SM2 Starter on complex numbers

Simplify.

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

2. i^2

2nd [.] [^] [2]

$i^2 = -1$

3. $\sqrt{-64}$

8i

4. $-\sqrt{-49}$

-7i

5. $\sqrt{-8}$

scientific

~~x decimal using graphing calc~~

$\sqrt{-1} \cdot \sqrt{8}$

$i \cdot 2\sqrt{2}$

~~$2\sqrt{2}i$~~ $= 2\sqrt{2}\,i$ or $2i\sqrt{2}$

6. $\sqrt{24}$

$2\sqrt{6}$

Section 6.2

Objective: Solving Quadratics using the Square Root Property

Example: How many numbers can be squared to get 9?

$x^2 = 9$ $x = 3$ $3 \cdot 3 = 9$ $-3 \cdot -3 = 9$

In other words, how many solutions are there to the equation $x^2 = 9$?

What are they? 3, -3

What about the equation $x^2 = -9$?

$x = \pm\sqrt{-9}$ $x = \pm 3i$

or $3i, -3i$

★ **All numbers except zero have two square roots, a positive square root and a negative square root. The $\sqrt{\ }$ symbol means the positive square root. Both roots must be considered when solving an equation by taking square roots, so we use the $\pm$ symbol to include both roots.**

Square Root Property: If b is a real number and if $a^2 = b$, then $a = \pm\sqrt{b}$.

Solving Equations by Taking Square Roots: Do this when the equation has a perfect square and no other variables.

1. Get the perfect square alone on one side of the equation.
2. Use the square root property.
3. Simplify all square roots. Write the square roots of negative numbers in terms of i.
4. Solve for the variable, if necessary.

Examples: Solve each equation using the square root property. Include both real and imaginary solutions. Write your solutions in simplest radical form.

Write imaginary solutions in the form $a+bi$.

a) $x^2 = 50$

$\sqrt{x^2} = \pm\sqrt{50}$

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

b) $\frac{2z^2}{2} = \frac{-48}{2}$

$z^2 = -24$

$\sqrt{z^2} = \sqrt{-24}$

$i\sqrt{24}$

$z = \pm 2i\sqrt{6}$

c) $16 = (y+1)^2$

$\sqrt{16} = \sqrt{(y+1)^2}$

$\pm 4 = y+1$

$-1 \quad -1$

$+4-1 = y$

$-4-1 = y$

$3, -5 = y$

d) $(2m-5)^2 = -25$

$\sqrt{(2m-5)^2} = \sqrt{-25}$

$2m-5 = \pm 5i$

$+5 \quad +5$

$\frac{2m}{2} = \frac{5 \pm 5i}{2}$

$m = \frac{5 \pm 5i}{2}$

e) $\frac{3(t-2)^2}{3} = \frac{54}{3}$

$(t-2)^2 = 18$

$\sqrt{(t-2)^2} = \pm\sqrt{18}$

$t-2 = \pm 3\sqrt{2}$

$+2 \quad +2$

$t = 2 \pm 3\sqrt{2}$

f) $(r+4)^2 - 10 = 26$

$+10 \quad +10$

$(r+4)^2 = 36$

$\sqrt{(r+4)^2} = \pm\sqrt{36}$

$r+4 = \pm 6$

$-4 \quad -4$

$r = \pm 6 - 4$

$6-4 = 2$

$-6-4 = -10$

g) $-10 = \frac{1}{2}(n-7)^2$

$-10 \div \frac{1}{2} = \frac{\frac{1}{2}(n-7)^2}{\frac{1}{2}}$

$-20 = (n-7)^2$

$\pm\sqrt{-20} = \sqrt{(n-7)^2}$

$\pm\sqrt{-20} = n-7$

$\pm i\sqrt{20} = n-7$

$\pm 2i\sqrt{5} = n-7$

$+7 \quad +7$

$7 \pm 2i\sqrt{5} = n$

h) $-4(w+3)^2 + 6 = 86$

$-6 \quad -6$

$\frac{-4(w+3)^2}{-4} = \frac{80}{-4}$

$(w+3)^2 = -20$

$\sqrt{(w+3)^2} = \pm\sqrt{-20}$

$w+3 = \pm i\sqrt{20}$

$w+3 = \pm 2i\sqrt{5}$

$w = -3 \pm 2i\sqrt{5}$

i) $0 = -x^2 + 8$

$-8 \quad -8$

$\frac{-8}{-1} = \frac{-x^2}{-1}$

$\pm\sqrt{8} = \sqrt{x^2}$

$\pm 2\sqrt{2} = x$

j) $\frac{5(x+10)^2}{5} = \frac{0}{5}$

$(x+10)^2 = 0$

$\sqrt{(x+10)^2} = \pm\sqrt{0}$

$x+10 = \pm 0$

$x = -10 \pm 0$

$-10+0 = -10$

$-10-0 = -10$

k) $\frac{-2(x-3)^2}{-2} = \frac{-32}{-2}$

$(x-3)^2 = 16$

$\sqrt{(x-3)^2} = \pm\sqrt{16}$

$x-3 = \pm 4$

$+3 \quad +3$

$x = 3 \pm 4$

$3+4 = 7$

$3-4 = -1$

l) $16 = -\frac{1}{3}(x-2)^2$

$(-3) \quad (-3)$

$-48 = (x-2)^2$

$\pm\sqrt{-48} = \sqrt{(x-2)^2}$

$\pm i\sqrt{48} = x-2$

$\pm 4i\sqrt{3} = x-2$

$+2 \quad +2$

$2 \pm 4i\sqrt{3} = x$

Homework 6.2

2, 5, 8, 11, 14, 17, 20, 23