Unit 4.1: Solving by Factoring

Quadratic equation is: An equation with x^2 as the highest exponent

Before you begin factoring, the expression should be in standard form.

1) Factor each expression:

a) $p^2 - 10p + 9$ — $9p^2$, $-9 \wedge -1$

$(p-9)(p-1)$

b) $2b^2 - 12b - 54$ — $-27b^2$, $-9 \wedge 3$

$2(b^2 - 6b - 27)$

$2(b-9)(b+3)$

c) $\sqrt{n^2} - \sqrt{81}$ * Difference of squares

$(n+9)(n-9)$

d) $2x^2 - 17x - 9$ — $-18x^2$, $-18x \wedge 1x$

$2x^2 - 18x + 1x - 9$

$2x(x-9) + 1(x-9)$

$(x-9)(2x+1)$

2) Solve each of the following: Solve: Get to x=____

a) $p^2 - 10p + 9 = 0$ — $9p^2$, $-9 \wedge -1$

$(p-9)(p-1) = 0$

$p=9$ $p=1$

$9-9=0$ $1-1=0$

Here we have two things multiplied to equal 0. Since anything times 0 is 0, we'll find the values that makes each of the factors 0.

b) $2b^2 - 12b - 54 = 0$

$2(b^2 - 6b - 27) = 0$ — $-27b^2$, $-9 \wedge 3$

$2(b-9)(b+3) = 0$

$b=9$ $b=-3$

$9-9=0$ $-3+3=0$

c) $n^2 - 81 = 0$

$(n+9)(n-9) = 0$

$n=-9$ $n=9$

d) $2x^2 - 17x - 9 = 0$

$(x-9)(2x+1) = 0$

$x=9$ $2x+1=0$

$2x = -1$

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

If you don't know what value would make the factor equal to 0, then set the factor equal to 0 and solve.

The big idea behind solving by factoring is:

Find the value that makes the factor equal to 0

Ignore the directions for a moment. What are the differences in the question between when you factored and when you solved?

We just factored when there was no equal sign.
We solved by factoring when there was an equal sign.

Note: We solve **equations** (equal sign) while we simplify **expressions** (no equal sign).

3) Solve each equation.

a) $k^2 + 9k + 14 = 0$

$14k^2$: $7 \wedge 2$

$(k+7)(k+2)=0$

$k=-7$ $k=-2$

b) $n^2 - 7n + 6 = 0$

$6n^2$: $-6 \wedge -1$

$(n-6)(n-1)=0$

$n=6$ $n=1$

c) $-x^2 - 4x - 4 = 0$

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

$4x^2$: $2 \wedge 2$

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

$x=-2$ $x=-2$

d) $n^2 - 7n = 0$

$n(n-7)=0$

$n=0$ $n=7$

Have to plug in 0 to get n to equal 0

e) $6k^2 + 7k = -2$

$+2 \quad +2$

$6k^2+7k+2=0$

$12k^2$: $4 \wedge 3$

$6k^2+4k+3k+2=0$

$2k(3k+2)+1(3k+2)=0$

$(3k+2)(2k+1)=0$

* One side must always equal 0 before factoring

$3k+2=0 \quad 2k+1=0$

$3k=-2 \quad 2k=-1$

$k=\frac{-2}{3}$ $k=\frac{-1}{2}$

f) $x^2 - 22 = 3$

$-3 \quad -3$

$x^2-25=0$

$(x+5)(x-5)=0$

$x=-5$ $x=5$

g) $-n^2 - 9n - 23 = -5$

$+5 \quad +5$

$-n^2-9n-18=0$

$18n^2$: $6 \wedge 3$

$-(n^2+9n+18)=0$

$-(n+6)(n+3)=0$

$n=-6$ $n=-3$

h) $10r^2 + 19r = -7$

$+7 \quad +7$

$10r^2+19r+7=0$

$70r^2$: $14r \wedge 5r$

$10r^2+14r+5r+7=0$

$2r(5r+7)+1(5r+7)=0$

$(5r+7)(2r+1)=0$

$5r+7=0 \quad 2r+1=0$

$5r=-7 \quad 2r=-1$

$r=\frac{-7}{5}$ $r=\frac{-1}{2}$