

## Simplification

In simplification an expression, we must remove the brackets strictly in the order ( ), { }, [ ] and then we must apply the operations:

Of, Division, Multiplication, Addition and Subtraction.

**'BODMAS'** where B stands for bracket, O for of ('Of' means multiplication); D for division; M for Multiplication, A for Addition and S for Subtraction strictly in the order.

**Division Algorithm:** Dividend = (Divisor × Quotient) + Remainder

**Modulus or Absolute value :** The absolute value of a real number X is denoted by the symbol |x| and is defined as –

$$|x| = \begin{cases} x, & \text{if } x > 0 \\ -x, & \text{if } x < 0 \\ 0, & \text{if } x = 0 \end{cases}$$

Ex. : |5| = 5, |-5| = -(-5) = 5

In multiplication and division, when both the numbers carry similar sign, we get positive sign in the result otherwise we get negative sign in the result i.e.

$$\begin{array}{ll} (+) \times (+) & = + \\ (+) \times (-) & = - \\ (-) \times (+) & = - \\ (-) \times (-) & = + \\ (+) \times (+) & = + \\ (+) \times (-) & = - \\ (-) \times (+) & = - \\ (-) \times (-) & = + \end{array}$$

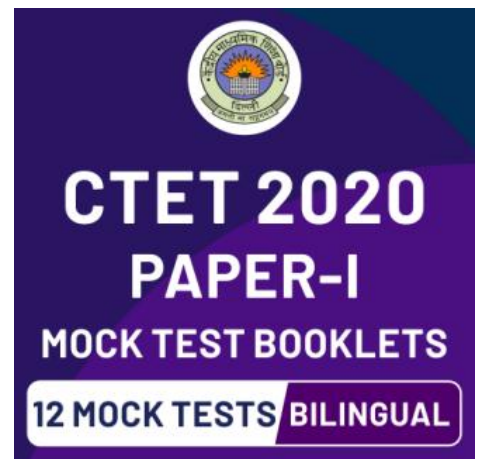
### Important terms:

**Identity elements of Addition:** '0' (zero) is called identity element of addition of '0' in any number does not affect that number.

e.g.  $x + 0 = x$  ( $x \in \mathbb{Q}$ )

**Identity element of Multiplication:** '1' is called identity element of multiplication as multiplication of '1' in any number does not affect that number.

e.g.  $x \times 1 = x$



**Inverse element of Addition / Negative element of Addition / Additive Inverse:** The number is called “Additive inverse” of a certain number, when it is added to the certain number and result becomes ‘0’ (zero).

**Ex.**

(i)  $x + (-x) = 0$

Here  $(-x)$  is Additive inverse of  $x$ .

(ii)  $(9) + (-9)$  is Additive inverse of ‘9’

**Inverse element of Multiplication / Reciprocal element / Multiplicative Inverse:** The number is called “Multiplicative inverse” of a certain number, when the product of number and multiplication inverse is 1.

**Ex.**  $x \times \frac{1}{x} = 1$

Here,  $\frac{1}{x}$  is multiplicative inverse of ‘x’

**CONTINUED FRACTION:** A continued fraction consists of the fractional denominators

**Ex.** The value of  $\frac{1}{2+\frac{1}{8+\frac{1}{5}}}$  is:

**Sol.**  $\frac{1}{2+\frac{1}{8+\frac{1}{5}}} = \frac{1}{2+\frac{1}{41/5}}$   
 $= \frac{1}{2+\frac{5}{41}} = \frac{1}{\frac{87}{41}} = \frac{41}{87}$

**Componendo and dividendo (C & D):** It is a theorem on proportions that allows for a quick way to perform calculations and **Reduce** the amount of expansions **needed** It is particularly useful when dealing with equations involving fractions or rational functions.

**Ex.**  $\frac{a}{b}, \frac{a+b}{a-b}, \frac{a+kb}{a-kb}$

If  $a, b, c$  and  $d$  are numbers such that  $b$  and  $d$  are non – zero and  $\frac{a}{b} = \frac{c}{d}$ , then

**Some Points**

1. Componendo  $\frac{a+b}{b} = \frac{c+d}{d}$
2. Dividendo  $\frac{a-b}{b} = \frac{c-d}{d}$
3. for  $k \neq \frac{a}{b}, \frac{a+kb}{a-kb} = \frac{c+kd}{c-kd}$
4. for  $k \neq \frac{-b}{a}, \frac{a}{b} = \frac{a+kc}{b+kd}$

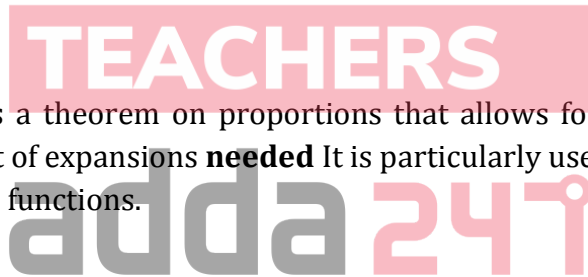
**Ex.** If  $\frac{a}{b} = \frac{16}{3}$ , Find the value  $\frac{a+b}{a-b}$

**Sol.** If  $\frac{a}{b} = \frac{c}{d}$

Then  $\frac{a+b}{a-b} = \frac{c+d}{c-d}$

The value  $\frac{a}{b} = \frac{16}{3}$

$\frac{a+b}{a-b} = \frac{16+3}{16-3} = \frac{19}{13}$



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**Recurring Number:**

**Pure recurring decimals:** These are recurring decimals where the recurrence starts immediately after the decimal point.

**Ex:**  $0.4444 \dots = 0.\overline{4}$

$232323 \dots = 3.\overline{23}$

$0.564564564 = 0.\overline{564}$

**Impure recurring decimals:** Unlike pure recurring decimals, in these decimals, the recurrence occurs after a certain number of digits in the decimal.

**Ex:**  $0.43542542 \dots = 0.43\overline{542}$

$0.546666 \dots = 0.54\overline{6}$

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