

Week 1

Solving Linear Equations

MA123: Mathematical Reasoning & Modeling
(Spring 2021)

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Example 1: Solve the equation

$$5x + 9 = 2x - 4$$

$$5x + 9 = 2x - 4$$

$$5x - 2x = -4 - 9$$

$$3x = -13$$

$$\frac{3x}{3} = \frac{-13}{3}$$

$$x = -\frac{13}{3} \#$$

Example 2: Solve the equation

$$-3x + 5 = 3x - 1$$

$$-3x + 5 = 3x - 1$$

$$-3x - 3x = -1 - 5$$

$$-6x = -6$$

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

$$x = 1 \#$$

Example 3: Solve for x

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

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

$$6x + 4 - 12 + 3x = x + 8$$

$$6x + 3x - x = 8 - 4 + 12$$

$$8x = 16$$

$$\frac{8x}{8} = \frac{16}{8}$$

$$x = 2 \#$$

Example 4: Solve for x

$$8(x+9) + 4 = -5(x-8) - 11$$

$$8(x+9) + 4 = -5(x-8) - 11$$

$$8x + 72 + 4 = -5x + 40 - 11$$

$$8x + 76 = -5x + 29$$

$$8x + 5x = 29 - 76$$

$$13x = -47$$

$$\frac{13x}{13} = \underline{-\frac{47}{13}}$$

$$\begin{aligned}x &= -\frac{47}{13} \\&= -3.615384615\end{aligned}$$

Example 5: Solve for k

$$\frac{3}{4}k + \frac{-5}{9} = 6 - \frac{1}{9}k$$

$$\frac{3}{4}k + \frac{-5}{9} = 6 - \frac{1}{9}k$$

$$\frac{3}{4}k + \frac{1}{9}k = 6 + \frac{5}{9}$$

Common Denominator

$$\frac{3}{4}\frac{9}{9}k + \frac{1}{9}\frac{4}{4}k = \frac{6}{1}\cdot\frac{9}{9} + \frac{5}{9}$$

$$\frac{27}{36}k + \frac{4}{36}k = \frac{54}{9} + \frac{5}{9}$$

$$\frac{31}{36}k = \frac{59}{9}$$

$$k = \frac{59}{9} \cdot \frac{36}{4} \\ = \frac{59}{1} \cdot \frac{4}{31} = \frac{236}{31} \\ = 7.612903226$$

Example 6: Solve for x

$$\frac{1}{3}x + \frac{1}{2} = -5\left(\frac{3}{4}x + 3\right)$$

$$\frac{1}{3}x + \frac{1}{2} = -5\left(\frac{3}{4}x + 3\right)$$

$$\frac{1}{3}x + \frac{1}{2} = -\frac{15}{4}x - 15$$

$$\frac{1}{3}x + \frac{15}{4}x = -15 - \frac{1}{2}$$

Common Denominator

$$\frac{1}{3} \cdot \frac{4}{4}x + \frac{15}{4} \cdot \frac{3}{3}x = -\frac{15}{1} \cdot \frac{2}{2} - \frac{1}{2}$$

$$\frac{4}{12}x + \frac{45}{12}x = -\frac{30}{2} - \frac{1}{2}$$

$$\frac{49}{12}x = -\frac{31}{2}$$

$$x = -\frac{31}{2} \cdot \frac{12}{49}$$

$$x = -\frac{31}{2} \cdot \frac{6}{49}$$

$$x = -\frac{186}{49} \#$$