Board Problems

1. \( \frac{-2}{3} x + \frac{7}{3} = -3x - \frac{2}{6} \)

\[ 5.3 \left( \frac{-2x + 7/3}{3} \right) = -3x - \frac{2}{6} \]

\[ -2x(5) + 7(5) = -3x(5) - 2(3) \]

\[ -10x + 35 = -45x - 6 \]

\[ +45x \quad +45x \]

\[ 35x + 35 = -6 \]

\[ -35 \quad -35 \]

\[ 35x = -41 \]

\[ x = -\frac{41}{35} \]

2. \( \frac{x}{5} + \frac{8}{15} = \frac{x}{3} \)

\[ 5.3 \left( \frac{x}{5} + \frac{8}{15} = \frac{x}{3} \right) \]

\[ 3x + 8 = 5x \]

\[ -2x + 8 = 0 \]

\[ -2x = -8 \]

\[ x = -\frac{8}{2} = -4 \]

3. \( 4(y-1) - 1 = 2(2y - 3) \)

\[ 4y - 4 - 1 = 4y - 6 \]

\[ 4y - 5 = 4y - 6 \]

\[ -5 \neq -6 \]

\[ \text{no solution} \]

4. \( \frac{3}{y+5} = -4 \)

\[ y + 5 \left( \frac{3}{y+5} = -4 \right) \]

\[ 3 = -4(y+5) \]

\[ 3 = -4y - 20 \]

\[ 4y = -23 \]

\[ y = -\frac{23}{4} \]

5. \( x^2 - 8x + 16 = 0 \)

\[ x^2 - 8x + 16 = 0 \]

\[ x - 4 \]

\[ (x-4)(x-4) = 0 \]

\[ x = 4 \]
Solving Quadratic Equations by factoring (must be in standard form)

ex. \( x^2 - 5x + 6 = 0 \)

\( a = 1 \)

\( 1 \cdot 6 \)
\( 2 \cdot 3 \)
\( 1 \cdot 6 \cdot -2 \cdot 3 \)

which factors can I add up to get \(-5\)

\( (x-2)(x-3) = 0 \)
\( x-2 = 0 \) and \( x-3 = 0 \)
\( x = 2 \)
\( x = 3 \)

\* Now if \( a \neq 1 \)

ex. \( 2x^2 = 6x + 3 \)

\( 2x^2 - 5x - 3 = 0 \) (standard form)

\( 2x \cdot -3 \)
\( 1 \cdot -3 \)

\( \rightarrow \) Take factors one from each set multiply and add. To see which one gives you

\( 2x(-1) + x(3) = -2x + 3x = x \) \[ \text{no} \]
\( 2x(3) + x(-1) = 6x - x = 5x \) \[ \text{no} \]
\( 2x(1) + x(-3) = 2x - 3x = -x \) \[ \text{no} \]
\( 2x(-3) + x(1) = -6x + x = -5x \) \[ \text{yes} \]

keep in mind we need to multiply \( 2x(-3) \)
so when you write factors

\( (2x) \cdot (-3) \)

for sure they will multiply if set up this way

\( (2x+1)(x-3) = 0 \)
\( 2x+1 = 0 \)
\( x-3 = 0 \)
\( 2x = -1 \)
\( x = -\frac{1}{2} \)
\( x = 3 \)
Same example as before but another method.

\[ 2x^3 - 5x - 3 = 0 \]

\[ -6x^2 \]
\[ -x \]
\[ 6x \]
\[ x = -6x \]

\[ 2x^2 - 6x + x - 3 = 0 \]
\[ (2x^2 - 6x) + (x - 3) = 0 \]
\[ 2x(x - 3) + 1(x - 3) = 0 \]
\[ (2x + 1)(x - 3) = 0 \]
\[ x = -\frac{1}{2}, x = 3 \]

Solving Quadratics by completing the square

**Example 1**

\[ x^2 - 8x + 7 = 0 \]
\[ x^2 - 8x + \square = -7 \]
\[ -\frac{8}{2} = -4 \]
\[ (-4)^2 = 16 \]

\[ x^2 - 8x + 16 = -7 + 16 \]
\[ (x - 4)^2 = 9 \]
\[ \pm \sqrt{(x - 4)^2} = \pm \sqrt{9} \]
\[ x - 4 = \pm 3 \]
\[ x = 4 \pm 3 \]
\[ x = 4 + 3 \text{ and } x = 4 - 3 \]
\[ x = 7 \quad \text{and} \quad x = 1 \]

**Example 2**

\[ x^2 + 10x - 13 = 0 \]
\[ x^2 + 10x + \square = 13 \]
\[ \frac{10}{2} = 5 \quad (5)^2 = 25 \]

\[ x^2 + 10x + 25 = 13 + 25 \]
\[ (x + 5)^2 = 38 \]
\[ \sqrt{(x + 5)^2} = \pm \sqrt{38} \]
\[ x + 5 = \pm \sqrt{38} \]
\[ x = -5 \pm \sqrt{38} \]
\[ x = -5 + \sqrt{38} \text{ and } x = -5 - \sqrt{38} \]
Solve Quadratics by the quadratic formula

formula \( x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} \)

**Example**

\[ 3x^2 - 5x + 2 = 0 \]

\( a = 3 \quad b = -5 \quad c = 2 \)  \( \Rightarrow \)  \( x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(2)}}{2(3)} \)

\[ x = \frac{5 \pm \sqrt{25 - 24}}{6} = \frac{5 \pm 1}{6} \]

\[ x = \frac{5 + 1}{6} \quad \text{and} \quad x = \frac{5 - 1}{6} \]

\( x = 1 \quad \text{and} \quad x = \frac{2}{3} \)

*When solving quadratics they can have*

- 2 real solutions \((b^2-4ac > 0)\)
- 1 real solution \((b^2-4ac = 0)\)
- 2 imaginary solutions \((b^2-4ac < 0)\)

**Ex**

\[ 5x^2 - 7x + 2 = 0 \]

What kind of solutions?

\( a = 5 \quad b = -7 \quad c = 2 \)

\( b^2 - 4ac \)

\((-7)^2 - 4(5)(2) \)

\[ 49 - 40 = 9 \]

\( 9 > 0 \)  (2 real solutions)
How to solve for x and y intercepts

To find x-intercept
Let \( y = 0 \)

\[ y = 2x + 5 \]

\[ 0 = 2x + 5 \]
\[ -2x = 5 \]
\[ x = \frac{5}{-2} \]
\[ \left( -\frac{5}{2}, 0 \right) \]

To find y-intercept
Let \( x = 0 \)

\[ y = 2(0) + 5 \]
\[ y = 0 + 5 \]
\[ y = 5 \]
\[ \left( 0, 5 \right) \]