

APTITUDE MAHA MARATHON

15/01/2022

①. PERCENTAGES, SI & CI

PROFIT & LOSS, PARTNERSHIPS:

Q. 50% of $(x-4)$ = 30% of $(x+4)$, then what % is 4?

$$\text{A. } \frac{50}{100} (x-4) = \frac{30}{100} (x+4)$$

$$5x - 54 = 3x + 84$$

$$2x = 84$$

$$x = 42$$

Q. 2% of 4 + 4% of 2 = ?

$$\frac{x_4}{100} + \frac{y_4}{100} = \frac{2 \times 4}{100} = 0.08 \times 4 = 2\% \text{ of } 4,$$

$$\rightarrow \text{Absolute change} = |f_{\text{final}} - i_{\text{initial}}|$$

$$\rightarrow \text{Relative change} = \frac{|f_{\text{final}} - i_{\text{initial}}|}{i_{\text{initial}}}$$

$$\% \text{ Relative change} = \left| \frac{f - i}{i} \right| \times 100$$

Q. The radius & height of a circular cone increases by 10%. % increase in its volume.

$$\text{A. } R_2 = 1.1R, h_2 = 1.1h$$

$$V_2 = \frac{1}{3} \pi r^2 h_2$$

$$V_2 = \frac{1}{3} (1.1r)^2 (1.1h)$$

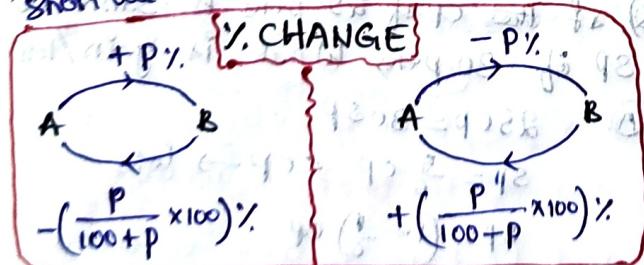
$$V_2 = (1.1)^3 V = 1.331 V, V_2 = V = 1.331$$

$$\% \text{ Increase} = \left| \frac{V_2 - V_1}{V_1} \right| \times 100 = \left| \frac{0.331}{1} \right| \times 100 = 33.1\%$$

Q. Age of Ravi is 20 years. If Shyam's age is 25% more than that of Ravi. Then how much % Ravi's age is less than Shyam's age.

$$\text{A. } R = 20, S = 1.2R \Rightarrow \% = \frac{1.2R - R}{R} \times 100 = 20\%,$$

short cut



Q. If the price of oil is increased by 20%, then by how much % a family should reduce its consumption so that the expenditure would remain the same?

$$\text{Expenditure} = \text{price} \times \text{Consumption}$$

$$E = P_1 C_1 = P_2 C_2 \quad | \quad P_2 = 1.2 P_1, C_2 = ?$$

$$C_2 = 0.769 C_1$$

% Consumption reduced by 23.0769%.

\Rightarrow Trick: $P \rightarrow +30\%$

$$C \rightarrow - \left(\frac{30}{100+30} \right) \times 100 = - \left(\frac{30}{130} \right) \times 100$$

$$= 23.0769\%$$

Q. Mr. X gave 40% of the money he had, to his parents. He also gave 10% of the remaining amount to each of his 3 siblings. Half of the amount now left was spent on his personal expenses and the remaining amount of Rs 21,000/- was deposited in the bank. How much money did Mr. X have initially?

$$\text{A. Total money} = M.$$

$$M \xrightarrow{-40\%} 0.6M \xrightarrow{-10 \times 3} 0.7(0.6M) \xrightarrow{\text{Half}} 0.5 \times 0.7(0.6M) = 21,000$$

$$\therefore \boxed{\text{Money} = 1,00,000/-}$$

Q. The population of a town is 18900 & decreases by 8% in the first year and increases by 5% in the second year. What is the population of the town at the end of 2 years?

$$\text{A. } x \xrightarrow{-8\%} 0.92x \xrightarrow{+5\%} 1.05 \times 0.92x$$

$$\text{after 2 years} = 0.92 \times 1.05 \times 18,900$$

$$= 182,574,$$

* Compound Interest:

$$A_t = P \left(1 + \frac{r}{100}\right)^t$$

$$CI = A_t - P$$

Total amount after 't' years.
Principal amount.

* Simple Interest:

$$SI = \frac{P \times T \times r}{100}$$

after 't' years total amount

$$A_t = P \left(1 + \frac{r \times t}{100}\right)$$

Q. Preethika invests an amount of 15,860/- in the names of her 3 daughters A, B, C in such a way that they get same interest after 2, 3 and 4 years resp. If the rate of simple

Simple interest is 5% p.a. Then the ratio of amount invested among A, B, C will be.

$$\text{A: } SI_A = \frac{P_1 \cdot 5 \times 2}{100} = \frac{P_1 \cdot 10}{100}$$

$$\text{B: } SI_B = \frac{P_2 \cdot 5 \times 3}{100} = \frac{15 P_2}{100}$$

$$\text{C: } SI_C = \frac{P_3 \cdot 20}{100}$$

$$SI_A : SI_B : SI_C \Rightarrow \frac{P_1 \cdot 10}{100} : \frac{P_2 \cdot 15}{100} : \frac{P_3 \cdot 20}{100}$$

$$2P_1 = 3P_2 = 4P_3 = k$$

$$P_1 = k/2, P_2 = k/3, P_3 = k/4$$

$$P_1 : P_2 : P_3 = \frac{k}{2} : \frac{k}{3} : \frac{k}{4} = 6 : 4 : 3$$

Q). 25,000/- is invested at compound interest at 10% p.a. Find the amount after 2 years, if the conversion period is i) Annually, ii) Half yearly iii) Quarterly.

$$\text{i). Annually } A_t = P \left(1 + \frac{r}{100}\right)^t$$

$$A_2 = 25,000 \left(1 + \frac{10}{100}\right)^2 = 25,000(1.1)^2 = 30251/-$$

$$\text{ii). Half yearly } A_t = P \left(1 + \frac{r/m}{100}\right)^{mt}$$

$$A_2 = 25,000 \left(1 + \frac{10/2}{100}\right)^{2 \times 2}$$

$$A_2 = 25,000 \left(1 + \frac{10/2}{100}\right)^2 = 25,000 \left(1 + \frac{5}{100}\right)^4$$

$$A_2 = 25,000 \left(1 + \frac{5}{100}\right)^4 = 30387.65/-$$

$$\text{iii). Quarterly } A_2 = 25,000 \left(1 + \frac{10/4}{100}\right)^{2 \times 2}$$

$$A_2 = 25,000 \left(1 + \frac{10/4}{100}\right)^4 = 25,000 \left(1 + \frac{2.5}{100}\right)^4$$

$$A_2 = 25,000 \left(1 + \frac{2.5}{100}\right)^4 = 30435.065/-$$

Q). What is the diff b/w the compound interest on 5000/- for $1\frac{1}{2}$ years at 4% per annum compounded yearly and half yearly?

$$\text{i) Annually: } A_1 = [P \left(1 + \frac{r}{100}\right)^t]$$

$$A_{1.5} = A_1 \left[1 + \frac{r/2}{100}\right]^2$$

$$A_{1.5} = P \left(1 + \frac{r}{100}\right) \left(1 + \frac{r/2}{100}\right)$$

$$A_{1.5} = 5000 \left(1 + \frac{4}{100}\right) \left(1 + \frac{2}{100}\right) = 5304/-$$

$$\text{ii) Half yearly: (integer)} A_1 = [P \left(1 + \frac{r}{100}\right)^t]$$

$$A_{1.5} = P \left(1 + \frac{r}{100}\right)^{2 \times 1.5}$$

$$A_{1.5} = 5000 \left(1 + \frac{4}{100}\right)^3 = 5306.04/-$$

$$\text{Difference} = 2.04/-$$

The Difference b/w simple interest and compound interest on P Rs/- at r% p.a. for 2 years.

$$CI + SI = P \left(\frac{r}{100}\right)^2$$

$$\% \text{ profit} = \frac{SP - CP \times 100}{CP} (\text{SP} > \text{CP})$$

$$\% \text{ loss} = \frac{CP - SP \times 100}{CP} (\text{CP} > \text{SP})$$

$$SP = (100 + l)\% \text{ of CP} \quad CP = (100 - l)\% \text{ of SP}$$

Q). A trader sells an article at a loss of 12%. Then CP: SP = ?

$$\text{A). } SP = (100 - l)\% \text{ of CP}$$

$$SP = (87.5)\% \text{ of CP}$$

$$\frac{CP}{SP} = \frac{1}{0.875} = \frac{8}{7}$$

Q). Find the CP of an article which is sold for 220/- at a loss of 12%.

$$\text{A). } SP = (100 - l)\% \text{ of CP}$$

$$SP = 88\% \text{ of CP}$$

$$CP = \frac{220}{0.88} = 250/-$$

Q). A man, by selling an article a man makes a profit of 25% of its SP. His profit % is ?

$$SP = (100 + 25)\% \text{ of CP} = 125\% \text{ of CP}$$

$$\frac{SP - CP}{CP} = \frac{0.25 \text{ CP}}{\text{CP}} \times 100 = 25\%$$

$$\% \text{ profit} = 25\%, SP = 0.25 \text{ SP}$$

$$SP - CP = 0.25 \text{ SP}$$

$$0.75 \text{ SP} = CP$$

$$SP = \frac{4}{3} \text{ CP}$$

$$\% \text{ profit} = \frac{4 \text{ CP} - \text{CP}}{\text{CP}} \times 100 = 33.33\%$$

Q). If the CP of 25 pens is same as SP of 80 pens what is gain/loss%?

$$\text{A). } 25 \text{ CP} = 80 \text{ SP}$$

$$SP = \frac{5}{8} \text{ CP} < CP \rightarrow \text{loss}$$

$$SP = \left(1 - \frac{5}{8}\right) \text{ CP}$$

$$SP = (100 - 62.5\%) \text{ CP}$$

$$\% \text{ loss} = 16.67\%$$

