Ratio | proportion | Indices

Ratio
- fraction
- unitless
- Simplest form
- Divisible by Non-Zero same

(a : b)
- a = Antecedant
- b = Consequent

- a > b — Ratio of Greater inequality
- a < b — Ratio of lesser inequality
- a = b — Ratio of equality

Note
- Duplicate Ratio of Sub-duplicate ratio of m : n = m : n
- Sub-duplicate ratio of duplicate ratio of m : n is m : n
- Triplicate ratio of Sub-triplicate ratio of a : b is a : b
- Sub triplicate ratio of triplicate of p : q - p : q
- Inverse Ratio of Inverse ratio of a : b - a : b

Types of Ratios
- Inverse
- Duplicate
- Triplicate
- Compounded
- Sub-triplicate
- Sub-duplicate
- Ratio is compounded with its inverse then it Ratio of Equality

(1) a^b or $b\sqrt{a}$ = a^b on calculator.

i) Take a on calsi
ii) press √ (b times)
iii) Deduct 1
iv) multiply the b
v) Add 1
vi) press (=) 12 times

press √ one in calsi its = Root 2
Twice = Root 4
Twice = Root 8
likewise, it will give ....

How to get $\sqrt[99]{a}$ on calsi.
1. press a on calsi
2. press (=) till next step
Count comes of (b) as 99.

proportion (P)

In a series - P, Q, M, S
- If P : Q = M : S
  OR
  PS = QM
  then they are said to be in proportion.

★ when (P) is in (P) then it is not necessary they must be in (CP)

Continued proportion

In, P, Q, M, S
If P : Q = Q : M = M : S
then they are said to be in Continued proportion-(CP)

★ When it is in CP then it is also in P

= Antecedant

= Consequent

a<b
Ratio of lesser inequality

a=b
Ratio of equality

- If Ratio is Compounded with itself then result is Duplicate Ratio.

Types of Ratios

- Ratio is Compounded with its Duplicate then its Triplicate
- Ratio is Compounded with its Inverse then its Ratio of equality

plicate Triplicate Compounded Sub-triplicate Sub-duplicate

ven $b\sqrt{a} = a^b$ on Calculator.

a on calsi
√ (x times)
educt 1
ultiply the b
d 1
ress (x =) 12 times

press (√) one on Calsi its = Root 2
Twice = Root 4
Thrice = Root 8
likewise, it will give ....

How to get $\sqrt[99]{a}$ on calsi.

(1) press a on calsi
(2) press (=) till 99 step
Count times of (b) as 99.

P, Q, M, S
= M : S

= Q as
y are said to be
ortion.

(b) is in (P) then

proportion (P)

Continued proportion

In, P, Q, M, S
If P : Q = Q : M = M : S
then they are said to be in Continued proportion (CP)

- Some imp properties on proportion.

① Alternendo property

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

② Addendo property $\frac{a+c}{b+d} = \frac{c+a}{d+b}$

⑤ Subtrahendo property $\frac{a-c}{b-d} = \frac{c-a}{d-b}$

④ Invertendo property $= \frac{a}{b} = \frac{c}{d} = \left\{\frac{b}{a} = \frac{d}{c}\right\}$

⑧ Componendo property $\frac{a+b}{b} = \frac{c+d}{d}$

⑥ Dividendo property $= \frac{a-b}{b} = \frac{c-d}{d}$

⑦ Componendo property / Dividendo $= \frac{a+b}{a-b} = \frac{c+d}{c-d}$

logarithms (logs) 2-(6 hour)

- log x = characteristics x + Mantissa of x.

log x → Characteristics (Integral part) + Mantissa (fractional / decimal part)

Characteristics (Integral part):

1. $x \geq 1$ (no. of digits before decimal point − 1)
2. $0 < x < 1$ (no. of zeroes immediate after decimal point + 1)

Mantissa (fractional / decimal part):

- From log table
- Calsi

properties of logs

1. A. log (log K) = Klo = log(A. logK)
2. Common base is 10
   Then $\log_{10}10 = 1$ 10 ★ $\log_{10}1 = 0$
   $\log_{10}100 = 2$ $\log 10^0 = 1$
   $\log_{10}1000 = 3$
3. If $\log_b a = k$ then $b^k = a$
4. $\log_b a = \frac{\log a}{\log b}$
5. $\log (a \times b) = \log a + \log b$
6. $\log_m (xyz) = \log_m x + \log_m y + \log_m z$

- Calculation of log(x) through Calsi
  1. Enter x in the Calsi
  2. press √ 18 times
  3. Deduct (1)
  4. multiply by 14230.9635

- Calculation of Anti-log of (x)
  1. Enter x on calsi
  2. Divide by 14230.9635
  3. Add 1
  4. press "x =" = 15 times.

7. $\log \frac{a}{b} = \log a - \log b$
8. $\log a^b = b \cdot \log a$
9. $\log_b a \times \log_a b = 1$
10. $\log_b a \times \log_c b = \log_c a$
11. $\log \frac{ab}{c} = \log a + \log b - \log c$

Indices

- $a^n \cdot a^n = a^{m+n}$
- $\frac{a^m}{a^n} = a^{m-n}$

- $a^x = y^x \Rightarrow a = y$
- $a^x = a^y \Rightarrow x = y$
- $a^m \cdot b^m \cdot c^m = (abc)^m$
- $a^{-m} = a^{\frac{1}{m}}$ / $a^m = a^{\frac{1}{m}}$
- $a^{\frac{m}{n}} \Rightarrow \sqrt[n]{a^m}$
- $a^0 = 1$

$$\left(\frac{xy}{z}\right)^m = \frac{(x)^m \cdot (y)^m}{(z)^m} = x^m \cdot y^m \cdot z^m$$

$$\sqrt[m]{a} = a^{\frac{1}{m}}$$

- $\frac{a^b \times a^c}{a^d} = a^{b+c-d}$
- $(m^p)^q = m^{pqr}$
- $(a \times b)^x = a^x \cdot b^x$

Rational

Commensurable (which can be written in the form of Integers)

Incommensurable Rat° (which cannot be written in the form of Integer)