Imaginary Numbers:

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

i is called the imaginary unit.

Simplify each Notes

1. $\sqrt{-16} = 4i$

$\sqrt{-1 \cdot 16}$

2. $\sqrt{-576} = 24i$

3. $\sqrt{-96}$

$16 \cdot 6$

$4i\sqrt{6}$

4. $\sqrt{-7}$

$\sqrt{-1 \cdot 7}$

$i\sqrt{7}$

Complex Numbers:

any number that can be written
in the form: $a + bi$ (a and b can be any real #)

Real Part — Imaginary Part

Real Number: when b=0

Imaginary Number: when b≠0 (a may or may not be zero)
it may look like this: a + bi
or just bi

The terms Complex Number and Imaginary Number are quite often used interchangeably.

$a + bi$

Write each as a Complex Number.

1. $2 + \sqrt{-9}$

$2 + 3i$

2. $\sqrt{-12} - 5$

$-5 + 2\sqrt{3}\,i$

$-5 + 2i\sqrt{3}$

Simplify each expression:

Combine like terms

1. $(6 - \sqrt{-64}) + (5 + \sqrt{-49})$

$(6 - 8i) + (5 + 7i)$

$6 + 5 = 11 - i$ $\quad -8i + 7i$

2. $(-11 + \sqrt{-9}) - (6 - \sqrt{144})$

$-11 - 6 = -17$ $\quad = -5 + 3i$

$3i \quad +12$

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

$i^2 = -1$

Simplify each:

1. $4i(3 + 6i)$

$12i - 24$

$-24 + 12i$

2. $(2 + 3i)(1 - 5i)$

$2 - 10i + 3i + 15i^2$

$17 - 7i$

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

$i^2 = -1$

$i^3 = i^2 \cdot i = (-1)(i) = -i$

$i^4 = (i^2)^2 = (-1)^2 = 1$

$i^5 = i^4 \cdot i = 1 \cdot i = i$

$i^6 = i^5 \cdot i = i \cdot i = -1$

$i^{25} = i$

$i^{237} = i$

Find all Complex Solutions (real and imaginary).

1. $3x^2 + 70 = 22$

$-70 \quad -70$

$\frac{3x^2}{3} = \frac{-48}{3}$

$\sqrt{x^2} = \sqrt{16}$

$x = \pm 4i$

$\pm 4i$

2. $6 - 2x^2 = 96$

$+2x^2 \quad -96$

$6 - 96 = 2x^2$

$\frac{-90}{2} = \frac{2x^2}{2}$

$\sqrt{-45} = \sqrt{x^2}$

$9 \cdot 5 = x$

$\pm i 3\sqrt{5} = x$

3. $7x^2 + 3 = 38$

$-3 \quad -3$

$\frac{7x^2}{7} = \frac{35}{7}$

$\sqrt{x^2} = \sqrt{5}$

$x = \pm\sqrt{5}$