

22/4/21

Percentages (Quantitative Aptitude)

* percent \rightarrow per hundred (Represented as %).

Ex: $25\% = \frac{25}{100} = \frac{1}{4}$

Ex: 1) Shyam obtained 325 marks out of 400. His percentage is $= \frac{325}{400} \times 100 = \underline{81.25\%}$

2) A student scored 65% marks. Total marks were 500. His score is $= 65\% \text{ of } 500 = \frac{65}{100} \times 500 = \underline{325 \text{ marks}}$

19) The height of Amitabh 2 yrs ago was 110cm. Now his height is 120cm. Find percentage change in his height.

A: Let current height = h

$$\Rightarrow \% \text{ change in height} = \frac{120 - 110}{110} \times 100$$
$$= \frac{10}{110} \times 100 = \underline{9.09\%}$$

! 20) The salary of Raja is ₹. 9000 per month, salary of Rani is ₹. 10000 per month.

a) what percent is salary of Rani that of Raja?

b) what percent is salary of Raja to that of Rani?

A: a) Salary of Rani to Raja

$$= \frac{10000}{9000} \times 100$$

$$= \underline{111.11\%}$$

b) Salary of Raja to Rani

$$= \frac{9000}{10000} \times 100 = \underline{90\%}$$

9) Ashwin got an increment of 25% on his salary. By what percentage should his salary be decreased to obtain previous salary?

A: Let Ashwin's original salary = "x".

Salary after incrementing 25%

$$\Rightarrow p = x + \frac{25}{100} \times x = \left[x + \frac{x}{4} \right]$$

\Rightarrow To obtain previous salary 'x' again

$$x = p + p \times \frac{x_2}{100} \quad (\text{let some } x_2\% \text{ must be decreased})$$

$$x = x + \frac{x}{4} - \left[x + \frac{x}{4} \right] \frac{x_2}{100}$$

$$\Rightarrow \frac{x}{4} = \frac{5x}{4} \frac{x_2}{100}$$

$$\Rightarrow x_2 = \frac{100}{5} = 20\%$$

\therefore His salary should be decremented by 20% to obtain previous salary.

Shortcut:

$x \uparrow \rightarrow$ decrease %

$$= \left(\frac{x}{100+x} \times 100 \right) \%$$

$$\text{i.e., } = \left(\frac{25}{100+25} \right) \times 100 = \frac{1}{5} \times 100$$

$$= 20\%$$

* percentage increase and percentage decrease:

Ex: price of product changed from

A $\xrightarrow{\text{increased by } 33.33\%}$ B
 x (400) find x ?

$$\Rightarrow 33.33\% = \frac{1}{3}$$

$$\Rightarrow 1 + \frac{1}{3} = \frac{4}{3}$$

$$\Rightarrow x \times \frac{4}{3} = 400$$

$$(x = 300) \Rightarrow \text{original price.}$$

Similarly,

if A $\xrightarrow{\text{decreased by } 33.33\%}$ B
 x (300)

$$\Rightarrow 33.33\% = \frac{1}{3}$$

$$\Rightarrow 1 - \frac{1}{3} = \frac{2}{3}$$

$$\Rightarrow \frac{2}{3} \times x = 300$$

$$\Rightarrow (x = 450) \text{ (original price).}$$

$$Q) x \xrightarrow{+40\% \uparrow} 280$$

$$\Rightarrow x + x \times \frac{40}{100} = 280$$

$$\Rightarrow x + \frac{2}{5}x = 280$$

$$4x = 280 \times 5$$

$$(x = 200)$$

$$(or) x \times \frac{140}{100} = 280 \rightarrow \left(\begin{array}{l} \uparrow \text{ by } 40\% \\ = 100 + 40 = 140 \end{array} \right)$$

$$Q) x \xrightarrow{\ominus 60\% \downarrow} 140$$

$$x - x \times \frac{60}{100} = 140$$

$$\Rightarrow x - \frac{3}{5}x = 140$$

$$2x = 140 \times 5$$

$$(x = 350)$$

$$(or) x \times \frac{40}{100} = 140 \rightarrow \downarrow \text{ by } 60\% \\ \rightarrow 100 - 60 = 40\%$$

$$\rightarrow \frac{1}{2} = 50\%$$

$$\rightarrow \frac{1}{3} = 33.33\%$$

$$\rightarrow \frac{1}{4} = 25\%$$

$$\rightarrow \frac{1}{5} = 20\%$$

$$\rightarrow \frac{1}{6} = 16.66\%$$

$$\rightarrow \frac{1}{7} = 14.28\%$$

$$\rightarrow \frac{1}{8} = 12.5\%$$

$$\rightarrow \frac{1}{9} = 11.11\%$$

$$\rightarrow \frac{1}{11} = 9.09\%$$

$$\rightarrow \frac{1}{12} = 8.33\%$$

Q) $A \xrightarrow{+33.33\%} \text{After 1 year} \xrightarrow{+16.66\%} \text{After 1 year again} (500)$ find x ?

$$\Rightarrow +33.33\% = 1 + \frac{1}{3} = \frac{4}{3}$$

$$\Rightarrow +16.66\% = 1 + \frac{1}{6} = \frac{7}{6}$$

$$\Rightarrow \left(x \times \frac{4}{3}\right) \times \frac{7}{6} = 500$$

$$\Rightarrow x = \frac{500 \times \frac{3}{4} \times \frac{6}{7}}{1} = \frac{250 \times 9}{7} //$$

Shortcut:

$$\% \text{Net} = P_1 + P_2 + \frac{P_1 P_2}{100}$$

If $\% \uparrow$,
put "+"
If $\% \downarrow$,
put "-".

ex:

$$A \xrightarrow{\uparrow 50\%} B \xrightarrow{\downarrow -30\%} C$$

Net percentage change

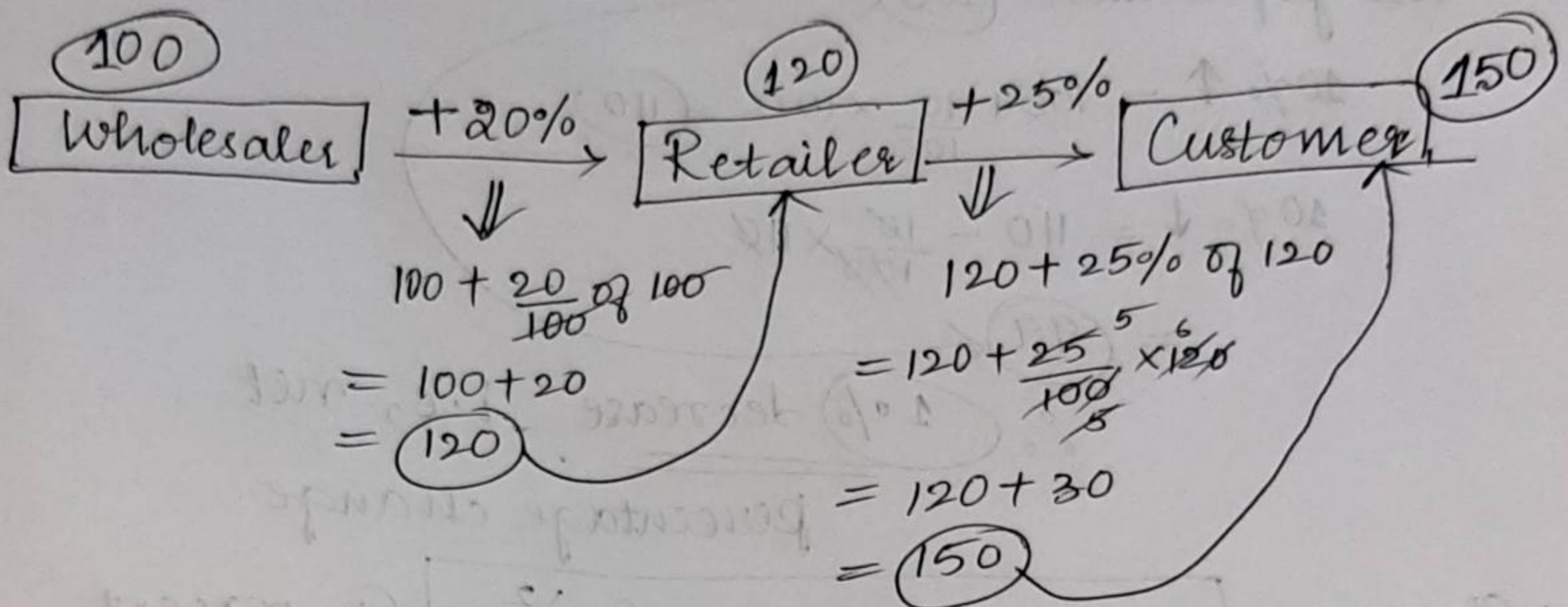
$$= 50 - 30 - \frac{1500}{100} = +5\%$$

i.e., Net increase in 5% of product.

* Successive percentage change

Ex: There is a watch whose manufacturing cost is ₹100. The wholesaler sells it to retailer at 20% profit, the retailer sells it to customer at 25% profit. What is the price at which customer buys the watch?

A:



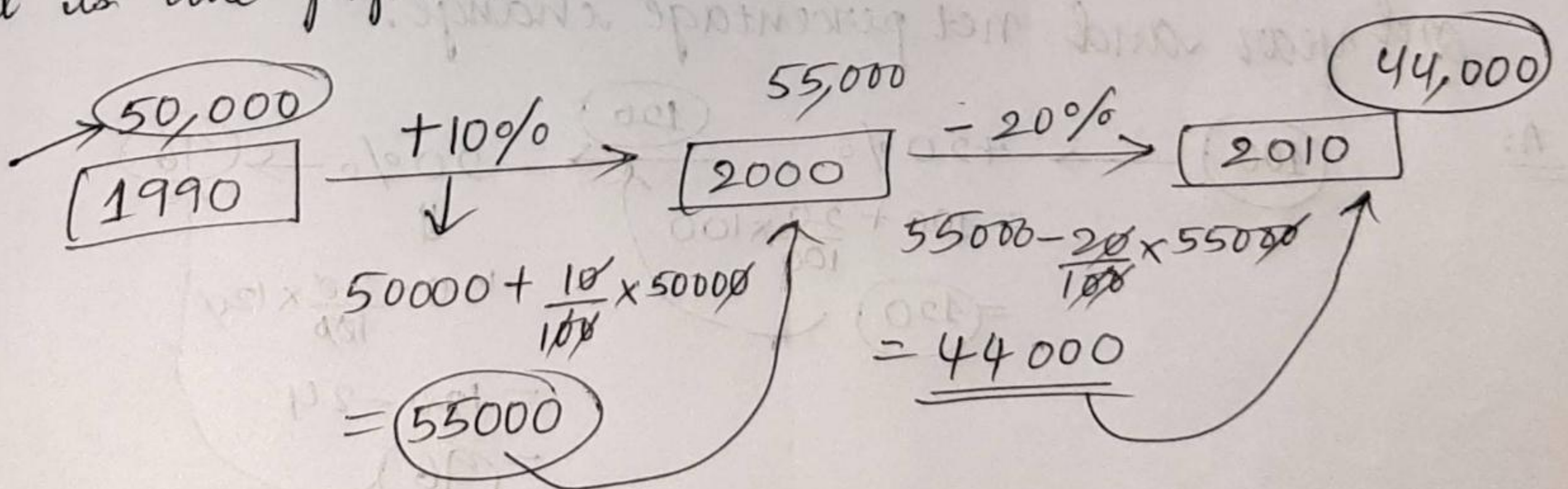
∴ Customer buys at ₹150

Shortcut:

$$100 \left(\frac{100+20}{100} \right) \left(\frac{100+25}{100} \right) = 100 \times \frac{120}{100} \times \frac{125}{100} = 150$$

28) population in 1990 is 50,000 in a city, By 2000 it ↑ed by 10% and from 2000 to 2010, it ↓ed by 20% what is the population in 2010?

A:



$$(or) \quad 50,000 \left(\frac{100+10}{100} \right) \left(\frac{100-20}{100} \right) = 50,000 \left(\frac{110}{100} \right) \left(\frac{80}{100} \right) = 44000 \text{ in } 2010$$

* Increase - Decrease by same percentage

Ex: The population of a town first increases by 10% in 1990 and then decrease by 10% in the year 2000. Find the net percentage change.

A: Let population = 100

$$10\% \uparrow = 100 + \frac{10}{100} \times 100 = 110$$

$$10\% \downarrow = 110 - \frac{10}{100} \times 110$$

$$= 99$$

\therefore 1% decrease i.e., net percentage change.

Shortcut:

$$\text{Net \% change} = \left(\frac{p}{10} \right)^2 \quad (p = \text{percent } \uparrow \text{ or } \downarrow)$$

from above = $\left(\frac{10}{10} \right)^2 = 1\%$

Ex: A pen costs ₹100, after 1 year the price ↑ed by 20% and after 1 year again, price ↓ed by 20%, find price at the end of the 2nd year and net percentage change.

A:

$$\begin{aligned} 100 &\xrightarrow{+20\%} 120 \\ &= 100 + \frac{20}{100} \times 100 \\ &= 120 \\ 120 &\xrightarrow{-20\%} 96 \\ &= 120 - \frac{20}{100} \times 120 \\ &= 120 - 24 \\ &= 96 \end{aligned}$$

\therefore At the end of 2 years, it is sold at

$$₹.96 \Rightarrow ₹.100 - ₹.96 = ₹.4 = 4\% \text{ of } 100$$

\therefore Net change = 4%

(By using shortcut)

$$= \left(\frac{20}{10} \right)^2 = 4\%$$