BAAP OF ALL FORMULA LISTS

FOR IIT JEE

COMPLEX NUMBERS

SL#	FORMULA
1	$i^1 = i$ | $i^5 = i$ | $i^{4n+1} = i$ $i^2 = -1$ | $i^6 = -1$ | $i^{4n+2} = -1$ $i^3 = -i$ | $i^7 = -i$ | $i^{4n+3} = -i$ $i^4 = 1$ | $i^8 = 1$ | $i^{4n} = 1$
2	$z = a + bi$
3	$(a + bi) + (c + di) = (a + c) + (b + d)i$
4	$(a + bi) - (c + di) = (a - c) + (b - d)i$
5	$(a + bi)(c + di) = (ac - bd) + (ad + bc)i$
6	$\frac{a + bi}{c + di} = \frac{ac + bd}{c^2 + d^2} + i \cdot \frac{bc - ad}{c^2 + d^2}$
7	**Conjugate Complex Numbers** $\overline{a + bi} = a - bi$
8	$a = r\cos\varphi, b = r\sin\varphi$
9	**Polar Presentation of Complex Numbers** $a + bi = r(\cos\varphi + i\sin\varphi)$
10	**Modulus and Argument of a Complex Number: If** $a + bi$ **is a complex number, then** $r = \sqrt{a^2 + b^2}$ **(modulus),** $\varphi = \tan^{-1}\left(\frac{b}{a}\right)$ **(argument).**

11	**Product in Polar Representation** $z_1 \cdot z_2 = r_1(\cos\varphi_1 + i\sin\varphi_1) \cdot r_2(\cos\varphi_2 + i\sin\varphi_2) = r_1 r_2[\cos(\varphi_1 + \varphi_2) + i\sin(\varphi_1 + \varphi_2)]$
12	**Conjugate Numbers in Polar Representation** $\overline{r(\cos\varphi + i\sin\varphi)} = r[\cos(-\varphi) + i\sin(-\varphi)]$
13	**Inverse of a Complex Number in Polar Representation** $\frac{1}{r(\cos\varphi + i\sin\varphi)} = \frac{1}{r}[\cos(-\varphi) + i\sin(-\varphi)]$
14	**Quotient in Polar Representation** $\frac{z_1}{z_2} = \frac{r_1(\cos\varphi_1 + i\sin\varphi_1)}{r_2(\cos\varphi_2 + i\sin\varphi_2)} = \frac{r_1}{r_2}[\cos(\varphi_1 - \varphi_2) + i\sin(\varphi_1 - \varphi_2)]$
15	**Power of a Complex Number** $z^n = [r(\cos\varphi + i\sin\varphi)]^n = r^n[\cos(n\varphi) + i\sin(n\varphi)]$
16	**De Moivre** $(\cos\varphi + i\sin\varphi)^n = \cos(n\varphi) + i\sin(n\varphi)$
17	**nth Root of a Complex Number** $\sqrt[n]{z} = \sqrt[n]{r(\cos\varphi + i\sin\varphi)} = \sqrt[n]{r}\left(\frac{\cos(\varphi + 2\pi k)}{n} + i\sin\left(\frac{\varphi + 2\pi k}{n}\right)\right.,$
18	**Euler\'s Formula** $e^{ix} = \cos x + i\sin x$