

May 1st

MPM2D
Ms. Kueh

Solve Quadratic Equations

* Factored form $y = a(x-r)(x-s)$

Definition:

Quadratic Equation is an equation in the form $ax^2 + bx + c = 0$ where $a, b,$ and c are real numbers and $a \neq 0$.
 \nearrow int
 = standard form

To "Solve a quadratic equation" means Find x . A question that says Solve means solve for the variable. One of LS and RS must be set to **Zero!**

Example 1 Solve by factoring

Solve for x . Check your answers by substitution.

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

$(x+2)(x+7) = 0$
 $x = -2, x = -7$

$ac = 1 \times 14 = 14$
 $b = 9$
 $7 \times 2 = 14$
 $7 + 2 = 9$

b) $2x^2 + 5x = 0$

$x(2x+5) = 0$

LS is zero if $x = 0$ or $2x+5 = 0$
 $2x = -5$
 $x = \frac{-5}{2}$

c) $6x^2 - x = 15$

$6x^2 - x - 15 = 0$

$(6x^2 - 10x) + (9x - 15) = 0$

$2x(3x-5) + 3(3x-5) = 0$

$(3x-5)(2x+3) = 0$

$ac = 6 \times -15 = -90$
 $b = -1$
 $-10 \times 9 = -90$
 $-10 + 9 = -1$
 $\downarrow \quad \downarrow$
 $-10x \quad 9x$

LS = 0 if

$3x-5 = 0$ or $2x+3 = 0$
 $\frac{3x}{3} = \frac{5}{3}$ $\frac{2x}{2} = \frac{-3}{2}$
 $x = \frac{5}{3}$ $x = \frac{-3}{2}$

$(6x^2 - 18x) + 5x = 15 = 0$
 $6x(x-3) + 5(x-3) = 0$
 $(x-3)(6x+5) = 0$

Example 2 Dimensions of a Rectangle

A rectangle has dimensions $3x+1$ and $2x-5$. Its area is 10 cm^2 . What are its dimensions?

$A = lw$

$10 = (2x-5)(3x+1)$

$0 = (2x-5)(3x+1) - 10$

$0 = 6x^2 + 2x - 15x - 5 - 10$

$0 = 6x^2 - 13x - 15$ $\leftarrow ac = -90$

$b = -13$
 $-18 \times 5 = -90$

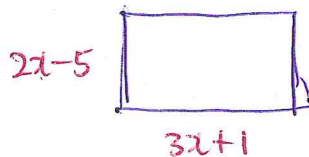
$0 = (6x+5)(x-3)$

RS is zero if $(x-3) = 0$ or $(6x+5) = 0$

$x-3 = 0$
 $x = 3$

$6x+5 = 0$
 $6x = -5$

$x = \frac{-5}{6}$



because you can't have negative width

Width = $2(3) - 5 = 1$ or length.

Length = $3(3) + 1 = 10$

\therefore The dimensions are $1 \text{ cm} \times 10 \text{ cm}$

Expanding/Factoring Review Practice (Optional)

1) Expand and Simplify

a. $(6x + 5)(3x + 1)$

$= 18x^2 + 6x + 15x + 5$

$= 18x^2 + 21x + 5$

2) Factor, if possible

a. $x^2 + 12x + 27$

$(x+9)(x+3) = 0$

$x = -3, -9$

$ac = 27$

$b = 12$

$9 \times 3 = 27$

$9 + 3 = 12$

b. $x(3x + 2)(2x - 5) + (2x + 4)^2$

$= x(6x^2 - 15x + 4x - 10) + (4x^2 + 8x + 8x + 16)$

$= x(6x^2 - 11x - 10) + (4x^2 + 16x + 16)$

$= 6x^3 - 11x^2 - 10x + 4x^2 + 16x + 16$

h. $9d^2 - 6d + 1$

$(3d)^2 - 2(3d)(1) + 1^2 = 0$

$(3d - 1)^2 = 0 \quad \therefore d = \frac{1}{3}$

$= (2x+4)(2x+4)$

$4a^2 - 10a - 10a + 25$

$2a(2a-5) - 5(2a-5)$

$(2a-5)(2a-5) = 0$

$2a-5 = 0$

$2a = 5 \rightarrow a = \frac{5}{2}$

$ac = 4 \times 25 = 100$

$b = -20$

$(-10) \times (-10) = 100$

$(-10) + (-10) = -20$

c. $9x^2 + 25$

Not factorable

$x^2 + 3x - x - 3 = 0$

$x(x+3) - (x+3) = 0$

$(x+3)(x-1) = 0$

$x = -3, x = 1$

$ac = -3$

$b = 2$

$3 \times (-1) = -3$

$3 + (-1) = 2$

e. $2y^2 + 5y + 2$

$2y^2 + 4y + y + 2 = 0$

$2y(y+2) + (y+2) = 0$

$(y+2)(2y+1) = 0$

$y+2 = 0$

$2y+1 = 0$

$y = -2$

$2y = -1$

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

$ac = 2 \times 2 = 4$

$b = 5$

$4 \times 1 = 4$

$4 + 1 = 5$

f. $n^2 + 22n + 21$

$(n+11)(n+1) = 0$

$n = -11$

g. $x^2 - 49$

$(x+7)(x-7) = 0$

$x = 7, -7$

i. $16x^2 - 8x + 1$

$(4x)^2 - 2(4x)(1) + 1^2 = 0$

$(4x-1)^2 = 0$

$x = \frac{1}{4}$

j. $8t^2 - 18$

$2(4t^2 - 9) = 0$

$2(2t+3)(2t-3) = 0$

$t = \frac{3}{2}, -\frac{3}{2}$

k. $2x^2 + 12x + 18$

$\Rightarrow 2(x^2 + 6x + 9) = 0$

$\Rightarrow 2(x+3)^2 = 0$

$x = -3$

l. $81x^2 - 49$

$(9x)^2 - (7)^2 = 0$

$(9x+7)(9x-7) = 0$

$x = \frac{7}{9}$

$x = -\frac{7}{9}$

m. $12x^2 + 19x + 4$

n. $4x^2 - 5x + 16$