QUANTITATIVE APTITUDE

PERCENTAGE

PROF: RAVINDRA P. MANGRULKAR

APTITUDE TRAINER

PIBM PUNE

Important Formulas - Percentage

- **Percentage**

  Percent means for every Cent (100)

  So, when **percent** is calculated for any value, it means that we calculate **the value for every 100** of the actual value.

  percent is denoted by the symbol %.

- **For example, x percent is denoted by x%**

Important Formulas - Percentage

- **x% = x / 100**

  Example : 25% = 25/100 = 1/4

- **To express x / y as a percent, we have x / y = (x / y × 100) %**

  Example : 1 / 4 = (1 / 4×100)% = 25%

RATIO TABLE

%	FRACTION
5	1/20
8	2/25
10	1/10
12	3/25
15	3/20
16	4/25
20	1/5
25	1/4

%	FRACTION
60	3/5
75	3/4
3(1/8)	1/32
6(1/4)	1/16
8(1/3)	1/12
12(1/2)	1/8
13(1/3)	2/15

%	FRACTION
14(2/7)	1/7
16(2/3)	1/6
33(1/3)	1/3
37(1/2)	3/8
62(1/2)	5/8
66(2/3)	2/3
87(1/2)	7/8

Important Formulas - Percentage

- If the **price** of a commodity **increases** by **R%,** the **reduction** in **consumption** so as **not to increase the expenditure**

  = **[R / (100+R)]×100%**

- If the price of a commodity **decreases** by **R%,** the **increase** in **consumption** so as **not to decrease the expenditure**

  = **[R / (100−R)]×100%**

EXAMPLES

- **EXAMPLE 1: THE PRICE** OF RICE **FALLS BY 20%.** HOW MUCH RICE CAN BE BROUGHT NOW WITH THE MONEY THAT WAS SUFFICIENT TO BUY **20 KG** OF RICE PREVIUOSLY?
- **SOLUTION: ACCORDING TO FORMULA**

increase in **consumption** = **[R / (100−R)]×100%**

= **[(20 / (100 – 20)] ×100%**

= **(20 / 80) × 100 %**

= **25%**

EARLIER 20 KG RICE WAS BROUGHT , NOW 25% MORE = 20 * (125/100)

= **25 KG CAN BE BROUGHT**

EXAMPLES

- **EXAMPLE 2:** THE **PRICE** OF SUGAR IS **REDUCED BY 25%.** BUT INSPITE OF THE DECREASE, **AKSHAY** ENDS UP **INCREASE HIS EXPENDITURE** ON SUGAR BY **20%.** WHAT IS THE **% CHANGE** IN HIS MONTHLY **CONSUMPTION** OF SUGAR?
- **SOLUTION:**

LET AKSHAY USE TO CONSUME 100 KG FOR RS 100.

DUE TO **25%** REDUCTION IN PRICE, **100 KG IS FOR RS 75**.

DUE TO **20%** INCREASE IN EXPENDITURE, PURCHASED FOR **RS. 120**

FOR RS. 120 HE COULD BUY = (100/75) * 120 = 160KG.

INCREASE IN CONSUMPTION = 160 – 100 = 60KG.

% INCREASE IN CONSUMPTION = (60/100) * 100 = 60%.

Important Formulas - Percentage

- If the **population of a town = P** and it **increases** at the rate of **R% per annum**, then **Population after n years**

  $= P*[1+(R / 100)]^n$

- **If the population of a town = P** and it **increases** at the rate of **R% per annum**, then **Population before n years**

  $= P / [1+(R / 100)]^n$

EXAMPLES

- **EXAMPLE 3: THE POPULATION OF A VILLAGE IS 100000. THE RATE OF INCREASE IS 10% P.A. FIND THE POPULATION AT THE START OF 3RD YEAR?**
- **SOLUTION: Population after n years**

$$= P*[1+(R / 100)]^{n}$$

$$= 100000*[(1 + (10 / 100)]^{2}$$

$$= 100000 * (11/ 10)^{2}$$

$$= 121000$$

Important Formulas - Percentage

- If the **present value of a machine = P** and it **depreciates** at the rate of **R% per annum**, Then **Value of the machine after n years**

  $= P*[1 - (R / 100)]^n$

- If the **present value of a machine = P** and it **depreciates** at the rate of **R% per annum**, Then **Value of the machine before n years**

  $= P / [1 - (R / 100)]^n$

THEOREMS

- **THEOREM # 1**:

  IF **2 VALUES** ARE RESPECTIVELY **X%** AND **Y%** **MORE** THAN **A THIRD NUMBER**,
  THEN THE **1ST** IS **[(100 + X) / (100 + Y)] * 100%** OF THE **2ND**.

- **EXAMPLE 4:**

  2 NUMBERS ARE RESPECTIVELY **20% AND 50% MORE** THAN **THE THIRD NUMBER**. WHAT **%** IS THE **1ST OF THE 2ND**?

- **SOLUTION: ACCORDING TO FORMULA**

  THE **1ST** IS **[(100 + 20) / (100 + 50)] * 100%** OF THE **2ND**

  THE **1ST** IS **(120/150) * 100%** OF THE **2ND**

  THE **1ST** IS **4/5* 100%** OF THE **2ND**

  THE 1ST IS 80% OF THE 2ND.

THEOREMS

- **EXAMPLE 5:**

  2 NUMBERS ARE RESPECTIVELY **30% AND 40% LESS** THAN **THE THIRD NUMBER**. WHAT **%** IS THE **2ND OF THE 1ST ?**

- **SOLUTION: ACCORDING TO FORMULA**

  THE **1ST** IS **[(100 - 40) / (100 - 30)] * 100%** OF THE **2ND**

  THE **1ST** IS **(60/70) * 100%** OF THE **2ND**

  THE **1ST** IS **(600/7)* 100%** OF THE **2ND**

  THE 1ST IS 85&(5/7)% = 85.71% OF THE 2ND.

THEOREMS

- **THEOREM # 2:**

  IF **A IS X% OF C** AND **B IS Y% OF C**,
  THEN **A** IS **(X/ Y) *100%** OF **B.**

- **EXAMPLE 6:**

  2 NUMBERS ARE **20% AND 25%** OF THE **THIRD NUMBER**. WHAT **%** IS THE **1ST** OF THE **2ND**?

- **SOLUTION: ACCORDING TO FORMULA**

  = A IS **(20/ 25) *100%** OF **B**

  = A IS **80%** OF **B**

THEOREMS

- **THEOREM # 3: X%** QUANTITY IS **TAKEN BY 1ST, Y%** IS TAKEN BY **2ND, REMAINING** IS TAKEN BY **3RD** , NOW **A** AMOUNT IS **LEFT**, THEN IN THE **BEGINNING** THERE WAS

  = [A*100*100*100 / (100 -X)*(100 – Y)* (100 - Z)]

- **EXAMPLE 7: RAJ** SPENDS **20%** OF HIS MONTHLY ON HIS **HOUSEHOLD EXPENDITURE**, **15%** OF THE REST **ON BOOKS**. **30%** OF THE REST **ON CLOTHES** AND **SAVES** THE **REST**. ON COUNTING HE COMES TO KNOW THAT HE HAS FINALLY **SAVED RS. 9520**. FIND HIS **MONTHLY INCOME**.
- **SOLUTION: ACCORDING TO FORMULA**
- **MONTHLY INCOME = 9520*100*100*100 / (80 * 85 * 70)**

  = 20000.

THEOREMS

- **THEOREM # 4:** IF **1ST VALUE** IS **R% MORE** THAN THE **2ND VALUE**, THEN THE **2ND** IS **[R / (100 + R)] * 100 % LESS** THAN THE **1ST** VALUE.
- **THEOREM # 5 :** SIMILARLY, IF **1ST VALUE** IS **R% LESS** THAN THE **2ND VALUE**, THEN THE **2ND** IS **[R / (100 - R)] * 100 % MORE** THAN THE **1ST** VALUE.
- **EXAMPLE 8:** IF **A'S** SALARY IS **25% MORE THAN** THAT OF **B**, THEN HOW MUCH **%** IS **B'S** SALARY **LESS THAN** THAT OF **A**?
- **SOLUTION: B'S SALARY LESS BY**

  [25 / (100+25)] * 100%

  = 20%

THEOREMS

- **THEOREM # 6:**

  IF **THE VALUE** OF A NUMBER IS **1ST INCREASED BY X%** AND AGAIN **INCREASED BY Y%** THEN **THE NET CHANGE IS** ALWAYS **[X + Y + (X*Y / 100)].**

- **THEOREM # 7:**

  IF **THE VALUE** OF A NUMBER IS **1ST INCREASED BY X%** AND AGAIN **INCREASED BY Y%** THEN **THE NET CHANGE IS** ALWAYS **[X + Y + (X*Y / 100)].**

EXAMPLE 9: A SHOPKEEPER MARKS THE PRICE OF HIS GOODS **AT 20% HIGHER** THAN THE ORIGINAL PRICE. AFTER THAT, HE ALLOWS A **DISCOUNT OF 10%.** WHAT **% PROFIT OR LOSS** DID HE GET?

SOLUTION: NET CHANGE

= [20 – 10 – (20*10 / 100)] = + 8% +VE IS PROFIT

EXAMPLE 10:

THE HEIGHT OF A TRIANGLE IS **INCREASED BY 40%.** WHAT CAN BE THE **MAXIMUM % INCREASE IN LENGTH OF THE BASE** SO THAT THE **INCREASE IN AREA** IS RESTRICTED TO A **MAXIMUM OF 60%?**

SOLUTION:

LET THE MAXIMUM % INCREASE IN LENGTH OF THE BASE BE Y.

ACCORDING TO FORMULA

$$60 = [40 + Y + (40 * Y) / 100]$$

$$60 = (4000 + 100Y + 40Y) / 100$$

$$6000 = 4000 + 140Y$$

$$2000 = 140Y$$

$$Y = 2000 / 140$$

$$Y = 100 / 7$$

$$\underline{Y = 14 \& (2/7) = 14.28}$$

EXAMPLE 11:

Two students appeared at an examination. **One** of them secured **9 marks more** than the other and his marks was **56%** of the **sum of their marks**. **What are the marks obtained by them**?

Explanation :

Let the marks secured by them be x and (x + 9)

Then sum of their marks = x + (x + 9) = 2x + 9

Given that **(x + 9)** was **56%** of the **sum of their marks**

=>(x+9)=(56/100)(2x+9)

=>(x+9)=(14/25)(2x+9)

=> 25x + 225 = 28x + 126

=> 3x = 99

=> x = 33

Then (x + 9) = 33 + 9 = 42

Hence their marks are 33 and 42

EXAMPLE 12:

If **20% of a = b**, then **b% of 20 is** the same as:

Explanation :

20% of a = b

$\Rightarrow$**b = (20/100)a**

$\Rightarrow$**b% of 20 = (b/100)*20**

$\Rightarrow$=[{(20/100)*a}/100]*20

$\Rightarrow$**=(20×20×a)/100×100**

$\Rightarrow$**=4*a/100 = 4% of a**

EXAMPLE 13: In a competitive examination in **State A, 6% candidates got selected** from the total appeared candidates. **State B** had an equal number of candidates appeared and **7% candidates got selected with 80 more candidates** got selected **than A**. **What was the number of candidates appeared from each State?**

Explanation :

State A and State B had an equal number of candidates appeared.

In state A, 6% candidates got selected from the total appeared candidates

In state B, 7% candidates got selected from the total appeared candidates

But in State B, 80 more candidates got selected than State A

From these, it is clear that **1% of the total appeared candidates in State B = 80**

=> **total appeared candidates in State B = 80 x 100 = 8000**

=> **total appeared candidates in State A = total appeared candidates in State B = 8000**

EXAMPLE 14: A student multiplied a number by **3/5** instead of **5/3**.**What is the percentage error in the calculation**?

Explanation :

Let the number = 1

Then, ideally he should have multiplied 1 by 5/3.

Hence the **correct result** was **1 x (5/3) = (5/3)**

By mistake, he multiplied 1 by 3/5.

Hence the **result with the error = 1 x (3/5) = (3/5)**

Error = (5/3)−(3/5)=(25−9)/15=16/15

percentage error = (Error/True Value)×100

=[(16/15)(5/3)]×100

=(16×3×100)/(15×5)

=(16×100)/(5×5)

=**16×4 = 64%**

EXAMPLE 15:

Aman got **30%** of the maximum marks in an examination and failed by **10** marks. However, Suman who took the same examination got **40%** of the total marks and got **15** marks more than the passing marks**. What were the passing marks in the examination?**

Explanation : **Let x is the maximum marks of the examination**

Marks that Aman got = 30 % of x = (30*x)/100

Given that Aman failed by 10 marks

⇒Minimum Pass Mark = [(30*x)/100]+10.....(Equation 1)

Marks that Suman got = 40 % of x = (40*x)/100

Given that **Suman got 15 marks more than the passing marks**

⇒ (40*x)/100 =Minimum Pass Mark +15

⇒Minimum Pass Mark = [(40*x)/100] −15.....(Equation 2)

From equations 1 and 2, we have

[(30*x)/100]+10 = [(40*x)/100]−15

⇒(10*x)/100 = 10+15 = 25

⇒x/10=25

⇒x = 10×25 = 250

⇒Maximum marks of the examination = x = 250

Substituting the value of x in Equation 1,

we have **Minimum Pass Mark = [(30*x)/100]+10**

= [(30×250) / 100] + 10 = 75+10 = 85.

THANK YOU.