



Sahi Prep Hai Toh Life Set Hai

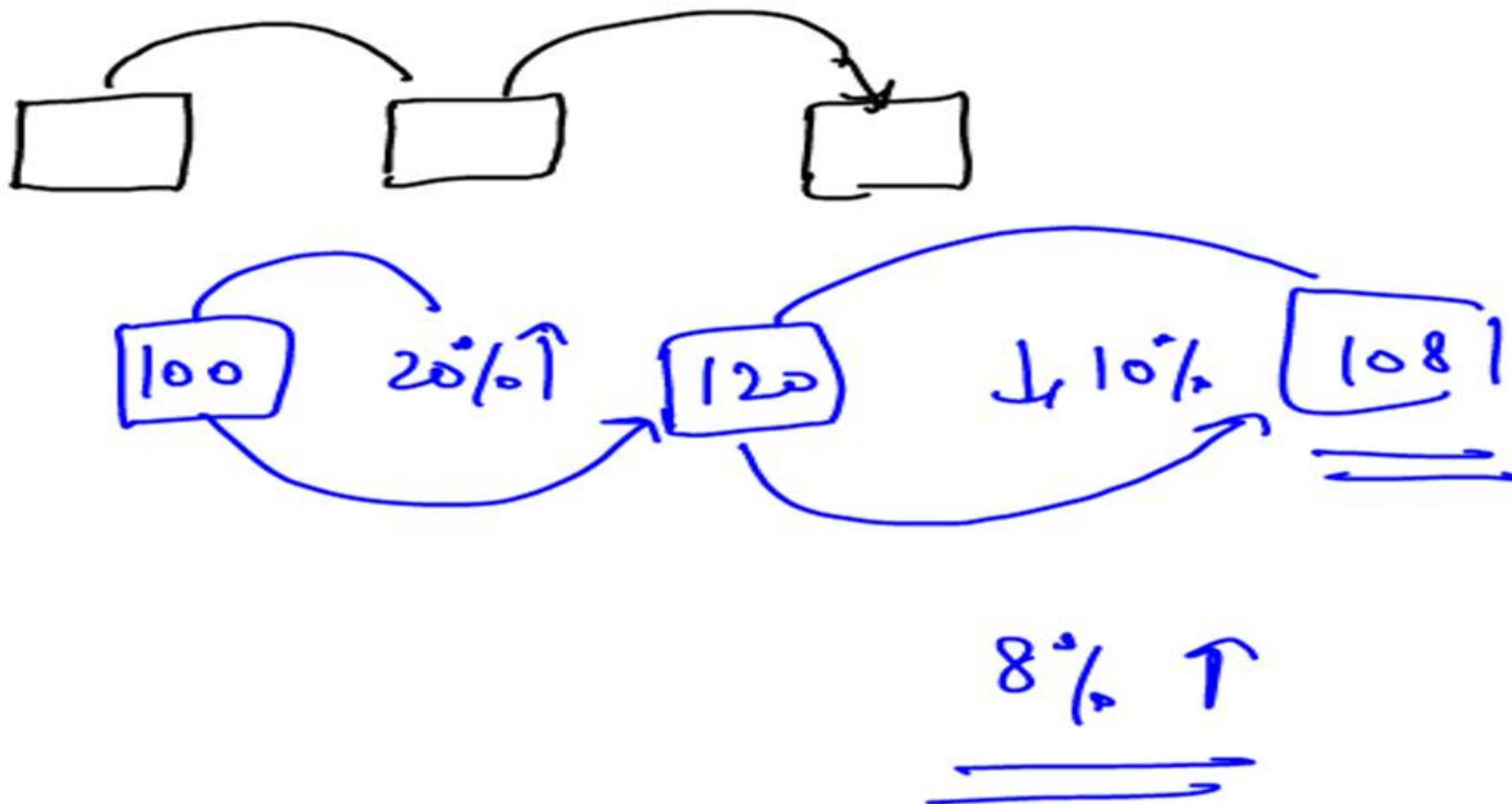
PERCENTAGE

Part-2

Agenda

- * Successive % change → (54-58) min
- * Distribution → (12-14) min
- * Election → (20-22) min

SUCCESSIVE PERCENTAGE CHANGE



Eg. A's salary is first increased by 20% and then it is decreased by 30%. What is the net % change in his salary?

$\uparrow 20\%$ $\downarrow 30\%$

Solⁿ

100 120 84

16% decrease

Examples on Successive % Change:

↑ increase

100 (i) $\overset{130}{30\% \uparrow}$

156 $20\% \uparrow$

$56\% \uparrow$

↓ decrease

100 (ii) $\overset{130}{30\% \uparrow}$

104 $20\% \downarrow$

$4\% \uparrow$

100 (iii) $\overset{70}{30\% \downarrow}$

84 $20\% \uparrow$

$16\% \downarrow$

100 (iv) $\overset{70}{30\% \downarrow}$

56 $20\% \downarrow$

$44\% \downarrow$

100 (v) $\overset{80}{20\% \downarrow}$

104 $30\% \uparrow$

$4\% \uparrow$

In successive % change questions order is not important.
 As you can see in (ii) & (v) part the final answer is same
 because only the order of the value has changed.

| | | | |
|---|------|--------------|--------------|
| { | (ii) | <u>30% ↑</u> | <u>20% ↓</u> |
| | (v) | <u>20% ↓</u> | <u>30% ↑</u> |

SUCCESSIVE % CHANGE FORMULA

If there are 2 changes of $X\%$ and $Y\%$, overall change :

$$X + Y + \frac{X \cdot Y}{100}$$

↑ increase +ve
↓ decrease -ve

eg ↑ 30% ↓ 20%

$$\rightarrow 30 - 20 + \frac{30(-20)}{100}$$

$$10 - 6 = \underline{\underline{4\% \text{ increase}}}$$

(i) $\uparrow 10\%$ $\downarrow 20\%$

$$10 - 20 \frac{10(-20)}{100} = -12 \quad \underline{\underline{12\% \downarrow}}$$

(ii) $\downarrow 20\%$ $\downarrow 30\%$

$$-20 - 30 \frac{(-20)(-30)}{100} = -44 \quad \underline{\underline{44\% \downarrow}}$$

(iii) $\uparrow 25\%$ $\downarrow 16\%$

$$25 - 16 \frac{25(-16)}{100}$$

$$9 - 4 = \underline{\underline{5\% \uparrow}}$$

$L \uparrow 30\%$ $B \downarrow 20\%$

Area??

Q4 (a).

If the length of the rectangle is increased by 30% and its breadth is decreased by 20%, then find the percentage change in its area?

Try by any method, we will discuss several approaches of this in class.

1st

By

Assuming value

$$L \times B = A$$

$$10 \times 10 = 100$$

$$13 \times 8 = 104$$

4% increase

IInd

By using Successive % change

L B Area $\uparrow 30$ $\downarrow 20\%$
 $\uparrow 30\%$ $\downarrow 20\%$

$$30 - 20 = \frac{30(-20)}{100} = 4\% \text{ increase}$$

Reason :-

$$L \times B = LB$$

$$\begin{aligned} \uparrow 30\% & \rightarrow 1.3LB \\ \downarrow 20\% & = L(0.8B) \end{aligned}$$

$$\uparrow 30\% \downarrow 20\% \rightarrow \underline{(1.3L)(0.8B)}$$

IIIrd

$$L \cdot B = \text{Area (LB)}$$

$$(1.34) (0.83) = (1.04) \text{ LB}$$

$$\frac{0.04 \text{ LB}}{\text{LB}} \times 100$$

$$= \underline{\underline{4\% \text{ increase}}}$$

LIMITATION OF SUCCESSIVE PERCENTAGE FORMULA

1. When there are more than 2 values

$$\boxed{x + y + \frac{xy}{100}}$$

↑ 20%

↑ 30%

↓ 40%

100

120

156

93.6

↓ 6.4%
decrease

$$20 + 30 + \frac{20 \cdot 30}{100}$$

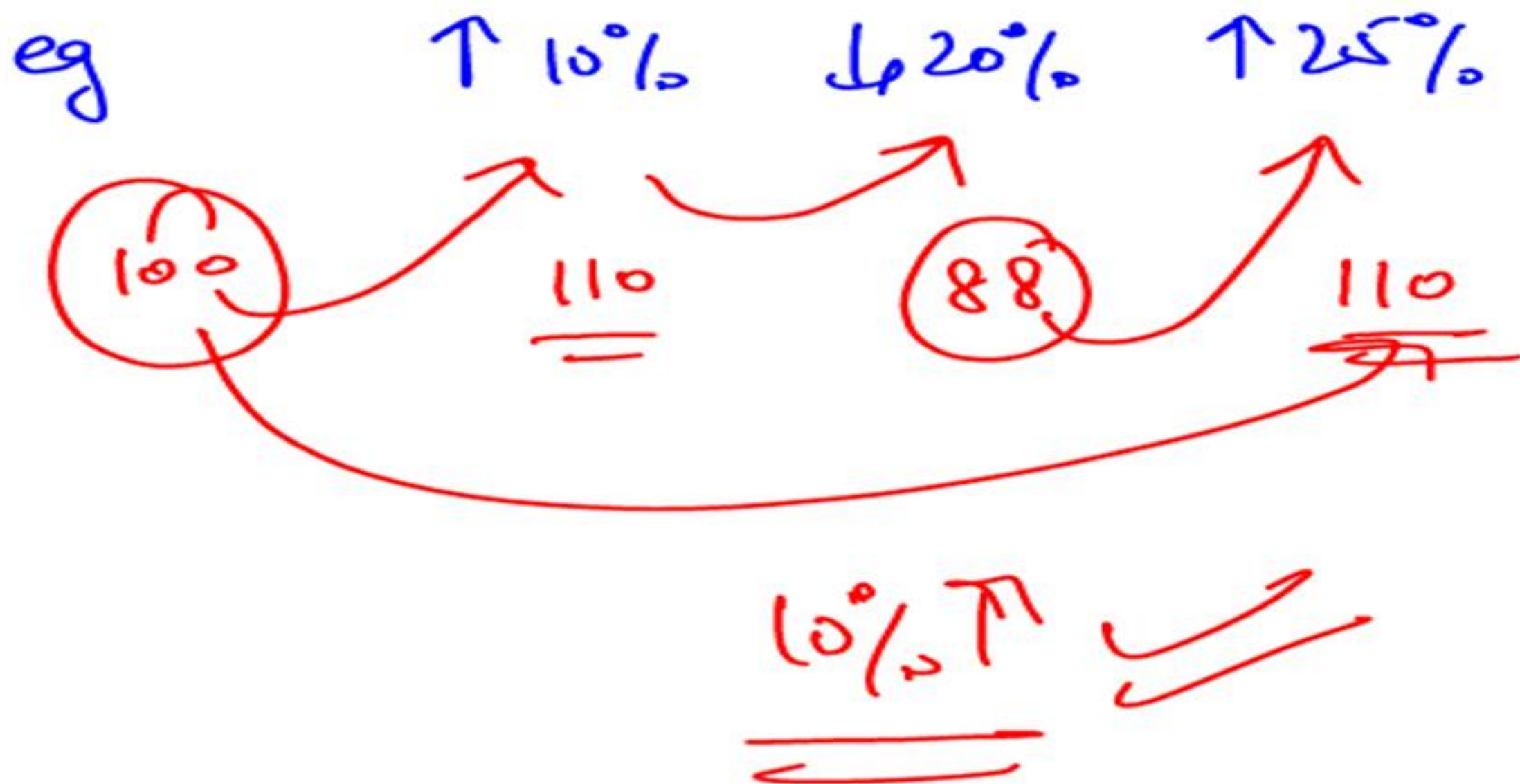
56%

$$56 - 40 = \frac{56(-40)}{100}$$

$$16 - 22.4 = \underline{\underline{-6.4}}$$

Ist

IInd



Eg. If the length, breadth and height of a cuboid are increased by 20%, 30% & 10%. Find % change in its volume?

$$\text{Volume of cuboid} = L \cdot B \cdot H$$

$$20 + 30 + \frac{20 \cdot 30}{100} = 56$$

$$56 + 10 + \frac{56 \cdot 10}{100} = 71.6$$

$$\begin{array}{rclcl} L & \cdot & B & \cdot & H & = & \text{Volume} \\ 10 & & 10 & & 10 & = & 1000 \\ 12 & \cdot & 13 & \cdot & 11 & = & 1716 \end{array}$$

$$\frac{716}{1000} \times 100 = 71.6\%$$

2. When there are multiple values that too in fraction.

eg

$$\uparrow 16\frac{2}{3}\%$$

$$\downarrow 20\%$$

$$\uparrow 11\frac{1}{9}\%$$

$$16\frac{2}{3}\% \left(\frac{1}{6}\right)$$

$$20\% \left(\frac{1}{5}\right)$$

$$11\frac{1}{9}\% \left(\frac{1}{9}\right)$$

$$\begin{array}{c} \cancel{3} \cancel{6} \\ \cancel{5} \\ 9 \\ \hline 27 \end{array}$$

$$7$$

$$\cancel{4} 2$$

$$\cancel{10} 2 \\ \hline 28$$

$$\frac{1}{27} \times 100$$

$$3\frac{19}{27}\% \uparrow$$

Eg. $\downarrow 11\frac{1}{9}\%$

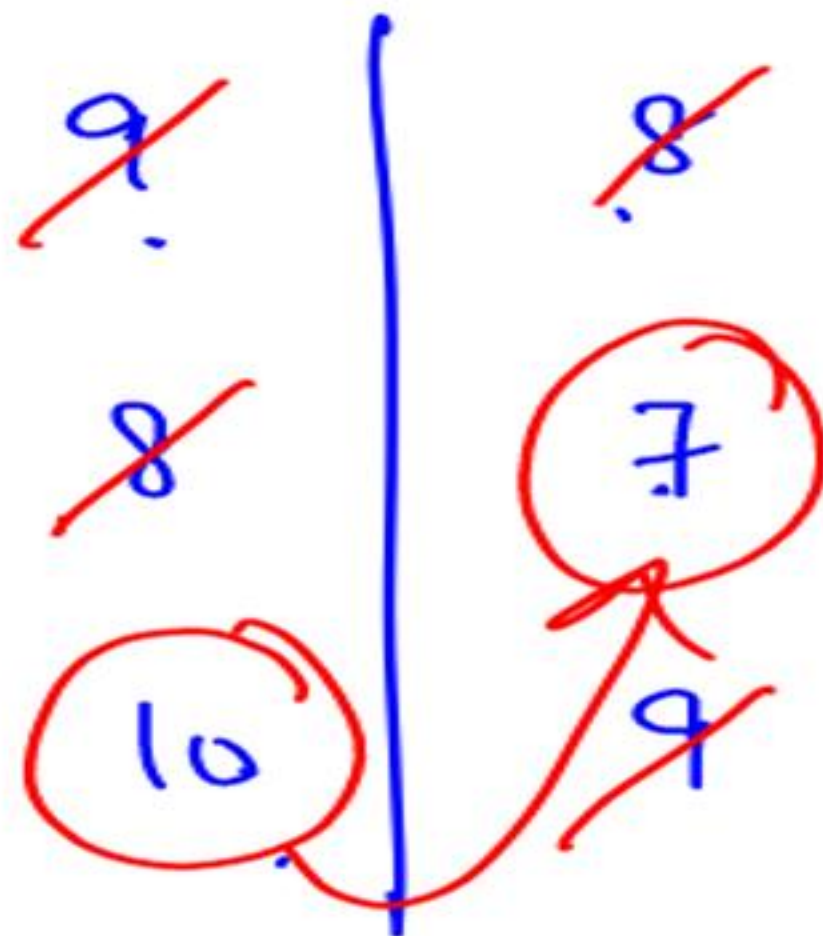
$\downarrow 12\frac{1}{2}\%$

$\downarrow 10\%$

$$11\frac{1}{9} \left(\frac{1}{9} \right)$$

$$12\frac{1}{2} \left(\frac{1}{8} \right)$$

$$10 \left(\frac{1}{10} \right)$$



$$\frac{3}{10} \times 10\%$$

30% ↓

Eg. $\uparrow 25\%$ $\uparrow 40\%$ $\uparrow 30\%$ $\downarrow 20\%$

$$25\% \left(\frac{1}{4} \right)$$

$$40\% \left(\frac{2}{5} \right)$$

$$30\% \left(\frac{3}{10} \right)$$

$$20\% \left(\frac{1}{5} \right)$$

| | |
|--------------|--------------|
| 4 | 5 |
| 5 | 7 |
| 10 | 13 |
| 5 | 4 |
| 50 | 91 |

$$\frac{41}{50} \cdot 100$$

$$\underline{\underline{82\% \uparrow}}$$

Eg. $\uparrow 20\%$

$\uparrow 25\%$

$\uparrow 40\%$

$\downarrow 30\%$

$$20\% \left(\frac{1}{5} \right)$$

$$25\% \left(\frac{1}{4} \right)$$

$$40\% \left(\frac{2}{5} \right)$$

$$30\% \left(\frac{3}{10} \right)$$

$$\left\{ \begin{array}{c|c} 5 & \cancel{3} \\ 2 & \cancel{4} \\ \cancel{8} & 7 \\ 10 & 7 \\ 100 & 147 \end{array} \right.$$

$$\underline{\underline{47\% \uparrow}}$$

L B Area

$\uparrow 20\%$

\downarrow

12.5%

$\frac{1}{5}$

(b) If the length of rectangle is increased by 20% then by what percentage its breadth be reduced so that its area increases only by 12.5%.

Note: There are certain situation where you can use successive % change formula but that is not a good approach.

$$\begin{array}{ccc} L & \times & B \\ \textcircled{5} & & \textcircled{\frac{8}{5}} \\ 6 & & \textcircled{\frac{9}{6}} \\ & & \textcircled{8} \\ & & 9 \end{array}$$

$$\frac{8}{5} \times \frac{3}{2} = \frac{24}{10} = 2.4$$

16 : 15

$$\frac{1}{16} \times 100 = 6.25\%$$



length
↑ 30%

Breadth
↓ 20%

(c) If length of the rectangle is increased by 30% and breadth is decreased by 20%. Find the percentage change in perimeter of the rectangle.

$$\text{Perimeter of Rectangle} = 2(\underline{L+B})$$

| | | |
|--------|--------|--|
| L | B | $\left\{ \begin{array}{l} \text{Perimeter} \\ \underline{\underline{L+B}} \end{array} \right.$ |
| $1.3L$ | $0.8B$ | |

$$\{ 1.3L + 0.8B$$

$$\frac{0.3L - 0.2B}{L+B} \times 100$$

[Can't be det]

Note :- If the question is on
"Som" we can't use
Successive % change
formula.

APPLICATION OF SUCCESSIVE PERCENTAGE CHANGE IN DISCOUNT

DISCOUNTS

Flat 40%

$$\begin{array}{c} \text{MP} \\ 100 - 40 = 60\text{Rs} \end{array}$$

Upto 40%

Max discount $\rightarrow 40\%$

Discount

0% to 40%

USAGE OF SUCCESSIVE % CHANGE IN DISCOUNTS

(i) 30% + 20%

I 100 70 56 44%

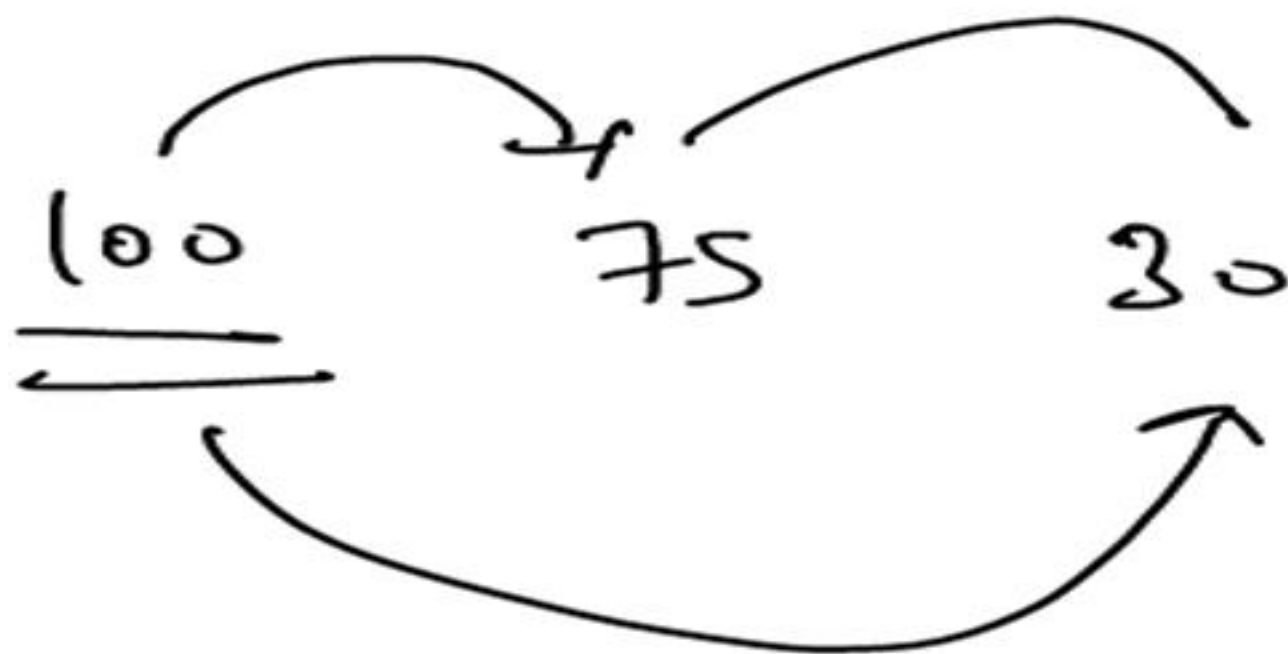
II $-30 \quad -20 \quad \frac{(-30)(-20)}{100}$

-44 discount
44%

III

10 7
5 4
50 28
 $\frac{22}{50} = \frac{22 \cdot 2}{50 \cdot 2} = \frac{44}{100} = 44\%$

(ii) 25% + 60%



75% discount

Eg. Which discount is best among these for the customer?

(i) 30% + 50%

$$-30 - 50 - \frac{30(-50)}{100} \Rightarrow \underline{\underline{65\%}}$$

for customer (ii) 60% + 20%

$$-60 - 20 - \frac{(-60)(-20)}{100} \Rightarrow 68\%$$

(iii) 55% + 25%

$$-55 - 25 - \frac{(-55)(-25)}{100} = 66.25\%$$

(iv) 40% + 40%

$$-40 - 40 - \frac{(-40)(-40)}{100} = 64\%$$

$$\underline{\underline{(ii) > iii > i > iv}}$$

Shortcut:

eg

(i) > iv) iii) > i

$$(i) \quad \underline{20\%} + \underline{28\%}$$

$$(ii) \quad \underline{35\%} + \underline{13\%}$$

$$(iii) \quad \underline{29\%} + \underline{19\%}$$

$$(iv) \quad \underline{16\%} + \underline{32\%}$$

Buy 4 get 1 free.

Find the discount % given by the shopkeeper.

$$\frac{1}{5} \times 100 = \underline{\underline{20\%}}$$

$$\frac{\text{Free}}{\text{Total}} \times 100$$

$$\frac{1}{5} \times 100 = 20\%$$

Buy 7 get 3 Free

find the Discount % $\rightarrow \frac{3}{10} \times 100 = 30\%$

Buy 2 get (2) Free

$$\frac{2}{4} \times 100 = 50\% \text{ discount}$$

20% food

28% clothes

12% Education

Q5(a). A person spends 20% on food, 28% on clothes and 12% on education, if he saves Rs.12000. Find his income.

Income $\rightarrow x$

$$40\% \text{ of } x = 12000$$

$$x = 30000$$



20% Food

Rem 25% Education

Rem 10% clothes

Saves \rightarrow 2700

1st

Income = 100

Food \rightarrow 20

Ed \rightarrow 20

clothes \rightarrow 6

Q5(b). A person spends 20% on food. Of the remaining amount he spends 25% on education, now whatever he is left with he spends 10% on clothes and rest he saves, if his savings are Rs.2700. Find his income.

54 \rightarrow 2700
1 \rightarrow 50

100×50
5000

20% Food

25% Education

10% Clothes

Savings = 2700

$$\frac{90}{100} \left[\frac{75}{100} \left[\frac{80}{100} I \right] \right] = \frac{100}{2400}$$

$$I = 5000$$

$$31\frac{1}{4}\% \rightarrow \left(\frac{5}{16} \right)$$

$$18\frac{2}{11}\% \rightarrow \frac{2}{11}$$

$$33\frac{1}{3}\% = \frac{1}{3}$$

Q5(c). A person spends $31\frac{1}{4}\%$ on food. Of the remaining amount he spends $18\frac{2}{11}\%$ on education, now whatever he is left with he spends on $33\frac{1}{3}\%$ clothes and rest he saves, if his savings are Rs.2400. Find his income.

$$\frac{\cancel{2}}{\cancel{3}} \left[\frac{\cancel{9}^3}{\cancel{11}} \left[\frac{\cancel{11}}{\cancel{16}} I \right] \right] = \frac{\cancel{400}}{\cancel{2400}}$$

$$I = \underline{\underline{6400}}$$

Eg

88% Education

Remaining

76% clothes

Remaining

94% Entertainment

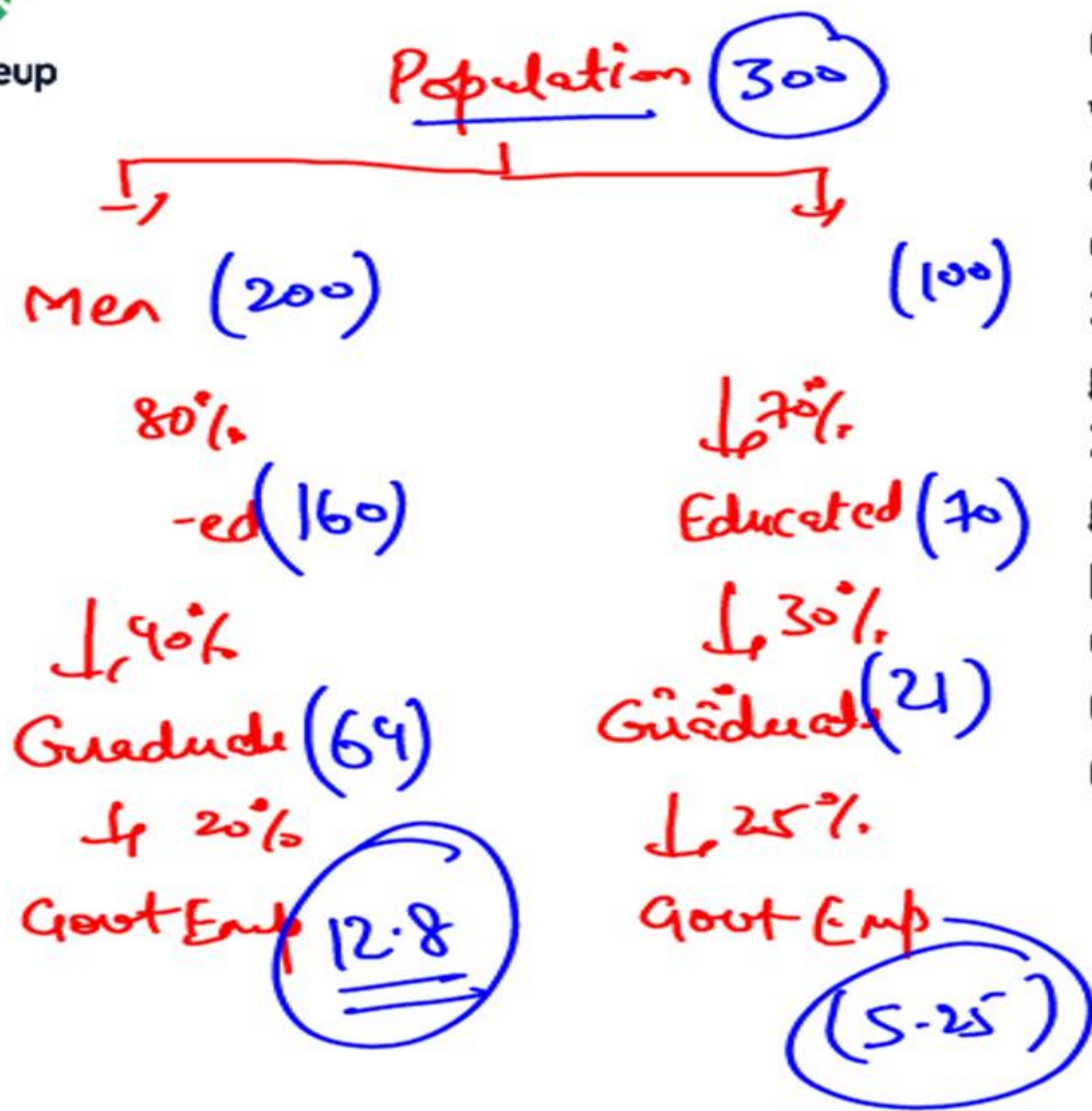
$$\frac{\cancel{4}}{100} \cdot \frac{\cancel{24}}{100} \cdot \frac{12}{100} I = \overset{86436^3}{5184}$$

5184 Rs

Find his Income

$$I = 30,00,000$$

30 lakh



Q5(d). Two-third of the population of village is men and the rest are women. 80% of men and 70% of women are educated. 40% of educated men and 30% of the educated women are graduate. 20% of graduate men and 25% of the graduate women are government employees. Find the percentage (approx.) of government employees in the village.

- (a) 3%
(c) 8%

- ☒ (b) 6%
(d) 1%

2/3

$$\frac{18.05}{200} \times 100 \approx 9\%$$

QUESTION BASED ON ELECTION

Eg. In an election between two candidates, one candidate got 56% votes and won the election by 600 votes. Find the total numbers of voters in the list.

Ans. 5,000

Eg. In an election between two candidates, one candidate got 46% votes and won the election by 600 votes. If 10% of the total votes were declared invalid. Find the total numbers of voters in the list.

Ans. 30,000

Eg. In an election between two candidates, 75% of the voters cast their votes out of which 2% of votes were declared invalid. A candidate got 9261 votes which were 75% of the valid votes. Find the total number of voters enrolled in that election.

A. 16000

B. 16400

C. 16800

D. 18000