Algebra Formula:

- ## Square algebra formula

$(a + b)^2 = a^2 + 2ab + b^2$

$(a – b)^2 = a^2 – 2ab + b^2$

$a^2 – b^2 = (a – b)(a + b)$

$a^2 + b^2 = (a – b)^2 + 2ab = (a + b)^2 – 2ab$

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$
$(a – b – c)^2 = a^2 + b^2 + c^2 – 2ab – 2ac + 2bc$

$(a + b + c + …)^2 = a^2 + b^2 + c^2 + … + 2(ab + ac + bc + …..)$

- ## Cube based formula:

$(a + b)^3 = a^3 + b^3 + 3ab(a + b)$; $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$

$a^3 – b^3 = (a – b)(a^2 + ab + b^2)$

$a^3 + b^3 = (a + b)(a^2 – ab + b^2)$

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$

- ## 4th power algebra formula:

$(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4)$

$(a - b)^4 = a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4)$

$a^4 - b^4 = (a - b)(a + b)(a^2 + b^2)$

• 5th power formula:

$a^5 - b^5 = (a - b)(a^4 + a^3b + a^2b^2 + ab^3 + b^4)$

• nth power algebra formula

If n is a natural number, $a^n - b^n = (a - b)(a^{n-1} + a^{n-2}b + \ldots + b^{n-2}a + b^{n-1})$
If n is even $(n = 2k)$, $a^n + b^n = (a + b)(a^{n-1} - a^{n-2}b + \ldots + b^{n-2}a - b^{n-1})$

If n is odd $(n = 2k + 1)$, $a^n + b^n = (a + b)(a^{n-1} - a^{n-2}b + \ldots - b^{n-2}a + b^{n-1})$

$(a + b + c + \ldots)^2 = a^2 + b^2 + c^2 + \ldots + 2(ab + ac + bc + \ldots..)$

• Laws of Exponents (algebra formula)

$(p^m)(p^n) = p^{m+n}$

$(pq)^m = p^m q^m$

$(p^m)^n = p^{mn}$

• Fractional exponents:

$a^0 = 1$

$\frac{a_m}{a_n} = a^{m-n}$ (if $m > n$)

$= 1$ (if $m = n$)

$= \frac{1}{a_{n-m}}$ (if $m < n$)

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

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