

CA FOUNDATION

The Institute of Chartered Accountants of India

BUSINESS MATHEMATICS & LOGICAL REASONING



CONTENTS

BUSINESS MATHEMATICS

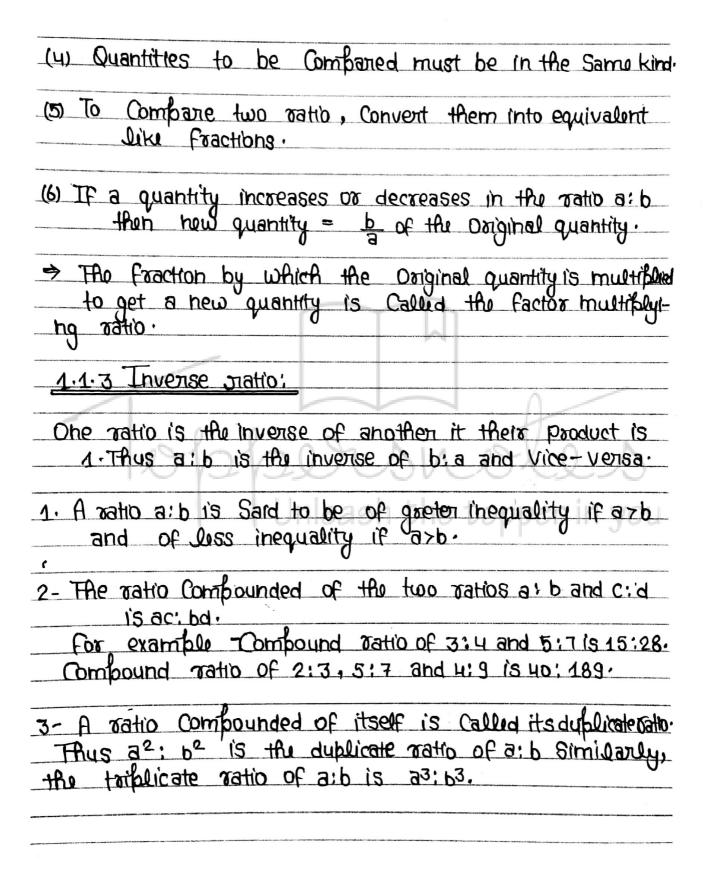
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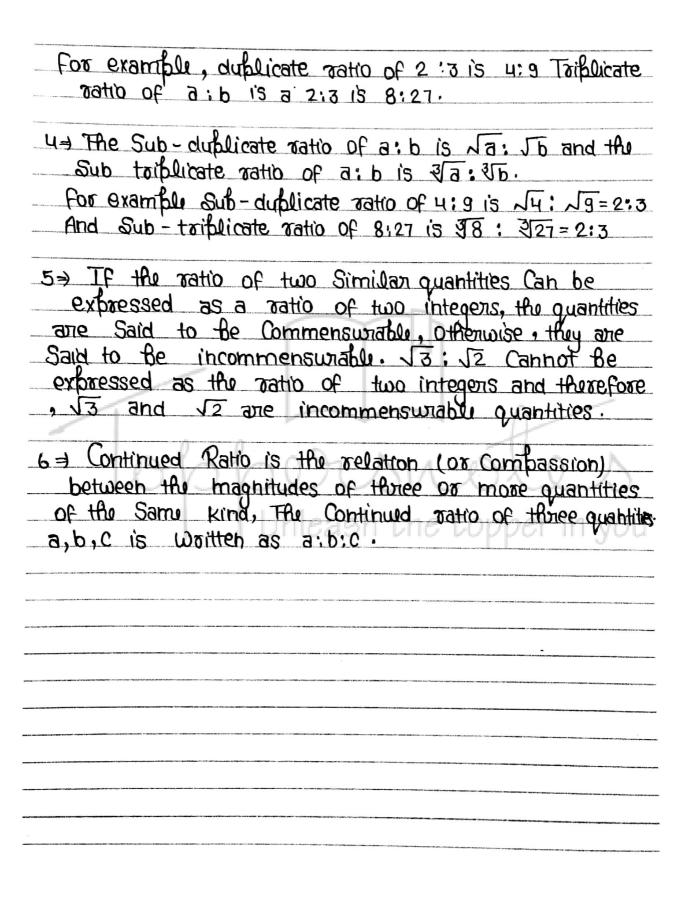
RATIO & PROPORTION

A viatio is a Companison of the size of two or more
quantities of the Same kind by division.
If a and b are two quantities of the same kind (in Same unit), then the fraction alb is Called the ratio of a tob.
* It is worthen as a: b
* Thus the ratio of a to b = alb or a:b
* The quantities a and b are Called the terms of the ratio.
* a is Called the first term or antecedent and b is Called the Second term or Consequent.
Important hotes:
(4) Both terms of a viatio Can be multiplied or divided by the Same (non-zero) humber.
(2) The Orden of the terms in ratio is important.
3;4 ≠ 4:3
(3) Ratio exists Only blu quantities of the Same Kind.
O TI DONG KITO

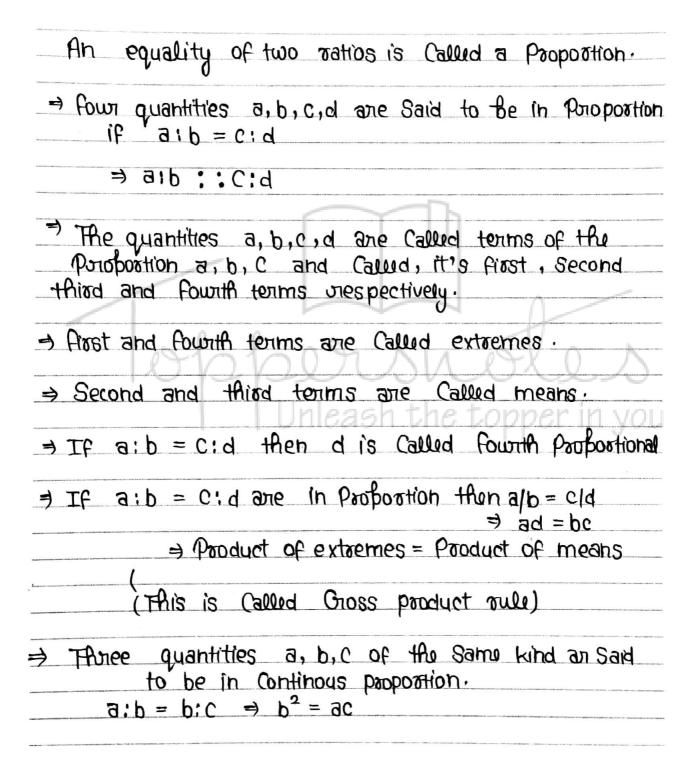














ITF a, b, C are in Continous proportion, then the middle term b is Called the mean proportion hal blw a & C a is the first proportional and C is the third proportional
Thus if his mean proportional how a C , then $b^2 = ac$
Three or more humbers are related that the ratio of the first to the Second, the ratio of the third, third to the fourth, are all equal, the humbers are Said to be in Continued Proportion H = y = z = w = P



1.2.1 Properties of Proportion-

1 - if a: b = C:d, then ad = bc

Proof. $\frac{a}{b} = \frac{c}{d}$; ... ad = bc (By Oross-multiplication

2- if a: b = c:d, then b: a = d:c (Inventendo)

Proof. $\frac{a}{b} = \frac{c}{d}$ or $1 / \frac{a}{b} = 1 / \frac{c}{d}$, or, $\frac{b}{a} = \frac{d}{c}$

3- if a:b = C:d, then a:c = b:d (Autennendo)

Proof. $\frac{a}{b} = \frac{c}{d}$ or, ad = bc

Dividing both Sides by Cd, We get.

ad = bc, or a = b die aic = bider in

u-if a:b=c:d, then a+b;b=c+d:d (Combonendo)

 $\frac{\rho_{\text{5DOf.}}}{b} = \frac{c}{c}, \quad \text{or,} \quad \frac{a}{b} + 1 = \frac{c}{d} + 1$

 $\frac{a+b}{or, b} = \frac{c+d}{d}, i-e \ a+b; b = c+d; d$

5- if a: b = c:d, then a-b=c-d:d (Dividendo)

 $\rho_{0000f} = \frac{c}{b}, \text{ or } = \frac{c}{d} + 1 = \frac{c}{d} + 1, \text{ or } = \frac{c}{d} + 1, \text{ or }$

3+b = c-b, 1.e. a-b; b = c-d; d.



6 =) if a:b=c:d, then a+b:a-b=C+d;C-d(Componendo) and Dividendo)
$P_{000}f, \frac{a}{b} = \frac{c}{d}, 0 = \frac{a}{b} + 1 = \frac{c}{d} + 1, 0$
$\frac{a+b}{b} = \frac{c+d}{d}$
Again, $\frac{a}{b} - 1$, $= \frac{c}{d} - 1$, or $\frac{a - b}{b} = \frac{c - d}{d}$
Dividing (1) by (2)
hie get,
3+b = C+d i.e a+b; a-b = c+a; c-d a-b C-d i.e a+b; a-b = c+a; c-d
(7) if a; b = c; d = e; f = then
each of those rations is equal
(a+c+e+); (b+d+f+)



SURDS & INDICES

The index of a number Says how many times to use the number in a multiplication

⇒ It is Written as a Small number to the right and above the base number.

Exit 2 exponent

8 (or)

Base Index
(or)

Power

means,
A factor which multiples is Called the "base" and the number of times it is multiplied is Called the "Power" or the "index".

 $\frac{\text{Law }T}{\text{am } x \text{ ah = am+n}}$

When mand n are Positive integers.

Ex; 34x35 ⇒ 34+5 = 34,

 $\frac{aw II}{ah} = a^{m-h}, \text{ when mand n are positive integers.}$ $\frac{Ex}{2^{4}} = 2^{7-4} = 2^{3} = 8.$



Law-3

$$(a^m)^h = a^{mh}$$

Where mand n are positive integers.

Example:

$$\left(2^{4}\right)^{3} = 2^{4 \times 3} = 2^{4} = 4096$$

Law-4

When I can take all of the Values.

Examble:

$$= (2x3)^3 = 2^3x3^3 = 8x27 = 216$$

Properties -

and
$$\frac{1}{a^{-m}} = a^m$$



LOGARITHM

the logarithm is the increase function to exponen- tiation
That means the logarithm of a given number a is the exponent to which another fixed humber the base by must be raised, to produce that number up.
Ext how many 25 We multiply to get 8?
=> 2×2×2 = 8, So he had to multiply is Called the 'base'
→ " the logarithm of 8 With base 2 is 3.
→ or " log base 2 rofe8 is 3"he topper in you
OX
"the base 2 log of 8 is 3.
Example: 24 = 16
Jog_16 = 4



<u>Facts'-</u>
1 → The two equation ax = n and x = log a 11 and Only transformation of each other and should be remembered to change One form of the relation into the other.
2.3 The logarithm of 1 to any base is zero, This is because any humber raised to the power zero is one. Since $a^{\circ} = 1$, $log_{\circ} 1 = 0$
3→ The logarithm of any quantity of the Same base is unity. This is because any quantity Since a¹ = a , log, a = 1 Examples:
1. if $\log_0 \sqrt{2} = \frac{1}{6}$, find the Value of a 2. We have $\frac{1}{6} = \sqrt{2} \Rightarrow a = (\sqrt{2})^6 = 2^3 = 8$
2- Find the logarithm of 5832 to the base $3\sqrt{2}$ Let us take $\log 3\sqrt{2}$ $5832 = x$
We may write, $(3\sqrt{2})^{x} = 5832 = 8 \times 729 = 2^{3} \times 3^{6} = (\sqrt{2})^{6} (3)^{6} = (3\sqrt{2})^{6}$
Logarithms of numbers to the base 10 are known as Common logarithm.



Fundamental Laws of Logarithm. 1 = Logarithm of the Product of two numbers is equal to the Sum of the Logarithms of the numbers to the Same base i.e. Logamn = logam + logan the logarithm of the quotient of two numbers is equal to the difference of their logarithm to Same base. logam - logan 3) logarithm of the humber raised to the power equal to the index of the power multiplied logarithm of the humber to the Same base. log mh = h log m Hange of Base the Joganithm of a number to any base is given loganithm of the Same humber to any base Can be determined from the onelation Jogam = Jogam x Jogap logam 20968 209103



logarithm tables:			
<u> 2004 auture (abues-</u>			
The logarithm of a number Consists of two			
parts, the whole part or the integral part is			
Called the chracteristic and the decimal part is			
Called the "mantissa".			
on the letter has to be obtained from the			
on the letter has to be obtained from the			
logarithm tables.			
Chanacteristic:			
The Chracteristic of the Jogarithm			
of any number greater than, is positive and is One			
less than the number of digits to the left of the			
decimal point in the given number.			
Zeno oh positive Chracteristic When the number			
Zeno on positive chracteristic When the number under Consideration is greater than unity.			
Since - $10^{\circ} = 1$, $\log 1_{10} = 0$			
$10^{1} = 10$, $\log 10 = 1$			
$10^2 = 100$ $\log 100 = 2$			
<u> </u>			
$10^3 = 1000 \qquad \log 1000 = 3$			



hegative Chracteristics-

$$10^{-1} = \frac{1}{10} = 0 = 1 \Rightarrow \log_{10} 0.1 = -1$$

$$10^{-2} = 1 = 0.01 \rightarrow \log 0.01 = -2$$

Mantissa

The mantissa is the fractional part of the logarithm of a given humber-

Number	Mantissa	logarithm
Jog 4594	6623)/	= 3.6623
Jog 459.4	= (6623) e t	1= 2:6623 YOU
Jog 45.94	= (6623)	= 1.6623
Jog 4.594	= (6623)	= 0-6623
Jog .4594	= (6623)	=T.6623

Hinti loganithm

If H is the loganithm of a given number h with a given base then n is Called antiloganithm of the that base.

Ex:-logan=x then n= antilog H



Number	Loganithm.			
	3			
206	2.3139			
20.6	1.3139			
2.06	0.3139			
•206	-1.3139			
-0206	-2.3139			
Kelation blw indics	and logarithm			
1 logam + logam =	log mn			
	V			
@ logam" = h logam				
6 0 1 d 1 0 1 b 1				
1 log Cx log b = 1				
^				
Important Rints				
• Log, mn = logam + logan				
$Ex \cdot log(2x3) = log^2 + log 3$				
<u> </u>				
· loga (m/h) = log, m-log, n				
$Ex-log(3/2) = log^3 - log^2$				
The second secon	を できない できない できない できない できない できない できない できない			