</b> $20\% = \frac{-1}{5}$			
Price	:	45	63
Or		5	7
Cons	:	5	4
$Exp. = P \ge C:$	25	28	
$\frac{3}{25} \times 100 = 12\%$			

CONCEPT-06

(Income, Expenditure & Savings)

Income = Expenditure + Savings

Ex:- A man spends 2/3rd of his income. If his income increase by 14% and the expenditure increases by 20%, then the percentage increase in his savings will be एक व्यक्ति अपनी आय का भाग खर्च करता है। यदि उसकी आय में 14% वृद्धि हो जाती है और व्यय में 20% की वृद्धि हो जाती है, तो व्यक्ति की बचत मे कितने प्रतिशत वृद्धि होगी?

Sol:				
Income		Exp.		Savings
300		200		100
342	-	240	=	102
		$=\frac{2}{100}$	×100 _	2%

CONCEPT-07

# (Population Based Questions)

**Ex:-** The total number of males and females in a town is 70,000. If the number of males increased by 6% and that of the females increased by 4%, then the total numbers of males and females in the town would become 73520. What is the difference between the number of males and females in the town, in the beginning?

एक कस्बे में पुरूषों और महिलाओं की कुल संख्या 70,000 है। यदि पुरुषों की संख्या में 6% और महिलाओं की संख्या में 4% की वृद्धि कर दी जाए, तो कस्वे में पुरूषों और महिलाओं की कुल संख्या 73520 हो जाएगी। कस्बे में पुरूषों और महिलाओं की आरंभिक संख्या में क्या अंतर है?



## Sol:

Given that, 35 unit = 70,000 Then required difference, (1817) unit = 2000

#### Method-02

2% of M + 4% of M + 4% of W = 3520

2% of M + 2800 = 3520

2% of M = 720

M = 36000 & W = 34000

Difference = 2000

#### CONCEPT-08

#### (Venn Diagram)

Venn Diagram in case of two elements/दो तत्वों के मामले में वेन आरेख



Where/जहाँ

- X = number of elements that belong to set A only
- X = उन तत्वों की संख्या जो केवल सेट A से संबंधित हैं
- Y = number of elements that belong to set B only
- Y = उन तत्वों की संख्या जो केवल सेट B से संबंधित हैं
- Z = number of elements that belong to set A and B both

Z = उन तत्वों की संख्या जो सेट A और B दोनों से संबंधित हैं

W = number of elements that belong to none of the sets A or B

W = उन तत्वों की संख्या जो किसी भी सेट A या B से संबंधित नहीं हैं Tip: Always start filling values in the Venn diagram from the innermost value.

वेन आरेख में हमेशा अंतरतम भाग से मान भरना शुरू करें।

# CONCEPT-09

#### (Question Based on Election)

**Ex:-** In an election between two candidates, one got 60%

of the total valid votes, 90% of the votes were valid. If the total number of votes was 12000, then what was the number of valid votes that the other candidate got? दो उम्मीदवारों के बीच एक चुनाव में, एक को कुल 60% विधिमान्य मत प्राप्त हुए, 90% मत विधिमान्य थे। यदि कुल मतों की संख्या 12000 थी, तो दूसरे उम्मीदवार को मिले विधिमान्य मतों की संख्या क्या थी? Sol:

Method-1 (Chain Method) Total Vote = 12000

Valid Vote =  $12000 \times \frac{90}{100} \times 10800 = 10800$ 

Number of valid votes that the other candidate got दूसरे उम्मीदवार को मिले वैध वोटों की संख्या

$$= 10800 \times \frac{40}{100} \times 4320 = 4320$$

Method-2 (Series Method)

Number of valid votes that the other candidate got

$$= 12000 \times \frac{90}{100} \times \frac{40}{100} = 4320$$

CONCEPT-11

#### (Questions Based on Commission)

**Ex:-** A company gives 12% commission to his salesman on total sales and 1% bonus on the sales over 15000. If the salesman deposits 52,350 after deducting his commission from total sales. Find

एक कंपनी अपने सेल्समैन को कुल विक्री पर 12% कमीशन देती है और 15000 से अधिक की बिक्री पर 1% बोनस देती है, यदि विक्रेता कुल विक्री से अपने कमीशन में कटौती के बाद रु. 52,350 जमा करता है, ज्ञात कीजिए

- (i) Total sales./कुल बिक्री
- (ii) Total commission of salesman./सेल्समैन का कुल कमीशन

#### Sol:

Salesman को यदि 15000 पर भी 1% अर्थात 150 मिल जाये तो उसे कुल sale पर 13% Commission मिल जायेगा।

- (i) Total sales =  $\frac{(52350 150)}{87} \times 100 = 60000$
- (ii) Total commission of salesman
  - = 12% of 15000 + 13% of 45000
  - = 1800 + 5850 = 7650

# **10 MCQ QUESTIONS**

- Q 1. If the word PHOTOGRAPH is spelt with 'F' in place of 'PH', then what would be the percentage reduction in the number of letters?
  - (a) 25%
  - (b) 10%
  - (c) 20%
  - (d) 18%
- Q 2. A number is first increased by and then is decreased by 15% to get 238. What is 37.5% Q 7. of that number?
  - (a) 150
  - (b) 75
  - (c) 120
  - (d) 90
- Q 3. The average salary of male employees in a firm was 5200 and that of females was 4200. The mean salary of all the employees was 5000. What is the percentage of female employees?
  - (a) 80%
  - (b) 20%
  - (c) 40%
  - (d) 30%
- Q4. A man's annual income has increased by 5 lakhs but the tax on income that he has to pay has reduced from 12% to 10%. He now pays 10000 more income tax. What is his increased income (in lakhs)?
  - (a) 20
  - (b) 25
  - (c) 15
  - (d) 10
- Q 5. In a village 60% votes were cast in an election. A and B were the contestants. A won by 600 votes. If B had got 40% more votes, there would have been a tie between them. Find the number of recognized voters in the village.
  - (a) 4500
  - (b) 2800
  - (c) 3500
  - (d) 3600

- Q 6. If an electricity bill is paid before the due date, one gets a reduction of 4% on the amount of the bill. By paying the bill before the due date a person got a reduction of 13. The amount of his electricity bill was
  - (a) 125
  - (b) 225
  - (c) 325
  - (d) 425
  - If 25% of a number is subtracted from a second number, the second number reduces to its five- sixths. What is the ratio of the first number to the second number?
    - (a) 1:3
    - (b) 2:3
    - (c) 3:2
    - (d) Data inadequate
- Q8. A man gave 40% of the amount he had to Rohan. Rohan in turn gave one-fourth of what he received from Aman to Sahil. After paying 200 to the taxi driver out of the amount he got from Rohan, Sahil now has 600 left with him. How much amount did Aman have?
  - (a) 4000
  - (b) 8000
  - (c) 12,000
  - (d) Data inadequate

**Directions (Questions 9 to 10):** Each of the questions given below consists of a statement and/or a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statement(s) is/are sufficient to answer the question. Read both the statements and

Give answer (a) if the data in statement I alone are sufficient to answer the question while the data in statement II alone are not sufficient to answer the question;

Give answer (b) if the data in statement II alone are sufficient to answer the question while the data in statement I alone are not sufficient to answer the question;

Give answer (c) if the data either in statement I or in statement II alone are sufficient to answer the question;

Give answer (d) if the data even in both statements I

and II together are not sufficient to answer the question; Give answer (e) if the data in both statements I and II together are necessary to answer the question.

#### What percentage of families in the city have Q 9. telephones?

- (i) 50% of the families of the city possess television.
- (ii) 30% of the television owners of the city have telephones.

# Q 10. If a certain factory has filled 120 orders, then what percent of the total number of orders has been filled?

- (i) The total number of orders on file is 300.
- (ii) The number of orders that the factory has already filled represents two-fifths of the total number of orders.

# **SOLUTION**

## 1. (c)

Photograph is changed to photograph So Initial letters = 10 Final letters = 8

: decrease =  $\frac{2}{10} \times 100 = 20\%$ 

# 2. (d)

Let number = ×

Increase =  $16\frac{2}{10}\%x = \frac{1}{6}x$  $\therefore$  New number =  $x + \frac{x}{6} = \frac{x}{6}$  $\frac{7}{6}x - \frac{15}{100} \times \frac{7}{6}x = 238$  $\frac{7}{6}x\left[1-\frac{15}{100}\right]=238$  $\frac{7}{6} \times \frac{17}{20} = 238$  $\frac{119X}{238}$  = 238 120  $\therefore x = \frac{238 \times 120}{119} = 240$ Now 37.5% of x =  $\frac{37.5}{100} \times 240 = \frac{3}{8} \times 240 = 90$ 3. (b)

Let male employee = xFemale employee = y

$$\therefore \frac{5200x + 4200y}{x + y} = 5000$$

IAS KGS

5200x + 4200y = 5000 (x + y)5200x + 4200y = 5000x + 5000y5200x - 5000x = 5000y - 4200y200x= 800y

= 4y

	x = 4y
Let	y = k
	x = 4k
	Total= 5k

Female = 
$$\frac{k}{5k} \times 100 = 20\%$$

### 4. (b)

Let original income = x lakh New income = x + 5 $(x + 5) \times 10\% - x \times 12\% = 0.1$  $(10000 = 0.1 \, \text{lakh})$  $(x + 5) \times 0.1 - 0.12x = 0.1$ 0.1x + 0.5 - 0.12x = 0.10.02x = 0.4

$$X = \frac{0.4}{.02} = \frac{4}{2} \times 10 = 20 \text{ lakh}$$

.. Increased income = 20 + 5 = 25 lakh

#### 5. (c)

Let the number of recognized voters in the village be . A won election by votes = 600B got 40% more votes For candidate B 40% = 300

$$100\% = \frac{300}{40} \times 100 = 750$$

Votes got by B = 750.: Votes got by A = 750 + 600 = 1350 According to the question, Number of votes cost in election 60% of

 $\frac{60x}{100} = 2100$  $x = \frac{2100 \times 100}{60} = 3500$ 

#### 6. (c)

Let the amount of the bill be x.

Then, 4% of x  $\Rightarrow = \frac{4}{100}x = 13 \Rightarrow x = \frac{13 \times 100}{4} = ₹ 325$ 7. (b)

Let the numbers be x and y.

Then, 
$$y - 25\%$$
 of  $x = \frac{5}{6}y = y - \frac{5}{6} = \frac{25}{100}x$ 

$$\frac{y}{6} = \frac{x}{4} = \frac{x}{y} = \frac{4}{6} = \frac{2}{3}$$

# 8. (b)

Let the amount with Aman Rs x.

Then, amount received by Sahil =  $\frac{1}{4}$  of 40% of  $\gtrless$  x = 10% of  $\gtrless$  x  $\therefore$  10% of x = 600 + 200

 $\Rightarrow \frac{10}{100} = 800 \text{ x} = 800 \times 10 = 8000.$ 

# 9. (e)

Let the total number of families be x. Then, from I and II, we have Number of families which have telephones

$$= 30\% \text{ of } 50\% \text{ of } x = \left(\frac{30}{100} \times \frac{50}{100} \times x\right)$$
$$= \frac{15}{100} x = 15\% \text{ of } x.$$

Required percentage = 15%

So, both I and II are required to answer the question. Correct answer is (e)  $\$ 

#### 10. (c)

From I, we have

Required percentage = 
$$\left(\frac{120}{300} \times 100\right)\% = 40\%$$

Thus, I alone give the answer. From II, we have: Required percentage

$$=\left(\frac{2}{5}x\times\frac{1}{x}\times100\right)\%40\%.$$

So, I alone as well as II alone give the answer. Correct answer is (c).

# 3 KHAN SIR 🍽

