Warmup: Factor each of the following:

$x^2 - 3x - 28$

$(x-7)(x+4)$

$x^2 - 6x + 9$

$x \qquad 3$

$(x-3)(x-3)$

$(x-3)^2$

Difference of Squares

$4x^2 - 36 = 4(x^2-9) = 4(x-3)(x+3)$

$(2x-6)(2x+6)$

$2(x-3)(2x+6)$

$2 \cdot 2(x-3)(x+3) = 4(x-3)(x+3)$

$6x^2 + 11x - 10$

-60

$15 \quad -4$

11

$6x^2 + 15x - 4x - 10$

$3x(2x+5) - 2(2x+5)$

$(3x-2)(2x+5)$

Solve the following quadratic equations:

$-\cancel{2x^2} + \cancel{16x} = -96$

$+2x^2 - 16x \qquad +2x^2 - 16x$

$0 = 2x^2 - 16x - 96$

$0 = 2(x^2 - 8x - 48)$

$0 = 2(x-12)(x+4)$

$\cancel{2=0} \qquad x - 12 = 0 \qquad x + 4 = 0$

$x = 12 \qquad x = -4$

$-2x^2 = -450$

$+2x^2 \qquad +2x^2$

$0 = 2x^2 - 450$

$0 = 2(x^2 - 225)$

$0 = 2(x-15)(x+15)$

$\cancel{2=0} \qquad x - 15 = 0$

$x = 15$

$x + 15 = 0$

$x = -15$

E.Q.: How do we solve quadratic equations using the square root method?

$x^2 + 5x + 20 = 0$

$x^2 + 7x + 6$

Solving Using Square Roots

-Another method of solving quadratic equations is by using square roots to get rid of the exponent.

-The square root method works when there is no bx term.

-The equations should look like $ax^2 + c$ after you set them equal to zero

-In order to solve using square roots:

1) Isolate the variable on one side of the equation.
2) Take the square root of both sides.

   * When taking the square root you have positive and negative square root*

3) Simplify the radical expressions.

$= \sqrt{20}$

$= \sqrt{2 \cdot 10}$

$= \sqrt{2 \cdot 2 \cdot 5}$

$= 2\sqrt{5}$

$\sqrt{100} = 10$ or -10

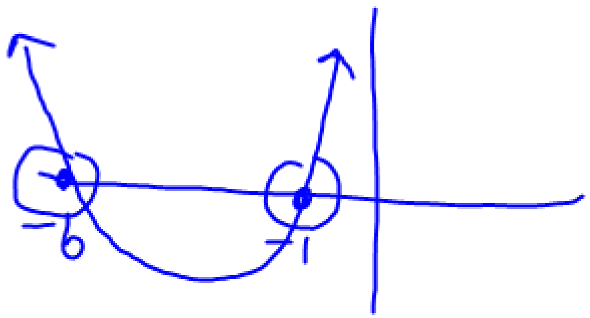
$\sqrt{100} = \pm 10$

$$\boxed{x^2+7x+6=0}$$

$$(x+6)(x+1)=0$$

$$x=-6 \text{ or } x=-1$$

x-intercepts or roots or zeroes



$$\frac{-2(x^2)}{-2} = \frac{-450}{-2}$$

$$\sqrt{x^2} = \sqrt{225}$$

$$x = \pm 15$$

Examples:

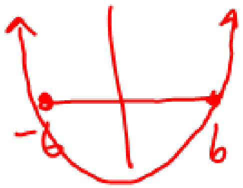
$\pm 3i$; $\sqrt{3}$

1) $n^2 - 6 = 30$

$\quad +6 \quad +6$

$\sqrt{n^2} = \sqrt{36}$

$n = \pm 6$



$n = 6$

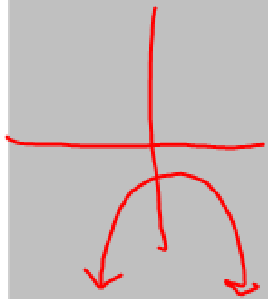
$n = -6$

2) $-8a^2 = 216$

$\frac{-8a^2}{-8} = \frac{216}{-8}$

$\sqrt{a^2} = \sqrt{-27}$

No real roots!



3) $3b^2 = -180$

$\frac{3b^2}{3} = \frac{-180}{3}$

$\sqrt{b^2} = \sqrt{-60}$

$\boxed{\text{No real solutions}}$

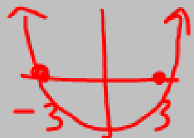
4) $4r^2 + 10 = 46$

$\quad -10 \quad -10$

$\frac{4r^2}{4} = \frac{36}{4}$

$\sqrt{r^2} = \sqrt{9}$

$r = \pm 3$



5) $5v^2 + 8 = 243$

$-8 \quad -8$

$\frac{5v^2}{5} = \frac{235}{5}$

$\sqrt{v^2} = \sqrt{47}$

$\boxed{v = \pm\sqrt{47}}$

$v = \pm 6.86$

6) $8n^2 + 8 = -120$

$-8 \quad -8$

$\frac{8n^2}{8} = \frac{-128}{8}$

$\sqrt{n^2} = \sqrt{-16}$

No real solutions

7) $3x^2 + 1 = 52$

$-1 \quad -1$

$\frac{3x^2}{3} = \frac{51}{3}$

$\sqrt{x^2} = \sqrt{17}$

$\boxed{x = \pm\sqrt{17}}$

8) $\frac{2x^2}{2} = \frac{156}{2}$

$\sqrt{x^2} = \sqrt{78}$

$x = \pm\sqrt{78}$

- You can also use the square root method when you have a square binomial in the problem.

-The steps are the same, except now we isolate the binomial first and then take the square root.

Examples:

9) $\boxed{(x-4)^2} - 3 = 13$

$+3 \quad 3$

$\sqrt{(x-4)^2} = \sqrt{16}$

$x - \cancel{4} = \pm 4$

$+\cancel{4} \quad +4$

$x = 4 \pm 4$

$x = 8$ or 0

$x - \cancel{4} = 4$

$+\cancel{4} \quad +4$

$x = 8$

or

$x - \cancel{4} = -4$

$+\cancel{4} \quad +4$

$x = 0$

10) $\frac{\cancel{-2}(x+3)^2}{\cancel{-2}} = \frac{40}{-2}$

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

No real roots.

11) $\boxed{\frac{1}{2}(x-6)^2} + 2 = 10$

$-2 \quad -2$

$\frac{\cancel{\frac{1}{2}}\boxed{(x-6)^2}}{\cancel{\frac{1}{2}}} = \frac{8}{\frac{1}{2}}$

$\sqrt{(x-6)^2} = \sqrt{16}$

$x - \cancel{6} = \pm 4$

$\cancel{+6} \quad +6$

$x = 6 \pm 4 \quad x = 10 \text{ or } 2$

12) $-(x-4)^2 - \cancel{12} = 0$

$+\cancel{12} \quad +12$

$\frac{\cancel{-}(x-4)^2}{\cancel{-1}} = \frac{12}{-1}$

$\sqrt{(x-4)^2} = \sqrt{-12}$

No real roots!

13) $5(x+7)^2 + 6 = 31$

$-6 \quad -6$

$5(x+7)^2 = 25$

$\sqrt{(x+7)^2} = \sqrt{5}$

$x + 7 = \pm\sqrt{5}$

$-7 \quad -7$

$x = -7 \pm \sqrt{5}$

or

$x = -7 + \sqrt{5}$

or

$-7 - \sqrt{5}$

14) $\frac{1}{3}(x+2)^2 + 4 = -22$

$-4 \quad -4$

$3 \cdot \cancel{\frac{1}{3}}(x+2)^2 = -26 \cdot 3$

$\sqrt{(x+2)^2} = \sqrt{-78}$

No real solutions.

15) $(x-11)^2+9=90$

$-9 \quad -9$

$\sqrt{(x-11)^2} = \sqrt{81}$

$x-11 = \pm 9$

$+11 \quad +11$

$x = 11 \pm 9$

$x = \underline{20}$

$x = \underline{2}$

16) $-3(x+5)^2-2=22$

$+2 \quad +2$

$\frac{-3(x+5)^2}{-3} = \frac{24}{-3}$

$\sqrt{(x+5)^2} = \sqrt{-8}$

No real solutions

$\underbrace{(x+5)^2} = -8$

Solving Using Square Roots Together

- Look at what you are given. Do you have just a letter squared? Or do you have a set of parentheses squared?
    - if you have just a letter squared, isolate that letter, take the square root, and solve
    - if you have a set of parentheses squared, isolate the parentheses, take the square root, and solve.

Examples:

1) $2(a + 3)^2 - 10 = 122$

2) $8x^2 - 9 = 583$

3) $4n^2 + 10 = 14$

4) $3(n - 10)^2 + 4 = 247$

Homework #5

Solving Quadratics by Square Roots