

# ✓ Percentage

$\frac{1}{100}$

$1\%$  =  $\frac{1}{100}$

$2\%$  =  $\frac{2}{100} = \frac{1}{50}$  ratio form

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

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

$8\% \Rightarrow \frac{8}{100} = \frac{2}{25}$

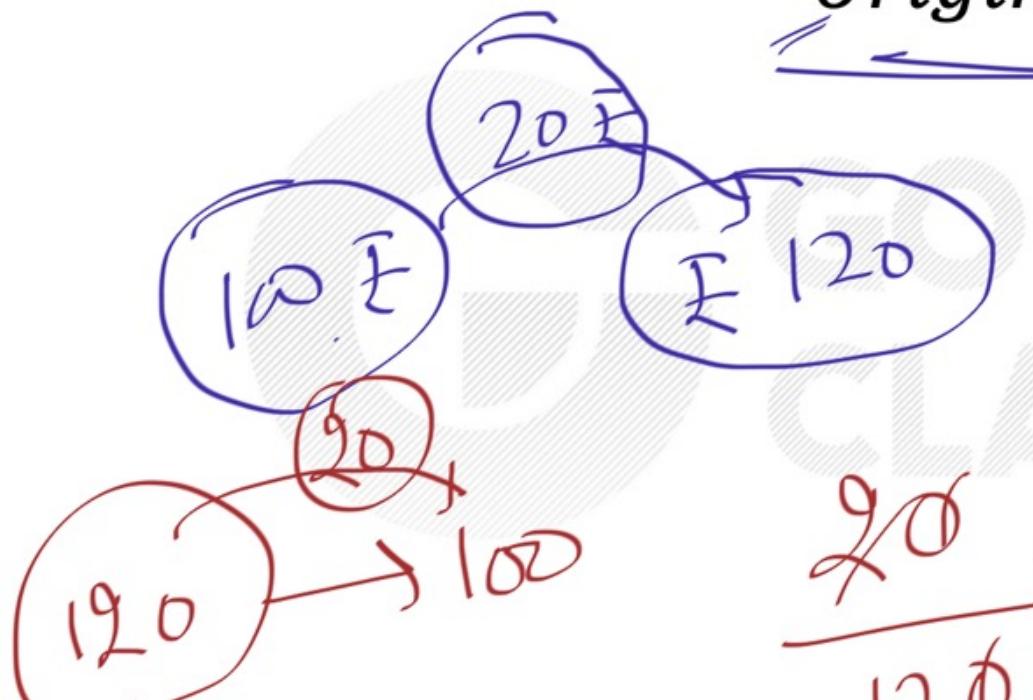
$$\left\{ \begin{array}{l} 10\% = \frac{1}{10} \leftarrow \frac{10}{100} \\ 20\% = \frac{1}{5} \checkmark \\ 40\% = \frac{2}{5} \times \frac{10}{100} \\ 60\% = \frac{3}{5} \\ 80\% = \frac{4}{5} \end{array} \right.$$

$$\begin{aligned} & \cdot 50\% = \frac{1}{2} \times \frac{1}{2} \\ & \cdot 25\% = \frac{1}{4} \times \frac{1}{2} \\ & \cdot 12\frac{1}{2}\% = \frac{1}{8} \times \frac{1}{2} \\ & \cdot 6\frac{1}{4}\% = \frac{1}{16} \times \frac{1}{2} \\ & \cdot 18\frac{3}{4}\% = \frac{3}{16} \times 3 \end{aligned}$$

$$\left\{ \begin{array}{l} 14\frac{2}{7}\% \rightarrow \frac{1}{7} \times \frac{1}{7} \times \frac{1}{2} \\ 37\frac{1}{2}\% \rightarrow \frac{75}{2} \times \frac{3}{8} \\ 66\frac{2}{3}\% \rightarrow \frac{2}{3} \\ 33\frac{1}{3}\% \rightarrow \frac{1}{3} \\ 16\frac{2}{3}\% \rightarrow \frac{1}{6} \\ 11\frac{1}{9}\% \rightarrow \frac{1}{9} \\ 8\frac{1}{3}\% \rightarrow \frac{1}{12} \\ 9\frac{1}{11}\% \rightarrow \frac{1}{11} \end{array} \right.$$

- Eg. What is 32% of ₹50 ? → 50% of 32 = 16
- Eg. What is 144% of ₹200 ? → 288 Ans
- Eg. What is 18% of ₹75 ? →  $\frac{18}{100} \times 75 = \frac{27}{2} = 13.5$
- Eg. The value of ₹50 if it increased by 32%? →  $50 + \frac{32}{100} \times 50 = 16 + 50 = 66$
- Eg. The value of ₹75 if it increased by 200%? →  $75 + \frac{200}{100} \times 75 = 150 + 75 = 225$

✓ Calculate % =  $\frac{Change}{Original} \times 100$



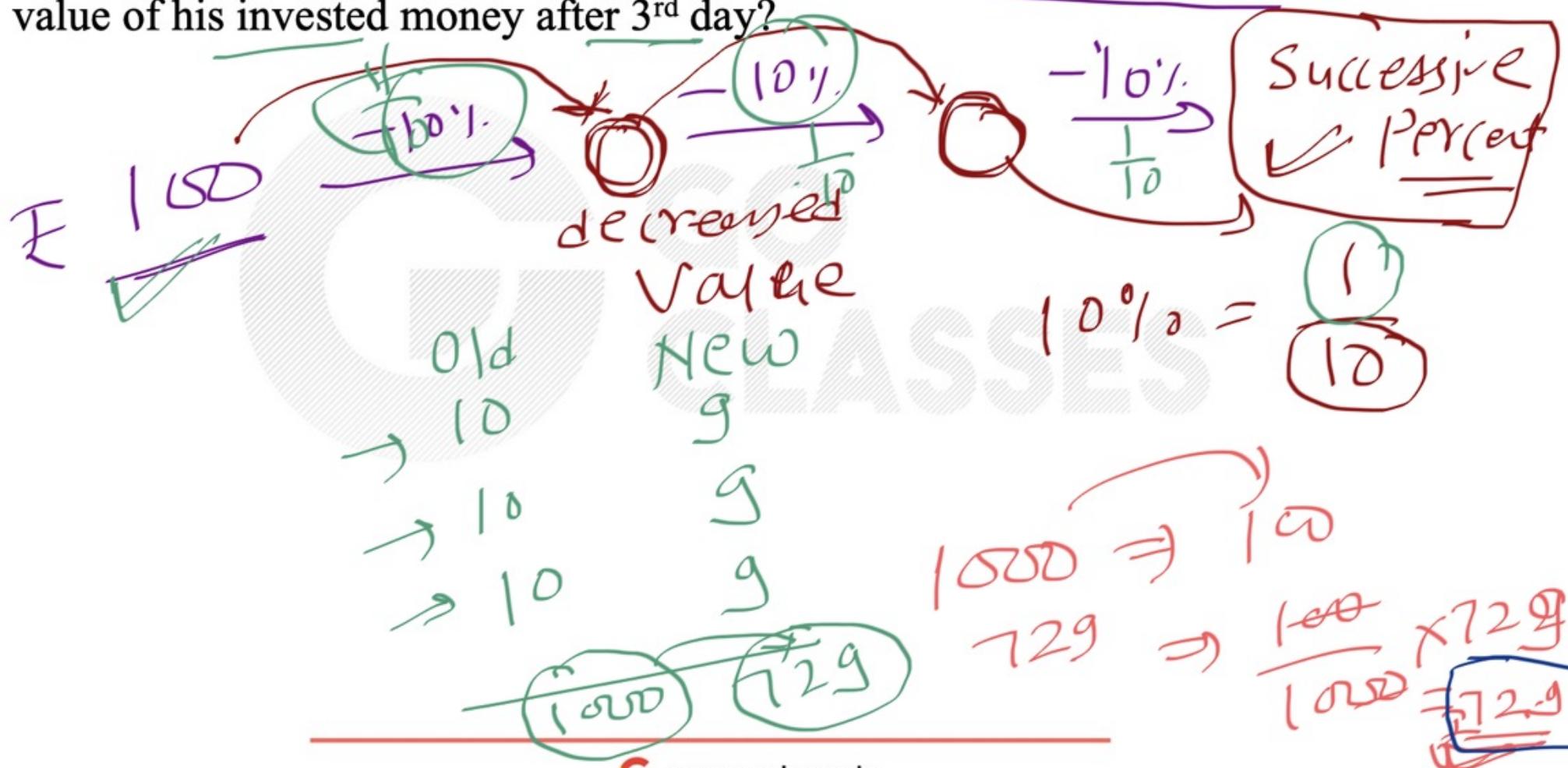
$$\frac{20}{120} \times 100 = \frac{100}{6}\% = \boxed{16\frac{2}{3}\%}$$

Eg. If the value of a stock was ₹100 and yesterday its price was increased by 10% but today it decreased by 10%. What is the current value of that stock?

$$\cancel{₹100} \xrightarrow{+10\%} 100 \times \frac{11}{10} = 110 + 100 \Rightarrow \boxed{110}$$

$$110 \xrightarrow{-10\%} 110 \times \frac{9}{10} = 99$$

Eg. Shinchain invested ₹100 in a bad company and after his investment the value of that company decreases 10% daily and continue decreasing for three days. What is the value of his invested money after 3<sup>rd</sup> day?



Eg.

₹2340 are divided between X, Y and Z. X gets  $14\frac{2}{7}\%$  more than Y and Y gets  $16\frac{2}{3}\%$  less than Z. find the share of each.

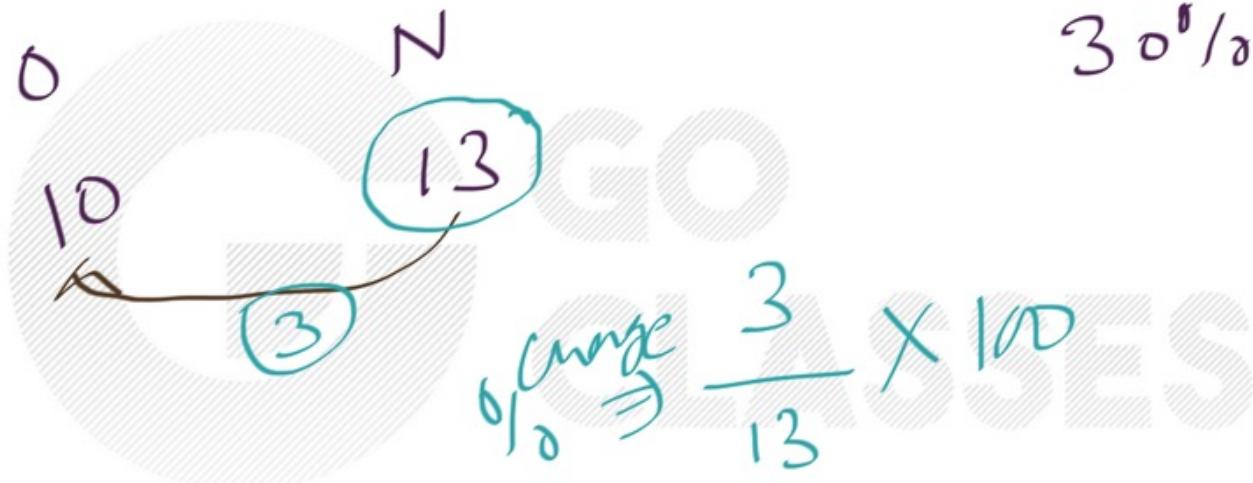
X ; Y ; Z

$\frac{6}{7} = \frac{5}{5}$

~~more~~  
Z [X → 8 ↗]  $14\frac{2}{7}\% = 7$   
7 [Y → 7 ↗]  
6 [Z → 840]  $16\frac{2}{3}\% = 6$

$\frac{35 \times 2340}{117} \rightarrow 70$   
 $40 : 35 : 42 \times 10$   
 $\Rightarrow \frac{2340}{40} \rightarrow \frac{2340}{117} \times 40 = 800$

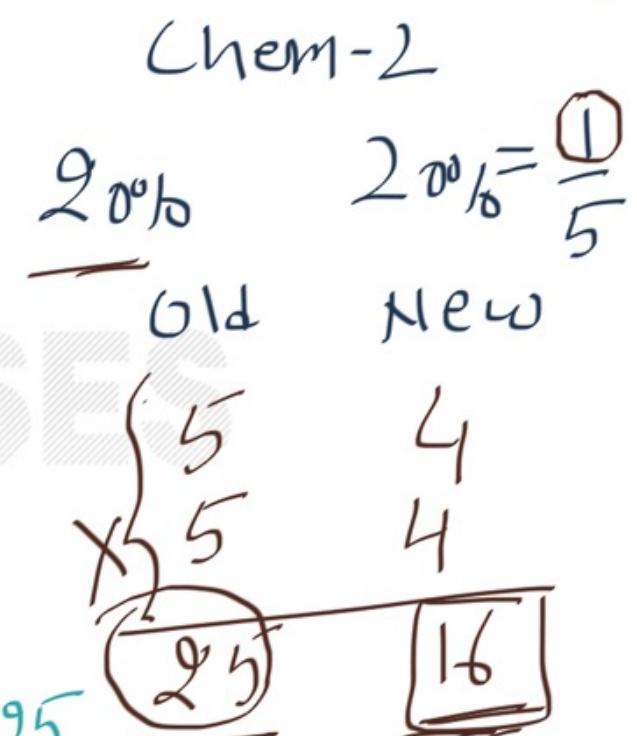
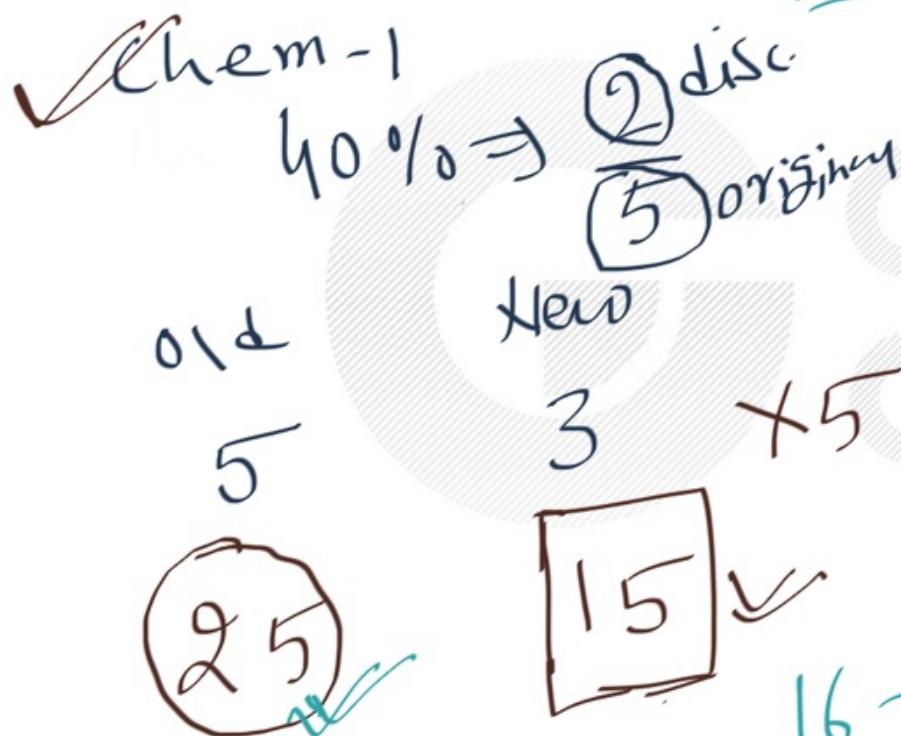
Eg. Kapil's salary was increased by 30% but due to his bad performance his salary again decreased to its original salary. How much percent deduction was done on his salary.



$$30\% \Rightarrow \frac{30}{100} = \frac{30}{10}$$

$$= \frac{300}{13}\% = 23\frac{1}{13}\%$$

Eg. One chemist gives the discount of 40% and other gives two successive discount of 20% & 20% on the same medicine. Find out which one gives you a better deal and if the difference in their price is 27 then what is the cost of the medicine before discount.



$$16 - 15 = 1 \Rightarrow 27$$

$$27 = 27 \times 25$$

$$= 675$$

£ AM

Eg. If price of tea increased by 10% then how much % the consumption should be decreased to keep the expenditure same.

$$\boxed{\text{Expenditure}} = \underline{\text{Price}} \times \underline{\text{Consumption}}$$

$100\text{₹} \rightarrow 110\text{₹}$

$80\text{₹} = \boxed{P \times C}$

$\frac{110}{100} \times 80 \times 1\text{kg Sugar} = 110 \times 2\text{kg}$

$100\% \rightarrow 110\%$

$\boxed{\text{Exp}_o} = \frac{P \times C}{10 \times C_o}$

$\checkmark \quad \boxed{\text{Exp}_N} = \frac{P \times C}{11 \times C_N} \Rightarrow \frac{C_0}{C_N} = \frac{11}{10}$

## Gate PYQs

1. Round-trip tickets to a tourist destination are eligible for a discount of 10% on the total fare. In addition, groups of 4 or more get a discount of 5% on the total fare. If the one way single person fare is Rs 100, a group of 5 tourists purchasing round-trip tickets will be charged Rs Rs 1850

$$100 \times 2 \Rightarrow 200 \times 5 = \boxed{1000}$$

$$\underline{1000} \times 15\% = \underline{150}$$

$$1000 - 150 = \underline{\underline{850}}$$

$$\underline{\underline{10\% + 5\%}}$$

## Gate PYQs

2. The Gross Domestic Product (*GDP*) in Rupees grew at 7% during 2012 – 2013. For international comparison, the *GDP* is compared in US Dollars (*USD*) after conversion based on the market exchange rate. During the period 2012 – 2013 the exchange rate for the *USD* increased from Rs. 50/USD to Rs.60/USD. India's *GDP* in *USD* during the period 2012 – 2013

- A. increased by 5%    B. decreased by 13%    C. decreased by 20%    D. decreased by 11% ✓

$$\begin{array}{ccc}
 \text{Old} & & \text{New} \\
 \text{₹} 100 & \xrightarrow{7\%} & \text{₹} 107 \\
 \downarrow & & \downarrow \\
 \frac{100}{50} \Rightarrow 2 \text{ USD} & & \frac{107}{60} = 1.78
 \end{array}$$

$$\begin{array}{c}
 \text{Old} \quad \text{New} \\
 \$ 1.20 \rightarrow \$ 1.78 \\
 1.78 - 1.20 = 0.58 \\
 \frac{0.58}{1.20} \times 100 = 48.33\%
 \end{array}
 \Rightarrow 11\%$$

## Gate PYQs

3. There are five levels  $\{P, Q, R, S, T\}$  in a linear supply chain before a product reaches customers, as shown in the figure.



At each of the five levels, the price of the product is increased by 25%. If the product is produced at level  $P$  at the cost of Rs. 120 per unit, what is the price paid (in rupees) by the customers?

A. 187.50

B. 234.38

C. 292.96

D. 366.21

If P  
100

$\rightarrow$  125  
 $+25\%$

$25\%$

1024  $\Rightarrow$  120  
 $3125 \Rightarrow \frac{120}{1024} \times 3125 = 366.21$

## Gate PYQs

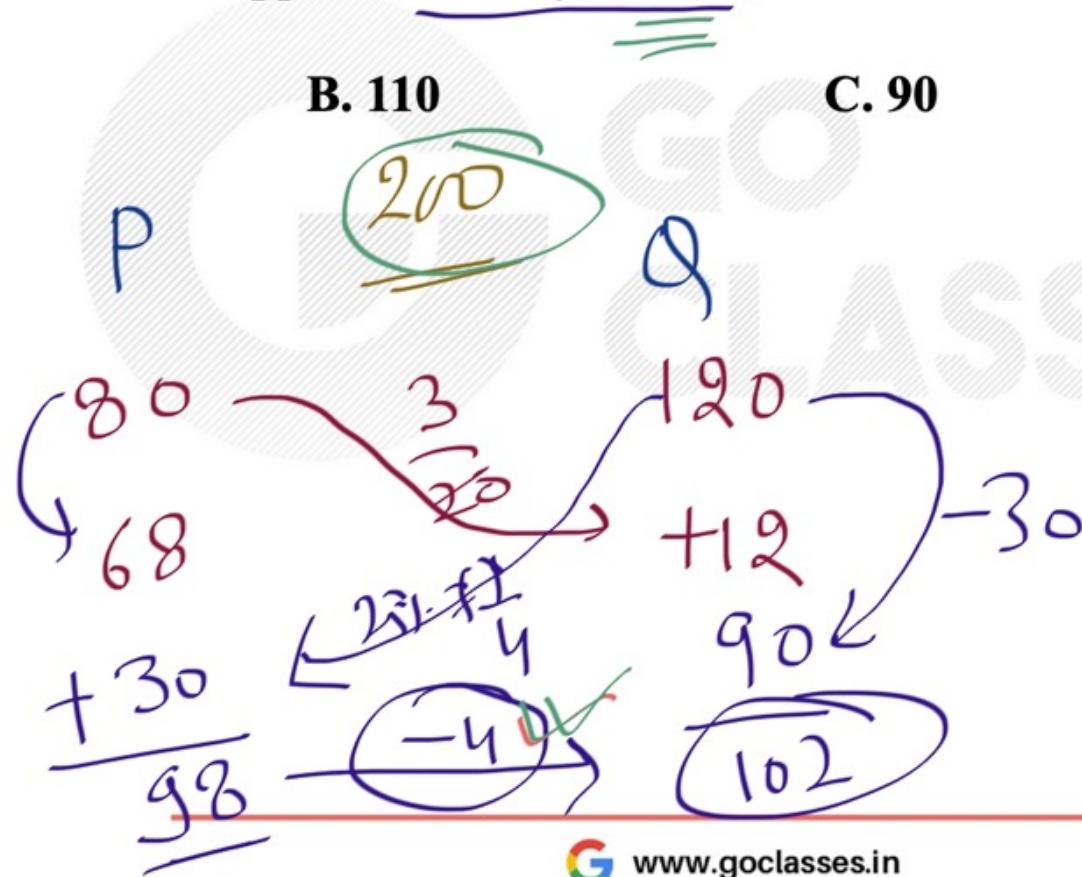
4. There are two candidates  $P$  and  $Q$  in an election. During the campaign, 40% of the voters promised to vote for  $P$ , and rest for  $Q$ . However, on the day of election 15% of the voters went back on their promise to vote for  $P$  and instead voted for  $Q$ . 25% of the voters went back on their promise to vote for  $Q$  and instead voted for  $P$ . Suppose,  $P$  lost by 2 votes, then what was the total number of voters?

A. 100

B. 110

C. 90

D. 95



$$\begin{aligned} 40\% &= \frac{2}{5} \\ \frac{40}{200} \times \frac{2}{5} &= 80 \end{aligned}$$

$$\begin{aligned} 4 &\Rightarrow 2 \\ 200 &\Rightarrow 100 \end{aligned}$$

## Gate PYQs

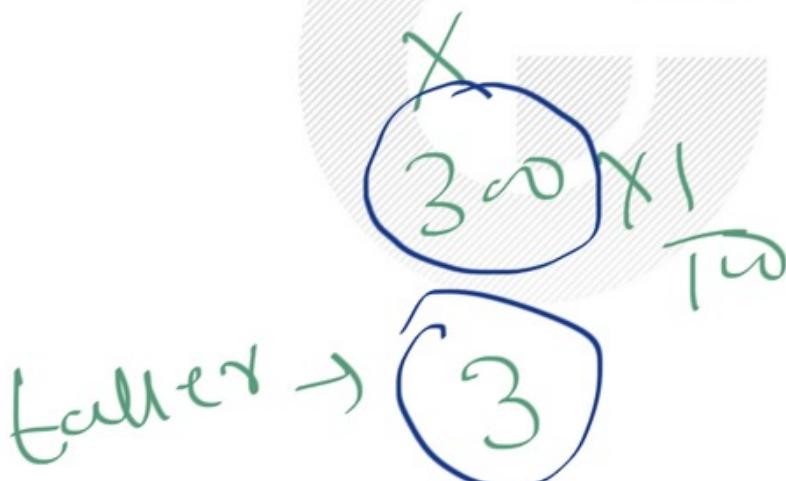
5. One percent of the people of country  $X$  are taller than 6 ft. Two percent of the people of country  $Y$  are taller than 6 ft. There are thrice as many people in country  $X$  as in country  $Y$ . Taking both countries together, what is the percentage of people taller than 6 ft?

A. 3.0

B. 2.5

C. 1.5

D. 1.25



$$\frac{5}{4} = \underline{\underline{1.25}}$$
$$\frac{100}{100} \times \frac{2}{100} = 1.25$$
$$+ 2 \Rightarrow \underline{\underline{5}}$$

## Gate PYQs

6. Industrial consumption of power doubled from 2000 – 2001 to 2010 – 2011. Find the annual rate of increase in percent assuming it to be uniform over the years.

A. 5.6

B. 7.2

C. 10.0

D. 12.2

Rule of 72 →  $\frac{72}{\text{rate}} = \text{years}$

If doubles  $\frac{72}{\text{rate}} = \text{years}$

$\frac{72}{\text{rate}} = \text{years}$

7.2%

## Gate PYQs

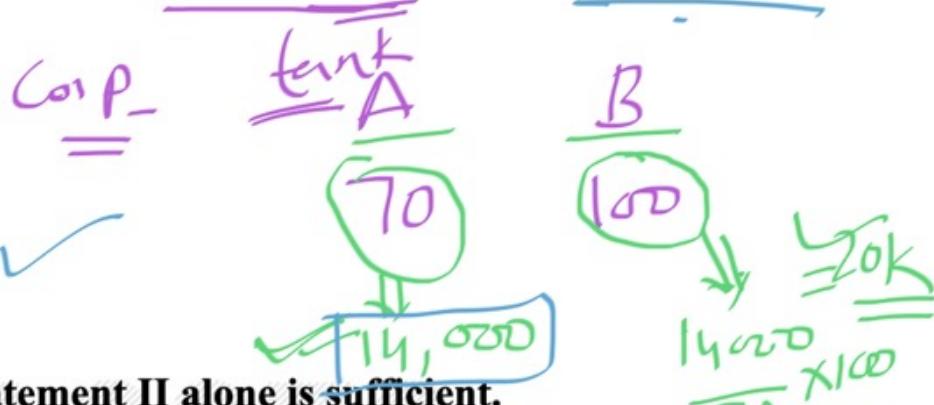
7. The given question is followed by two statements; select the most appropriate option that solves the question. Capacity of a solution tank A is 70% of the capacity of tank B. How many gallons of solution are in tank A and tank B?

Statements:

- I. Tank A is 80% full and tank B is 40% full.
- II. Tank A if full contains 14,000 gallons of solution.

- A. Statement I alone is sufficient.  
C. Either statement I or II alone is sufficient.

- B. Statement II alone is sufficient.  
D. Both the statements I and II together are sufficient.



A  
14,000 x 80%  
B  
20,000 x 40%  
80/40

## Gate PYQs

8.  $(x\% \text{ of } y) + (y\% \text{ of } x)$  is equivalent to \_\_\_\_.

- A. ~~2% of xy~~      B. 2% of  $(xy/100)$       C.  $xy\% \text{ of } 100$       D. 100% of  $xy$

$$\frac{xy}{100} + \frac{yx}{100} =$$

$$\frac{2xy}{100} =$$

$$2\% \text{ of } xy$$

## Gate PYQs

9. In a huge pile of apples and oranges, both ripe and unripe mixed together, 15% are unripe fruits. Of the unripe fruits, 45% are apples. Of the ripe ones, 66% are oranges. If the pile contains a total of 5692000 fruits, how many of them are apples?

A. 2029198

B. 2467482

C. 2789080

D. 3577422

Total apples =

$$\frac{85 \times 34}{100} + \frac{15 \times 45}{100} = \frac{3565}{100}$$

$$100 \Rightarrow 5692000 \quad \frac{5692000}{100} + \frac{3565}{100} = 2029198$$

## Gate PYQs

10. If the radius of a right circular cone is increased by 50% its volume increases by

A. 75%

B. 100%

C. ~~125%~~

D. 237.5%

$$V = \frac{1}{3} \pi r^2 h$$

GO  
OLD CLASSES

$$50\% = \frac{50}{100} = \frac{1}{2}$$



old      New

$$\begin{matrix} 2 & 3 \\ 9 & 3 \end{matrix} \quad \% \Rightarrow \frac{5}{4} \times 100 = 125\%$$

Volume  $\rightarrow$  4

## Gate PYQs

11. In the summer, water consumption is known to decrease overall by 25%. A Water Board official states that in the summer household consumption decreases by 20%, while other consumption increases by 70%. Which of the following statement is correct?

The ratio of household to other consumption is 8/17

The ratio of household to other consumption is 1/17

The ratio of household to other consumption is 17/8

There are errors in the official's statement.

$$\begin{aligned} \text{Total} &\Rightarrow H + \text{Others} \\ \downarrow 25\% &= 0.8H + 1.7 \text{ Others} \\ 0.75T &= 0.75H + 0.75 \text{ Others} \\ \cancel{0.75} &= 0.5H + 0.95 \text{ Others} \end{aligned}$$



## Gate PYQs

12. A designer uses marbles of four different colours for his designs. The cost of each marble is the same, irrespective of the colour. The table below shows the percentage of marbles of each colour used in the current design. The cost of each marble increased by 25%. Therefore, the designer decided to reduce equal numbers of marbles of each colour to keep the total cost unchanged. What is the percentage of blue marbles in the new design?

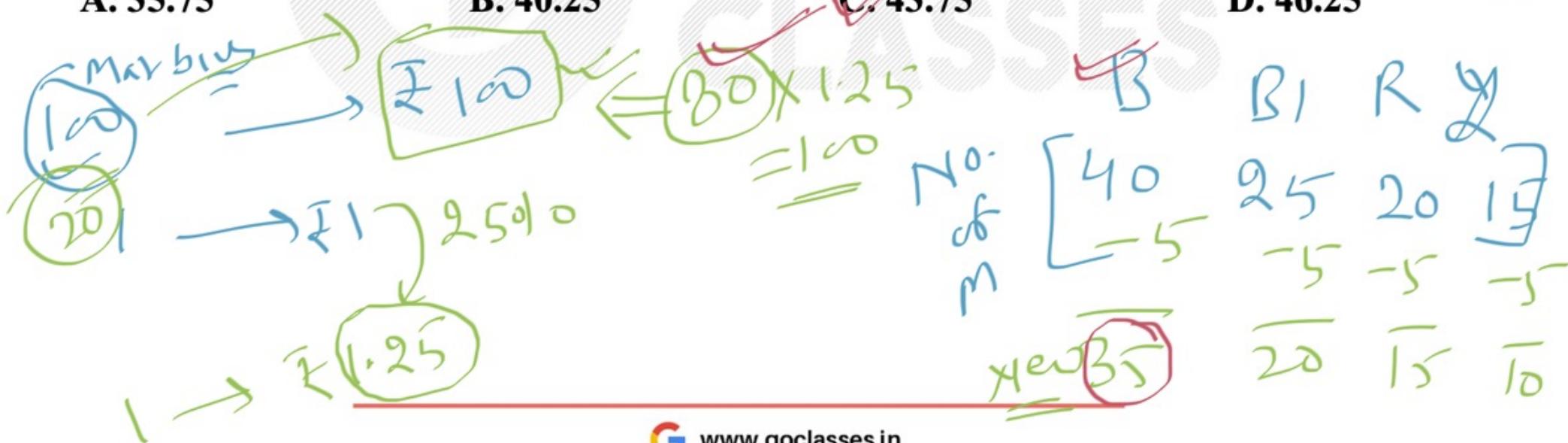
Blue	Black	Red	Yellow
40%	25%	20%	15%

A. 35.75

B. 40.25

C. 43.75

D. 46.25



## Gate PYQs

13. Population of state X increased by  $x\%$  and the population of state Y increased by  $y\%$  from 2001 to 2011. Assume that  $x$  is greater than  $y$ . Let  $P$  be the ratio of the population of state X to state Y in a given year. The percentage increase in  $P$  from 2001 to 2011 is \_\_\_\_\_

A.  $x - y$

B.  $x - y$

C.  $100(x-y) / 100+x$

D.  $100(x-y)$

$$\begin{aligned}
 & \text{In 2001} \quad P = \frac{a}{b} \\
 & \text{In 2011} \quad P_N = \frac{a(1 + \frac{x}{100})}{b(1 + \frac{y}{100})} \\
 & \text{Ans.} = \frac{P_N - P}{P} \times 100 \\
 & = \frac{a \left[ \frac{a(1 + \frac{x}{100}) - b(1 + \frac{y}{100})}{b(1 + \frac{y}{100})} \right] \times 100}{\frac{a}{b}} \\
 & \Rightarrow \frac{(100 + x - 100 - y)}{(100 + y)} \times 100 \\
 & \Rightarrow \frac{x - y}{100 + y} \times 100
 \end{aligned}$$

## Gate PYQs

14. The radius as well as the height of a circular cone increases by 10%. The percentage increase in its volume is \_\_\_\_\_.

A. 17.1

B. 21.0

C. 33.1

D. 72.8



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

614 New  
10 11 % =  $\frac{331}{100}$  No

10 11  
X  $\frac{100}{133}$  = 33.1 %

## Gate PYQs

15. In a country of 1400 million population, 70% own mobile phones. Among the mobile phone owners, only 294 million access the Internet. Among these Internet users, only half buy goods from e-commerce portals. What is the percentage of these buyers in the country?

A. 10.50

B. 14.70

C. 15.00

D. 50.00

1400 M  
=

294 M access Internet

$$\frac{294}{2} = \textcircled{147 M}$$

$$\frac{\cancel{147 M}}{\cancel{1400 M}} \times 100$$

$$\Rightarrow 10.5\%$$

## Gate PYQs

16. Fiscal deficit was 4% of the GDP in 2015 and that increased to 5% in 2016. If the GDP increased by 10% from 2015 to 2016, the percentage increase in the actual fiscal deficit is \_\_\_\_\_

A. 37.50

B. 35.70

C. 25.00

D. 10.00

