BAAP OF ALL FORMULA LISTS

FOR IIT JEE

ALGEBRA

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SL#	FORMULA
1	$a^2 - b^2 = (a + b)(a - b)$
2	$a^3 - b^3 = (a - b)\left(a^2 + ab + b^2\right)$
3	$a^3 + b^3 = (a + b)\left(a^2 - ab + b^2\right)$
4	$a^4 - b^4 = \left(a^2 - b^2\right)\left(a^2 + b^2\right) = (a - b)(a + b)\left(a^2 + b^2\right)$
5	$a^5 - b^5 = (a - b)\left(a^4 + a^3b + a^2b^2 + ab^3 + b^4\right)$
6	$a^5 + b^5 = (a + b)\left(a^4 - a^3b + a^2b^2 - ab^3 + b^4\right)$
7	**If n is odd, then** $a^n + b^n = (a + b)\left(a^{n-1} - a^{n-2}b + a^{n-3}b^2 - \ldots - ab^{n-2} + b^{n-1}\right).$
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8	**If n is even, then** $a^n - b^n = (a - b)\left(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \ldots + ab^{n-2} + b^{n-1}\right),$ $a^n + b^n = (a + b)\left(a^{n-1} - a^{n-2}b + a^{n-3}b^2 - \ldots + ab^{n-2} - b^{n-1}\right).$
9	$(a - b)^2 = a^2 - 2ab + b^2$
10	$(a + b)^2 = a^2 + 2ab + b^2$
11	$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$
12	$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
13	$(a - b)^4 = a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4$
14	$(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$
15	**Binomial Formula** $(a + b)^n =$ ^ nC_0a^n + **^nC_1a^(n-1)b+** ^ $nC_2a^{n-2}b^2 + \ldots +$ **^nC_(n-1)ab^(n-1)+** ^ $nC_nb^n,$
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16	$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$
17	$(a + b + c + \ldots + u + v)^2 = a^2 + b^2 + c^2 + \ldots + u^2 + v^2 + 2(ab + ac + \ldots + au + av + bc + \ldots + bu + bv + \ldots + uv)$
18	$a^m a^n = a^{m+n}$

19	$\frac{a^m}{a^n} = a^{m-n}$
20	$(ab)^m = a^m b^m$
21	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$
22	$(a^m)^n = a^{mn}$
23	$a^0 = 1, a \neq 0$
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24	$a^1 = 1$
25	$a^{-m} = \frac{1}{a^m}$
26	$a^{\frac{m}{n}} = \sqrt[n]{a^m}$
27	$\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}$
28	$\sqrt[n]{a}\sqrt[m]{b} = \sqrt[nm]{a^m b^n}$
29	$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}, b \neq 0$
30	$\frac{\sqrt[n]{a}}{\sqrt[m]{b}} = \frac{\sqrt[nm]{a^m}}{\sqrt[nm]{b^n}} = \sqrt[nm]{\frac{a^m}{b^n}}, b \neq 0.$
31	$\left(\sqrt[n]{a^m}\right)^P = \sqrt[n]{a^{mp}}$
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32	$\left(\sqrt[n]{a}\right)^n = a$
33	$\sqrt[n]{a^m} = \sqrt[np]{a^{mp}}$
34	$\sqrt[n]{a^m} = a^{\frac{m}{n}}$
35	$\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$
36	$\left(\sqrt[n]{a}\right)^m = \sqrt[n]{a^m}$
37	$\frac{1}{\sqrt[n]{a}} = \frac{\sqrt[n]{a^{n-1}}}{a}, a \neq 0$
38	$\sqrt{a \pm \sqrt{b}} = \frac{\sqrt{a + \sqrt{a^2 - b}}}{2} \pm \frac{\sqrt{a - \sqrt{a^2 - b}}}{2}$
39	$\frac{1}{\sqrt{a} \pm \sqrt{b}} = \frac{\sqrt{a} \pm \sqrt{b}}{a - b}$
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40	**Definition of Logarithm**

	$y = \log_a x$ **if and only if** $x = a^y$ **where** $a > 0, a \neq 1.$
41	$\log_a 1 = 0$
42	$\log_a a = 1$
43	$\log_a 0 = \begin{cases} -\infty & \text{if } a > 1 \\ +\infty & \text{if } a < 1 \end{cases}$
44	$\log_a(xy) = \log_a x + \log_a y$
45	$\frac{\log_a x}{y} = \log_a x - \log_a y$
46	$\log_a(X^n) = n \log_a x$
47	$\log_a \sqrt[n]{x} = \frac{1}{n} \log_a x$
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48	$\log_a x = \frac{\log_c x}{\log_c a} = \log_c a \cdot \log_a c, c > 0, c \neq 1.$
49	$\log_a c = \frac{1}{\log_c a}$
50	$x = a^{\log_a x}$
51	**Logarithm to Base 10** $\log_{10} x = \log x$
52	**Natural Logarithm** $\log_e x = \ln x$, **where** $e = \lim_{k \to \infty} \left(1 + \frac{1}{k}\right)^k = 2.718281828\ldots$
53	$\log x = \left(\frac{1}{\ln 10}\right) \ln x = 0.434294 \ln x$
54	$\ln x = \left(\frac{1}{\log e}\right) \log x = 2.302585 \log x$
55	**Linear Equation in One Variable** $ax + b = 0, x = -\frac{b}{a}$
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56	**Quadratic Equation** $ax^2 + bx + c = 0, x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
57	**Discriminant** $D = b^2 - 4ac$
58	**Viete\'s Formulas** **If** $x^2 + px + q = 0$, **then** $\begin{cases} x_1 + x_2 = -p \\ x_1 x_2 = q \end{cases}$

59	$ax^2 + bx = 0, x_1 = 0, x_2 = -\frac{b}{a}$
60	$ax^2 + c = 0, x_{1,2} = \pm\sqrt{-\frac{c}{a}}$
61	**Cubic Equation. Cardano\'s Formula.** $y^3 + py + q = 0,$ $y_1 = u + v, y_{2,3} = -\frac{1}{2}(u+v) \pm \frac{\sqrt{3}}{2}(u+v)i,$ **where** $u = \sqrt[3]{-\frac{q}{2} + \sqrt{\left(\frac{q}{2}\right)^2 + \left(\frac{p}{3}\right)^2}}, v = \sqrt[3]{-\frac{q}{2} - \sqrt{\left(\frac{q}{2}\right)^2 + \left(\frac{p}{3}\right)^2}}$
62	**Inequality Interval Notation** $a \leq x \leq b\ [a, b]$ $a < x \leq b\ (a, b]$ $a \leq x < b\ [a, b)$ $a < x < b\ (a, b)$ $-\infty < x \leq b, x \leq b\ (-\infty, b]$ $-\infty < x < b, x < b\ (-\infty, b)$ $a \leq x < \infty, x \geq a\ [a, \infty)$ $a < x < \infty, x > a\ (a, \infty)$
63	**If** $a > b$**, then** $b < a$**.**
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64	**If** $a > b$**, then** $a - b > 0$ **or** $b - a < 0$**.**
65	**If** $a > b$**, then** $a + c > b + c$
66	**If** $a > b$**, then** $a - c > b - c$
67	**If** $a > b$ **and** $c > d$**, then** $a + c > b + d$
68	**If** $a > b$ **and** $c > d$**, then** $a - d > b - c$
69	**If** $a > b$ **and** $m > 0$**, then** $ma > mb$
70	**If** $a > b$ **and** $m > 0$**, then** $\frac{a}{m} > \frac{b}{m}$
71	**If** $a > b$ **and** $m < 0$**, then** $ma < mb$
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72	**If** $a > b$ **and** $m < 0$**, then** $\frac{a}{m} < \frac{b}{m}$
73	**If** $0 < a < b$ **and** $n > 0$**, then** $a^n < b^n$
74	**If** $0 < a < b$ **and** $n < 0$**, then** $a^n > b^n$
75	**If** $0 < a < b$**, then** $\sqrt[n]{a} < \sqrt[n]{b}$
76	$\sqrt{ab} \leq \frac{a+b}{2}$**, where** $a > 0, b > 0$**; an equality is valid only if** $a = b$

77	$a + \frac{1}{a} \geq 2$, **where** $a > 0$; **an equality takes place only at** $a = 1$
78	$\sqrt[n]{a_1 a_2 \ldots a_n} \leq \frac{a_1 + a_2 + \ldots + a_n}{n}$, **where** $a_1, a_2, \ldots, a_n > 0$
79	**If** $ax + b > 0$ **and** $a > 0$, **then** $x > -\frac{b}{a}$
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80	**If** $ax + b > 0$ **and** $a < 0$, **then** $x < -\frac{b}{a}$
81	$ax^2 + bx + c > 0$
82	$\lvert a + b \rvert \leq \lvert a \rvert + \lvert b \rvert$
83	**If** $\lvert x \rvert < a$, **then** $-a < x < a$, **where** $a > 0$.
84	**If** $\lvert x \rvert > a$, **then** $x < -a$ **and** $x > a$, **where** $a > 0$
85	**If** $x^2 < a$, **then** $\lvert x \rvert < \sqrt{a}$, **where** $a > 0$
86	**If** $x^2 > a$, **then** $\lvert x \rvert > \sqrt{a}$, **where** $a > 0$
87	**If** $\frac{f(x)}{g(x)} > 0$, **then** $\begin{cases} f(x) \cdot g(x) > 0 \\ g(x) \neq 0 \end{cases}$
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88	$\frac{f(x)}{g(x)} < 0$, **then** $\begin{cases} f(x) \cdot g(x) < 0 \\ g(x) \neq 0 \end{cases}$
89	**General Compound Interest Formula** $A = C\left(1 + \frac{r}{n}\right)^{nt}$
90	**Simplified Compound Interest Formula** **If interest is compounded once per year, then the previous formula simplifies to:** $A = C(1 + r)^t$
91	**Continuous Compound Interest** **If Interest is compounded continually** $(n \to \infty)$, **then** $A = Ce^{rt}$
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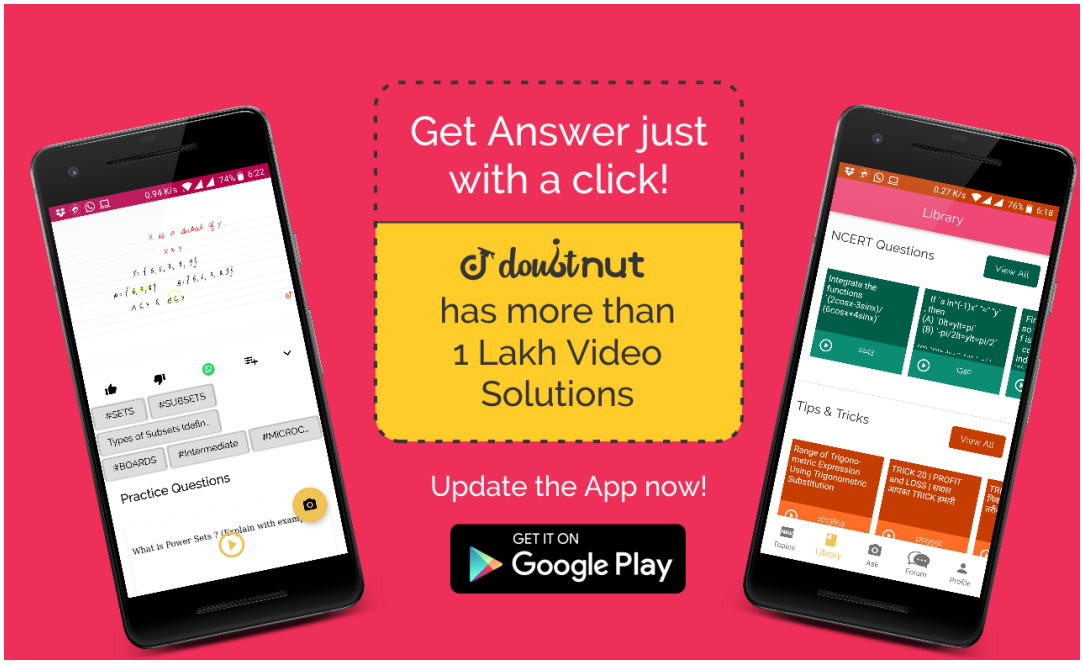
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