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# FORMULAE & TRICKS

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**CAT, XAT, MAT, All MBA  
Entrance & Government  
Job Examinations**

**Shweta Arora**

# ARITHMETIC

## FORMULAE AND TRICKS



### BASICS OF PERCENTAGE

- Percentage is denoted with % symbol. Percent means out of 100 or a fraction with denominator 100, e.g.,  $a/100$  means  $a\%$ .
  - One quantity (Q1) as a percentage of another quantity (Q2)
- $$= \frac{Q_1}{Q_2} \times 100$$
- PERCENTAGE TO FRACTION:** Remove percentage symbol and divide it by 100.
  - FRACTION TO PERCENTAGE:** Multiply the given fraction with 100.

Some Important Fractions and their Percentage Value					
1/1 or 1	100%	1/11	9.09%	1/21	4.76%
½	50%	1/12	8.33%	1/22	4.54%
1/3	33.33%	1/13	7.69%	1/23	4.34%
¼	25%	1/14	7.14%	1/24	4.16%
1/5	20%	1/15	6.67%	1/25	4%
1/6	16.67%	1/16	6.25%	1/26	3.84%
1/7	14.29%	1/17	5.88%	1/27	3.7%
1/8	12.5%	1/18	5.55%	1/28	3.57%
1/9	11.11%	1/19	5.26%	1/29	3.44%
1/10	10%	1/20	4%	1/30	3.33%

- Percentage Change =  $\frac{\text{Absolute Increase / Decrease}}{\text{Original Value}} \times 100$

**MULTIPLYING FACTOR:** It is the method to arrive directly at new value after applying the increase % or decrease % on the original value.

$$\text{Multiplying factor} = \frac{100 \pm \text{Increase / Decrease}}{100}$$

$$\text{New value} = \text{Original value} \times \frac{100 \pm \text{Increase / Decrease}}{100}$$

#### NOTE

To use the above formula, percentage increase will be treated as (positive '+') percentage change and percentage decrease will be treated as (negative '-') percentage change.

**EXAMPLE:** Ravi invests 50% of his monthly savings in fixed deposits. 30% of the rest of his savings is invested in stocks and the rest goes into Ravi's saving bank account. If the total amount deposited by him in the bank (for saving account and fixed deposits) is ₹59,500, then what is Ravi's total monthly savings (in ₹)? [CAT 2017]

**SOLUTION:** The correct answer is [70,000].

He invests  $50x$  in fixed deposits. 30% of  $50x$ , which is  $15x$  is invested in stocks and  $35x$  goes to saving bank.

It is given

$$85x = 59,500 \Rightarrow x = 700$$

$$\text{Hence, } 100x = 70,000$$

**EXAMPLE:** In an examination, the maximum possible score is  $N$  while the pass mark 45% of  $N$ . A candidate obtain 36 marks, but falls short of the pass mark by 68%. Which one of the following is then correct? [CAT 2018]

- (1)  $N < 200$       (2)  $243 < N < 252$       (3)  $201 < N < 242$       (4)  $N < 253$

**SOLUTION:** Option (2) is correct.

Assume marks =  $100N$

Pass mark =  $45N$

Marks obtained = 36

Hence, the obtained marks are 32% of the pass marks =  $100 - 68 = 32\%$

Hence, 32% of  $45N = 36$

$$\Rightarrow N = \frac{36 \times 100}{45 \times 32}$$

$$\Rightarrow 100N = 250$$

**EXAMPLE:** In a class, 60% of the students are girls and the rest are boys. There are 30 more girls than boys. If 68% of the students, including 30 boys, pass an examination, calculate the percentage of the girls who do not pass. [CAT 2019]

**SOLUTION:** The correct answer is [20].

Assuming the number of students =  $100x$

Hence, the number of girls =  $60x$  and the number of boys =  $40x$

We have,  $60x - 40x = 30$

$$\Rightarrow x = 1.5$$

The number of girls  $60 \times 1.5 = 90$

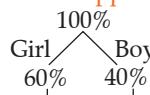
$$\begin{aligned} \text{Number of girls that pass} &= 68x - 30 \\ &= 68 \times 1.5 - 30 \\ &= 102 - 30 = 72 \end{aligned}$$

The number of girls who do not pass =  $90 - 72 = 18$

Hence, the percentage of girls who do not pass

$$= \frac{18}{100} \times 90 = 20$$

**Smart Approach:**



$$100\% = 150 \quad \therefore \{G = 90, b = 60\}$$

Pass stu. 68% = 30 boy + girl

Girl's fail =  $32\% - 30$

$$= 48 - 30$$

$$= 18$$

$$= \frac{18}{90} \times 100 = 20$$

**EXAMPLE:** In May, John bought the same amount of rice and the same amount of wheat as he had bought in April, but spent ₹150 more due to price increase of rice and wheat by 20% and 12%, respectively. If John had spent ₹450 on rice in April, then how much did he spend on wheat in May? [CAT 2020]

- (1) ₹560      (2) ₹570      (3) ₹590      (4) ₹580

**SOLUTION:** Option (1) is correct.

	Rice	Wheat
April	450	$x$
May	$\downarrow + 20\%$	$\downarrow + 12\%$
	₹90	₹60

{As given John spent 150 more in May}

So, 12% of  $x = 60$

So,  $x = 500$

Total amount spent on wheat in May =  $500 + 60 = 560$

## PROFIT, LOSS AND DISCOUNT

- **COST PRICE (CP):** The price at which the goods and services are purchased.
- **SELLING PRICE (SP):** The price at which the goods and services are sold.
- **MARKED PRICE (MP):** The price at which the goods and services are listed for sale. It is also known as List Price, MRP, Printed Price and Label Price, etc.
- Profit = SP – CP
- **GAIN:** It is same as profit when it comes to absolute numbers.
- Loss = CP – SP
- $SP = CP \times \frac{100 \pm \text{Profit \% or Loss \%}}{100}$
- [ $+$  in case of profit and  $-$  in case of loss]
- **DISCOUNT:** It is applied over Marked Price (MP). After deducting discount from MP, we get its Selling Price (SP) of the article.

$$\text{Discount} = \text{Marked Price (MP)} - \text{Selling Price (SP)}$$

$$\text{Selling Price} = \text{Marked Price} \times \frac{100 - \text{Discount \%}}{100}$$

- **MARKUP:** It is the gap between Marked Price and Cost Price.

$$\text{Markup} = \text{Marked Price (MP)} - \text{Cost Price (CP)}$$

$$\text{Markup \%} = \frac{\text{MP} - \text{CP}}{\text{CP}} \times 100$$

- Profit or Loss % =  $\frac{\text{Absolute Value of Profit or Loss}}{\text{Cost Price (CP)}} \times 100$

**SUCCESSIVE PERCENTAGE:** It refers to percentage change multiple times one after another. Direct formula to arrive at a single percentage value when there are two successive percentage changes is  $\pm a \pm b + \frac{(\pm a)(\pm b)}{100}$

### NOTE

To use the above formula, percentage increase will be treated as (positive '+') percentage change and percentage decrease will be treated as (negative '-') percentage change.

### Product Constancy

It refers to some specific set of problems where product of two terms results in third term which means  $A \times B = K$ . The example of such sets is; Time  $\times$  Speed = Distance, Price  $\times$  Consumption = Expenditure and Length  $\times$  Breadth = Area, etc.

When K remains constant in  $K = A \times B$ .

**CASE 1:** If A increases by a/b than B will decrease by a/(a + b) and vice versa.

**CASE 2:** If A decreases by a/b than B will increase by a/(b - a) and vice versa.

PRODUCT CONSTANCY TABLE (Assuming K as constant)

If A Increases ( $\uparrow$ )	Then B Decreases ( $\downarrow$ )	If A Decreases ( $\downarrow$ )	Then B Increases ( $\uparrow$ )
50% or $\frac{1}{2}$	33.33% or $\frac{1}{3}$	50% or $\frac{1}{2}$	100% or 1
33.33% or $\frac{1}{3}$	25% or $\frac{1}{4}$	33.33% or $\frac{1}{3}$	50% or $\frac{1}{2}$
25% or $\frac{1}{4}$	20% or $\frac{1}{5}$	25% or $\frac{1}{4}$	33.33% or $\frac{1}{3}$
20% or $\frac{1}{5}$	16.66% or $\frac{1}{6}$	20% or $\frac{1}{5}$	25% or $\frac{1}{4}$
16.66% or $\frac{1}{6}$	14.29% or $\frac{1}{7}$	16.66% or $\frac{1}{6}$	20% or $\frac{1}{5}$
14.29% or $\frac{1}{7}$	12.5% or $\frac{1}{8}$	14.29% or $\frac{1}{7}$	16.66% or $\frac{1}{6}$
12.5% or $\frac{1}{8}$	11.11% or $\frac{1}{9}$	12.5% or $\frac{1}{8}$	14.29% or $\frac{1}{7}$
11.11% or $\frac{1}{9}$	10% or $\frac{1}{10}$	11.11% or $\frac{1}{9}$	12.5% or $\frac{1}{8}$
10% or $\frac{1}{10}$	9.09% or $\frac{1}{11}$	10% or $\frac{1}{10}$	11.11% or $\frac{1}{9}$
9.09% or $\frac{1}{11}$	8.33% or $\frac{1}{12}$	9.09% or $\frac{1}{11}$	10% or $\frac{1}{10}$
8.33% or $\frac{1}{12}$	7.69% or $\frac{1}{13}$	8.33% or $\frac{1}{12}$	9.09% or $\frac{1}{11}$
7.69% or $\frac{1}{13}$	7.14% or $\frac{1}{14}$	7.69% or $\frac{1}{13}$	8.33% or $\frac{1}{12}$
7.14% or $\frac{1}{14}$	6.67% or $\frac{1}{15}$	7.14% or $\frac{1}{14}$	7.69% or $\frac{1}{13}$
6.67% or $\frac{1}{15}$	6.25% or $\frac{1}{16}$	6.67% or $\frac{1}{15}$	7.14% or $\frac{1}{14}$
6.25% or $\frac{1}{16}$	5.88% or $\frac{1}{17}$	6.25% or $\frac{1}{16}$	6.67% or $\frac{1}{15}$
5.88% or $\frac{1}{17}$	5.55% or $\frac{1}{18}$	5.88% or $\frac{1}{17}$	6.25% or $\frac{1}{16}$
5.55% or $\frac{1}{18}$	5.26% or $\frac{1}{19}$	5.55% or $\frac{1}{18}$	5.88% or $\frac{1}{17}$
5.26% or $\frac{1}{19}$	5% or $\frac{1}{20}$	5.26% or $\frac{1}{19}$	5.55% or $\frac{1}{18}$
5% or $\frac{1}{20}$	1/21	5% or $\frac{1}{20}$	5.26% or $\frac{1}{19}$

- Gain % =  $\frac{\text{Gain or Profit}}{\text{Cost Price (CP)}} \times 100$

- If the selling price of two articles is the same and one of them is sold at a profit of  $x\%$  while the other is sold at a loss of  $x\%$  then there will always be a loss in the whole transaction,

$$\text{Percentage of loss} = \frac{x^2}{100}$$

- If shopkeeper doesn't provide discount then MP becomes CP and markup becomes profit.

- Buy  $x$  and get  $y$  free then,

$$MP = x + y \text{ and discount} = y$$

$$\text{Discount \% will be } \frac{y}{x+y} \times 100$$

### Dishonest Shopkeeper/Faulty Weight

- If a shopkeeper sells his goods at cost price using a false weight instead of true weight, then,

$$\text{Profit \%} = \frac{\text{True Weight} - \text{False Weight}}{\text{False Weight}} \times 100$$

- If a shopkeeper sells his goods at a profit  $x\%$  and at the same time uses  $y$  grams faulty weight in place of  $z$  grams, then

$$\text{Profit \%} = \frac{\left[ \frac{z(100+x)}{100} \right] - y}{y}$$

- If a shopkeeper sells his goods at a loss of  $x\%$  and at the same time uses  $y$  grams faulty weight in place of  $z$  grams, then

$$\text{Profit \% or Loss \%} = \frac{\left[ \frac{z(100-x)}{100} \right] - y}{y}$$

#### NOTE

If the resultant value comes positive '+' that means it's a profit but if it comes negative that means it's a loss.

**EXAMPLE:** In a market, the price of medium quality mangoes is half that of good mangoes. A shopkeeper buys 80 kg good mangoes and 40 kg medium quality mangoes from the market and then sells all these at a common price which is 10% less than the price at which he bought the good ones. His overall profit is [CAT 2017]

- (1) 6%                          (2) 8%                          (3) 10%                          (4) 12%

**SOLUTION:** Option (2) is correct.

Let the cost of good mangoes be 200 per kg.

The cost of medium mangoes be 100 per kg.

CP of good mangoes =  $80 \times 200 = 16,000$

$$\text{CP of medium mangoes} = 40 \times 100 = 4,000$$

$$\text{Total CP} = 20,000$$

$$\text{His selling price} = 0.9 \times 200 = 180$$

$$\begin{aligned}\text{Therefore, total revenue generated by} \\ \text{selling all the mangoes} &= 120 \times 180 \\ &= 21,600\end{aligned}$$

Hence, the profit%

$$= \frac{21,600 - 20,000}{20,000} \times 100 = 8\%$$

#### Smart Approach:

$$\text{Let Good mangoes} = 80 \text{ Rs/kg}$$

$$\text{Total investment} = 80 \times 80 + 40 \times 40 = 8000$$

$$\begin{aligned}\text{Sold at all mangoes} &= 8000 \times \frac{90}{100} \times (80 + 40) \\ &= 8640\end{aligned}$$

$$\text{Profit \%} = \frac{640}{8000} \times 100 = 8\%$$

**EXAMPLE:** A shopkeeper sells two tables, each procured at cost price  $p$ , to Amal and Asim at a profit of 20% and at a loss of 20%, respectively. Amal sells his table to Bimal at a profit of 30%, while Asim sells his table to Barun at a loss of 30%. If the amount paid by Bimal and Barun are  $x$  and  $y$ , respectively, then  $\frac{(x-y)}{p}$  equals to [CAT 2019]

(1) 1

(2) 1.2

(3) 0.50

(4) 0.7

**SOLUTION:** Option (1) is correct.

Let CP of the table at which the shopkeeper procured each table = 100

It is given that shopkeeper sold the tables to Amal and Asim at a profit of 20% and at a loss of 20%, respectively

The selling price of the tables = 120 and 80 to Amal and Asim, respectively.

Amal sells his table to Bimal at a profit of 30%

So, CP of the table by Bimal ( $x$ ) =  $120 \times 1.3 = 156$

Asim sells his table to Barun at a loss of 30%

So, CP of the table by Barun ( $y$ ) =  $0.7 \times 80 = 56$

#### Smart Approach:

$$\begin{aligned}\text{Successive profit } x &= 100 + (20 + 30 + \frac{20 \times 30}{100}) \\ &= 156\end{aligned}$$

$$\begin{aligned}\text{Successive loss } y &= 100 - (-20 - 30 + \frac{-20 \times -30}{100}) \\ &= 56\end{aligned}$$

$$\text{ATQ, } \frac{x-y}{P} = \frac{156 - 56}{100} = 1$$

**EXAMPLE:** Anil buys 12 toys and labels each with the same selling price. He sells 8 toys initially at 20% discount on the labelled price. Then he sells the remaining 4 toys at an additional 25% discount on the discounted price. Thus, he gets a total of ₹2,112, and makes a 10% profit. With no discounts, his percentage of profit would have been: [CAT 2020]

(1) 55

(2) 60

(3) 54

(4) 50

**SOLUTION:** Option (4) is correct.

Let cost price = ₹ $x$

As he is getting 10% profit when selling all at ₹2,112.

$$\Rightarrow 12 \times x \times \frac{110}{100} = 2,112$$

$$x = ₹160$$

Now assumed marked price =  $100x$

So 8 toys sold at  $80x$  and 4 toys sold at [20% + 25%] discount.

Means at these 4 toys total discount =  $20 + 25 + \frac{25 \times 20}{100} = 40\%$

Means sale price =  $60x$

So total sale price =  $8 \times 80x + 4 \times 60x = 880x$

$$\text{Given, } 880x = 2,112 \\ x = 2.4$$

$$\text{So, marked price } \frac{240 - 160}{160} \times 100 = 50\%$$

$$\text{So the total percentage profit when all sold at marked price } \frac{240 - 160}{160} \times 100 = 50\%$$

### Smart Approach:

1 toy Selling price = 100 unit

12 toy Selling price = 1200

unit

$$\Rightarrow 80 \times 8 = 640$$

$$\Rightarrow 60 \times 4 = 240$$

Total S.P = 880

880 unit = 2.4

1 unit = 2112

S.P  $\Rightarrow$  1200 unit = 2880

and C.P =  $2112 \times \frac{100}{110} = 1920$

$$\text{profit} = \frac{2880 - 1920}{1920} \times 100$$

$$= \frac{960}{1920} \times 100 = 50\%$$

**EXAMPLE:** A dealer marks his goods at 20% above the cost price and allows a discount of 15% on the marked price. What is his gain or loss percentage? (SSC CGL 2023 Pre)

- (1) 1.4% gain      (2) 2.4% gain      (3) 3.4% Loss      (4) 4.2% Loss

**SOLUTION:** Option (2) is Correct.

let the CP of article be 100.

Then,

Marked Price of Article = 120

$$\text{Discount} = \frac{120 \times 15}{100} = 18$$

$$\text{Selling Price} = 120 - 18 = 102$$

$$\text{Profit} = 102 - 100 = 2$$

$$\text{Profit\%} = \frac{2}{100} \times 100 = 2\%$$

**SHORTCUT:**  $\frac{6}{5} \times \frac{17}{20} = \frac{102}{100}$

$$\text{Profit\%} = \frac{2}{100} \times 100 = 2\%$$

## SIMPLE INTEREST AND COMPOUND INTEREST

### Simple Interest (SI)

- Principal = Amount Invested/borrowed.

- Time = Time for which the amount is invested/borrowed. It can be in months as well as per annum.
- Rate% = Percentage of interest for per unit time.
- Simple Interest =  $\frac{P \times R \times T}{100}$
- Amount = Principal + Interest or  $P \times \left[1 + \frac{RT}{100}\right]$ .
- Principal remains constant every year.
- If a sum  $P$  becomes ' $n$ ' times of itself in a certain time, then the simple interest on it will be  $P(n - 1)$ .

### Compound Interest (CI)

- Principal increases every year in the same proportion.
- Amount after 1<sup>st</sup> year becomes principle for 2<sup>nd</sup> year and amount after 2<sup>nd</sup> year becomes principle for 3<sup>rd</sup> year, so on and so forth.
- Amount = Principal  $\times \left[1 + \frac{\text{Rate}}{100}\right]^{\text{time}}$

[It is applicable only when the rate is per annum and compounding also happens after every year]

- Compound Interest = Amount – Principal = Principal  $\times \left(\left(1 + \frac{\text{Rate}}{100}\right)^{\text{time}} - 1\right)$ .
- Rate of compound interest can also be converted into single flat % of interest using successive percentage formula;  $a + b + \frac{ab}{100}$ .

### Important Point

- For half yearly compounding, the rate becomes half and time becomes double.
- For quarterly compounding, the rate becomes 1/4<sup>th</sup> and the time becomes 4 times.
- For monthly compounding, the rate becomes 1/12<sup>th</sup> and time becomes 12 times.
- If the principle and rate are same then the difference between compound interest and simple interest for 2 years = Principle  $\times \left(\frac{r}{100}\right)^2$ .
- If the principle and rate are same then the difference between compound interest and simple interest for 3 years =  $\frac{3 \times \text{Principle}(\text{Rate})^2}{(100)^2} + \text{Principle} \left(\frac{\text{Rate}}{100}\right)^3$

**NOTE**

Difference can also be calculated by converting both SI and CI rate of interest rate into flat single equivalent percentage.

**EXAMPLE:** John borrowed ₹2,10,000 from a bank at an interest rate of 10% per annum, compounded annually. The loan was repaid in two equal installments, the first after one year and the second after another year. The first installment was interest of one year plus part of the principle amount, while the second was the rest of the principle amount plus due interest thereon Calculate each installment in ₹. [CAT 2018]

**SOLUTION:** The correct answer is [1,21,000].

By the end of two years, 2,10,000 will increase to  $2,10,000 \times 1.1 \times 1.1 = ₹2,54,100$

Let the amount paid as installment every year be ₹x.

John would pay the first installment by the end of the first year. Additionally he needs to pay extra  $0.1x$  in the next year. Hence he pays  $1.1x$  in the 2<sup>nd</sup> year

$$\Rightarrow 1.1x + x = 2,54,100$$

$$\Rightarrow 2.1x = 2,54,100$$

$$\Rightarrow x = ₹1,21,000.$$

**EXAMPLE:** Amal invests ₹12,000 at 8% interest, compounded annually, and ₹10,000 at 6% interest, compounded semi-annually, both investments being for one year. Bimal invests his money at 7.5% simple interest for one year. If Amal and Bimal get the same amount of interest, then the amount, in ₹, invested by Bimal is [CAT 2019]

**SOLUTION:** The correct answer is [20,920].

The amount with Amal at the end of 1 year  
 $= 12,000 \times 1.08 + 10,000 \times (1.03)^2 = 23,569$

Interest received by Amal =  $23,569 - 22,000$   
 $= 1,569$

Let the amount invested by Bimal =  $100b$

Interest received by Bimal =  $100b \times 7.5 \times \frac{1}{100}$   
 $= 7.5b$

It is given that the amount of interest received by both of them is the same

$$7.5b = 1,569$$

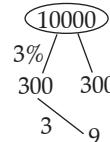
$$\Rightarrow b = 209.2$$

Hence, amount invested by Bimal =  $100b$   
 $= 20,920.$

**Smart Approach:**

$$\text{Interest on } 12000 = 12000 \times \frac{8}{100} = 960$$

$$\text{Interest on } 10000$$



$$= 300 + 309 = 609$$

Total Interest of Amal = Invest of Bimal  
 on x at 7.5 S.I

$$960 + 309 = \frac{7.5}{100} \times x$$

$$x = 20920$$

**EXAMPLE:** A person invested a certain amount of money at 10% annual interest, compounded half-yearly. After one and a half years, the interest and principal together became ₹18,522. The amount, in ₹, that the person had invested is [CAT 2020]

**SOLUTION:** The correct answer is [16,000].

Rate of interest = 10% annual

$$\text{So for half yearly } = \frac{10}{2} = 5\% \text{ half yearly}$$

Total amount = 18522

Let principal amount =  $P$

Then after one and half year

$$\text{Total amount} = P \times \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100}$$

$$\Rightarrow 18,522 = P \times \left(\frac{105}{100}\right)^3$$

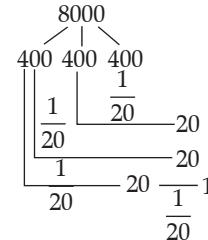
$$\Rightarrow P = \frac{18,522 \times 100 \times 100 \times 100}{105 \times 105 \times 105}$$

$$\Rightarrow P = ₹16,000$$

**Smart Approach:**

$$\text{Rate of interest half yearly} = 5\% = \frac{1}{20}$$

$$\text{Let amount} = 20 \times 20 \times 20 = 8000$$



$$\text{Interest} = 1261$$

$$\text{Amount} = 8000 + 1261 = 9261 - 18522$$

1 → 2

$$\begin{aligned} \text{Principle} &= 8000 \times 2 \\ &= 16000 \end{aligned}$$

**EXAMPLE:** If the rate of interest is 5%, then what would be the difference between compound interest and simple interest received on ₹10,000 (each) after 3 years from now?

(CDS 2024-I)

(1) ₹175.25

(2) ₹152.25

(3) ₹76.25

(4) ₹24.25

**SOLUTION:** Option (3) is Correct.

$$\text{Simple Interest} = \frac{10000 \times 3 \times 5}{100} = 1500$$

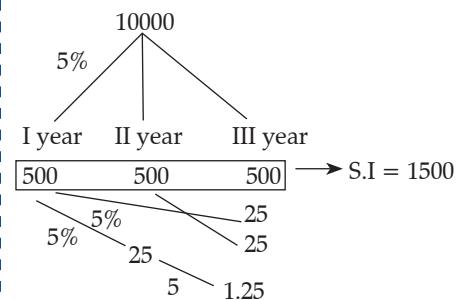
Amount on Compound Interest =

$$10000 \times \frac{(100 + 5)^3}{100} = 11576.25$$

$$\begin{aligned} \text{Compound Interest} &= 11576.25 - 10000 \\ &= 1576.25 \end{aligned}$$

$$\begin{aligned} \text{Required Difference} &= 1576.25 - 1500 \\ &= 76.25 \end{aligned}$$

**Smart Approach:**



**SHORTCUT:** If the principle and rate are same then the difference between compound

$$\text{interest and simple interest for 3 years} = \frac{3 \times \text{Principle} (\text{Rate})^2}{(100)^2} + \text{Principle} \left( \frac{\text{Rate}}{100} \right)^3$$

$$\text{Required Difference} = \frac{3 \times 10000 \times (5)^2}{(100)^2} + 10000 \times \left( \frac{5}{100} \right)^3 = 76.25$$

## RATIO AND PROPORTION & PARTNERSHIP

### Ratios

- Ratio is the simplest form of any fraction which shows the numerical comparison between the two quantities. For example, if ratio between the ages of A and B is 2:3 that means if the age of A will be 2 than B's age will be 3 but if the age of A becomes 4 then the age of B will become 6 and vice versa.
- Ratio remains same when numerator and denominator are multiplied by the same number,  $\frac{a}{b} = \frac{ac}{bc}$ .
- Ratio remains same when numerator and denominator are divided by the same number,

$$\frac{a}{b} = \frac{a/c}{b/c}$$

$$\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = k = \frac{a+c+e}{b+d+f}$$

### Proportions

- If two ratios are equal that means they are in proportion.
- If A:B: :C:D then D is called forth proportional.
- If A:B: :B:C then C is called third proportional to a and b.
- INVERTED:** If  $\frac{a}{b} = \frac{c}{d}$  then  $\frac{b}{a} = \frac{d}{c}$
- ALTERNANT:** If  $\frac{a}{b} = \frac{c}{d}$  then  $\frac{a}{c} = \frac{b}{d}$
- COMPONENDO:** If  $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a+b}{b} = \frac{c+d}{d}$
- DIVIDENDO:**  $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a-b}{b} = \frac{c-d}{d}$
- COMPONENDO AND DIVIDENDO:** If  $\frac{a}{b} = \frac{c}{d} \Rightarrow \left( \frac{a+b}{a-b} \right) = \left( \frac{c+d}{c-d} \right)$

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"She is an alumnus of IIM Ahmedabad (batch of 2020), and Delhi University (batch of 2018). Being a 99 percentiler in CAT 2017 and having cleared 12 IIM interviews in her first attempt, it is her lifetime mission to empower students to make the right career decisions by bridging the information gap in society. She has 2 years of corporate experience after her MBA and 7 years of guiding MBA aspirants through consistently creating content across her social media platforms. She has a followership of 1.6 million students cumulatively on YouTube, Instagram, LinkedIn & Quora."

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