

COMPLEX NUMBERS

WHAT IS i?

NOTE: $i^2 = -1$

STANDARD FORM

$$\underbrace{a}_{\text{REAL PART}} + \underbrace{bi}_{\text{IMAGINARY PART}}$$

$$\sqrt{-1} = i$$

① $\sqrt{-16}$
 $= \sqrt{-1 \cdot 4 \cdot 4}$
 $= 4\sqrt{-1}$
 $= \boxed{4i}$

② $\sqrt{-40}$
 $= i\sqrt{40}$
 $= i\sqrt{2 \cdot 2 \cdot 2 \cdot 5}$
 $= \boxed{2i\sqrt{10}}$
 ~~$2i\sqrt{10}$~~ $2i\sqrt{10}$

③ $\frac{6 - \sqrt{-9}}{3}$
 $\frac{6 - i\sqrt{9}}{3}$
 $\frac{6 - 3i}{3}$
 $\frac{6}{3} - \frac{3}{3}i$
 $\boxed{2 - i}$

④ $\frac{8 - \sqrt{-12}}{2}$
 $\frac{8 - i\sqrt{12}}{2}$
 $\frac{8 - i\sqrt{2 \cdot 2 \cdot 3}}{2}$

$\frac{8 - 2i\sqrt{3}}{2}$
 $\frac{8}{2} - \frac{2\sqrt{3}}{2}i$
 $\boxed{4 - i\sqrt{3}}$
 or
 $4 - \sqrt{3}i$

⑤ $(-2 + 5i) - (7 - 2i)$
 $\underline{-2} + \underline{5i} - \underline{7} + \underline{2i}$
 $\boxed{-9 + 7i}$

⑥ $(-3 + \sqrt{-32}) - (-4 + \sqrt{-18})$
 $(-3 + i\sqrt{2 \cdot 2 \cdot 2 \cdot 2}) - (-4 + i\sqrt{2 \cdot 3 \cdot 3})$
 $\underline{-3} + \underline{4i\sqrt{2}} + \underline{4} - \underline{3i\sqrt{2}}$

⑦ $4i(-3 + 2i)$
 $4i(-3) + 4i(2i)$
 $-12i + 8i^2$
 $-12i + 8(-1)$
 $-12i - 8$
 $\boxed{-8 - 12i}$

⑧ $(3 + 4i)(7 - i)$
 $3(7) + 3(-i) + 4i(7) + 4i(-i)$
 $21 - 3i + 28i - 4i^2$
 $21 + 25i - 4(-1)$
 $21 + 25i + 4$
 $\boxed{25 + 25i}$

⑨ $(3 + 2i)^2$
 $(3 + 2i)(3 + 2i)$
 $3(3) + 3(2i) + 2i(3) + 2i(2i)$
 $9 + 6i + 6i + 4i^2$
 $9 + 12i + 4(-1)$

⑩ $\sqrt{-18} \sqrt{-12}$
 $i\sqrt{2 \cdot 3 \cdot 3} \cdot i\sqrt{2 \cdot 2 \cdot 3}$
 $3i\sqrt{2} \cdot 2i\sqrt{3}$
 $6i^2\sqrt{2 \cdot 3}$
 $6(-1)\sqrt{6}$
 $\boxed{-6\sqrt{6}}$