Solving Equations with Binomials

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TYPE 1: *ax + b = cx + d*

To solve this type of equation:
1. Move all the terms with the variable to one side, and all the constants (numbers) to the other side.
2. Collect like terms.
3. Divide by the coefficient on x.

Example 1:   Solve: 8x + 6 = 10x − 20

Solution:
Step 1:   6 + 20 = 10x − 8x   Since it doesn't matter which side the variables are on,

                                        I pick the right side so I'm subtracting a small number of x's.
Step 2:   26 = 2x
Step 3:   13 = x

TYPE 2: (*ax + b)(cx + d) = 0*

To solve this equation, we use the theorem that says, if a · b = 0, then a = 0 or b = 0. So:
1. Use the theorem to split the problem into cases.
2. Move the constants (numbers) to the other side of the equation within each case.
3. Divide by the coefficient on x.

Example 2:   Solve: (3x + 6)(x + 5) = 0

Solution:
Step 1:   3x + 6 = 0   or   x + 5 = 0
Step 2:   3x = −6   x = −5
Step 3:   x = −2   or   x = −5

Therefore, the solutions are −2 and −5.

EXERCISES
A.   Solve:
   (1) x + 5 = 0   (3) 2x + 3 = 9

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(2) $x - 4 = 7$ (4) $\frac{1}{3}x + 4 = -1$

(5) $2x + 3 = 4x - 7$ (8) $-2(-x + 5) = -(x - 4)$

(6) $-5x - 10 = 2x - 9$ (9) $-(x - 4) + 3(x - 5) = 2(3x - 1)$

(7) $3(2x - 4) = 4x + 2$ (10) $(2x + 3) - 4(x - 1) = -(x - 9)$

B.   Solve:
(1) $(x + 1)(x - 1) = 0$ (6) $-x(x + 5) = 0$

(2) $(x - 2)(x - 3) = 0$ (7) $(x - 1)(x - 2)(x - 3) = 0$

(3) $(2x - 1)(3x - 1) = 0$ (8) $(x + 4)(x - 5)(x - 6) = 0$

(4) $(5x + 4)(3x - 2) = 0$ (9) $(2x + 3)(3x - 5)(4x - 7) = 0$

(5) $2x(x - 4) = 0$ (10) $5(3x - 6)(2x - 5)(3x + 1) = 0$

SOLUTIONS
A.   (1) $x = -5$ (2) $x = 11$ (3) $x = 3$ (4) $x = -15$ (5) $x = 5$ (6) $x = -\frac{1}{7}$ (7) $x = 7$
     (8) $x = \frac{14}{3}$ (9) $x = -\frac{9}{4}$ (10) $x = -2$
B.   (1) $x = -1, 1$ (2) $x = 2, 3$ (3) $x = \frac{1}{2}, \frac{1}{3}$ (4) $x = -\frac{4}{5}, \frac{2}{3}$ (5) $x = 0, 4$ (6) $x = -5, 0$
     (7) $x = 1, 2, 3$ (8) $x = -4, 5, 6$ (9) $x = -\frac{3}{2}, \frac{5}{3}, \frac{7}{4}$ (10) $x = -\frac{1}{3}, 2, \frac{5}{2}$