

Key

Systems: 4 points 2 from two different lines

Find the solution of the system of equations given 2 points from 1 line and 2 points from a different line.

Example 1: Line 1: (3, 7) & (-1, -5) and Line 2: (2, -1) & (-4, 11)

Step 1: Find the slope of Line 1 and Line 2.

Line 1

$$\frac{7 - (-5)}{3 - (-1)} = \frac{12}{4} = 3$$

Line 2

$$\frac{-1 - 11}{2 - (-4)} = \frac{-12}{6} = -2$$

Step 2: Find the y-intercept of Line 1 and Line 2.

Line 1

$$7 = 3(3) + b$$

$$7 = 9 + b$$

$$b = -2$$

Line 2

$$-1 = 2(2) + b$$

$$-1 = -4 + b$$

$$b = 3$$

Step 3: Write the equation of Line 1 and Line 2 in $y = mx + b$.

Line 1 Equation: $y = 3x + -2$

Line 2 Equation: $y = -2x + 3$

Step 4: Solve the system of equations by the substitution method.

$$3x + -2 = -2x + 3$$

$$5x = 5$$

$$x = 1$$

$$y = 3(1) + -2$$

$$y = 3 + -2$$

$$y = 1$$

Answer: (1, 1)

Example 2: Line 1: $(-7, -5)$ & $(7, -19)$ and Line 2: $(2, 6)$ & $(3, 10)$

Step 1: Find the slope of Line 1 and Line 2.

$$\begin{array}{l} \text{Line 1} \\ \frac{-5 - (-19)}{-7 - 7} = \frac{14}{-14} = -1 \end{array}$$

$$\begin{array}{l} \text{Line 2} \\ \frac{6 - 10}{2 - 3} = \frac{-4}{-1} = 4 \end{array}$$

Step 2: Find the y-intercept of Line 1 and Line 2.

$$\begin{array}{l} \text{Line 1} \\ -5 = -1(-7) + b \\ -5 = 7 + b \\ b = -12 \end{array}$$

$$\begin{array}{l} \text{Line 2} \\ 6 = 4(2) + b \\ 6 = 8 + b \\ b = -2 \end{array}$$

Step 3: Write the equation of Line 1 and Line 2 in $y = mx + b$.

Line 1 Equation: $y = -x + -12$

Line 2 Equation: $y = 4x + -2$

Step 4: Solve the system of equations by the substitution method.

$$\begin{array}{l} -x + -12 = 4x + -2 \\ -10 = 5x \\ x = -2 \end{array}$$

$$\begin{array}{l} y = -(-2) + -12 \\ y = 2 + -12 \\ y = -10 \end{array}$$

Answer: $(-2, -10)$

Problem #1: Line 1: (-6, 10) & (11, -7) and Line 2: (3, 9) & (-3, -9)

Step 1: Find the slope of Line 1 and Line 2.

Line 1

$$\frac{10 - -7}{-6 - 11} = \frac{17}{-17} = -1$$

Line 2

$$\frac{9 - -9}{3 - -3} = \frac{18}{6} = 3$$

Step 2: Find the y-intercept of Line 1 and Line 2.

Line 1

$$10 = -1(-6) + b$$

$$10 = 6 + b$$

$$b = 4$$

Line 2

$$9 = 3(3) + b$$

$$9 = 9 + b$$

$$b = 0$$

Step 3: Write the equation of Line 1 and Line 2 in $y = mx + b$.

Line 1 Equation: $y = -x + 4$

Line 2 Equation: $y = 3x$

Step 4: Solve the system of equations by the substitution method.

$$-x + 4 = 3x$$

$$4 = 4x$$

$$x = 1$$

$$y = 3(1)$$

$$y = 3$$

Answer (1, 3)

Problem #2: Line 1: (0, -4) & (5, 11) and Line 2: (3, -1) & (-5, -17)

Step 1: Find the slope of Line 1 and Line 2.

Line 1

$$\frac{-4-11}{0-5} = \frac{-15}{-5} = 3$$

Line 2

$$\frac{-1-(-17)}{3-(-5)} = \frac{16}{8} = 2$$

Step 2: Find the y-intercept of Line 1 and Line 2.

Line 1

$$\begin{aligned} -4 &= 3(0) + b \\ -4 &= b \\ b &= -4 \end{aligned}$$

Line 2

$$\begin{aligned} -1 &= 2(3) + b \\ -1 &= 6 + b \\ b &= -7 \end{aligned}$$

Step 3: Write the equation of Line 1 and Line 2 in $y = mx + b$.

Line 1 Equation: $y = 3x + -4$

Line 2 Equation: $y = 2x + -7$

Step 4: Solve the system of equations by the substitution method.

$$3x + -4 = 2x + -7$$

$$x = -3$$

$$y = 3(-3) + -4$$

$$y = -9 + -4$$

$$y = -13$$

Answer (-3, -13)

Problem #3: Line 1: (1, -2) & (-1, -3) and

Line 2: (7, -5) & (-5, 7)

Step 1: Find the slope of Line 1 and Line 2.

Line 1

$$\frac{-2 - (-3)}{1 - (-1)} = \frac{1}{2}$$

Line 2

$$\frac{-5 - 7}{7 - (-5)} = \frac{-12}{12} = -1$$

Step 2: Find the y-intercept of Line 1 and Line 2.

Line 1

$$\begin{aligned} -2 &= \frac{1}{2}(1) + b \\ -2 &= \frac{1}{2} + b \\ b &= -2\frac{1}{2} \end{aligned}$$

Line 2

$$\begin{aligned} -5 &= -1(7) + b \\ -5 &= -7 + b \\ b &= 2 \end{aligned}$$

Step 3: Write the equation of Line 1 and Line 2 in $y = mx + b$.

Line 1 Equation: $y = \frac{1}{2}x - \frac{5}{2}$

Line 2 Equation: $y = -x + 2$

Step 4: Solve the system of equations by the substitution method.

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

$$3x = 9$$

$$x = 3$$

$$y = -(3) + 2$$

$$y = -3 + 2$$

$$y = -1$$

Answer: (3, -1)

Problem #4: Line 1: (12, 10) & (-8, -5) and Line 2: (7, 6) & (-5, -6)

Step 1: Find the slope of Line 1 and Line 2.

Line 1

$$\frac{10 - (-5)}{12 - (-8)} = \frac{15}{20} = \frac{3}{4}$$

Line 2

$$\frac{6 - (-6)}{7 - (-5)} = \frac{12}{12} = 1$$

Step 2: Find the y-intercept of Line 1 and Line 2.

Line 1

$$10 = \frac{3}{4}(12) + b$$
$$10 = 9 + b$$
$$b = 1$$

Line 2

$$6 = 1(7) + b$$
$$6 = 7 + b$$
$$b = -1$$

Step 3: Write the equation of Line 1 and Line 2 in $y = mx + b$.

Line 1 Equation: $y = \frac{3}{4}x + 1$

Line 2 Equation: $y = x - 1$

Step 4: Solve the system of equations by the substitution method.

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

$$y = 8 - 1$$
$$y = 7$$

Answer (8, 7)

Problem #5: Line 1: $(-1, -20)$ & $(-1, -30)$ and Line 2: $(12, -5)$ & $(-9, -5)$

Step 1: Find the slope of Line 1 and Line 2.

Line 1

$$\frac{-20 - -30}{-1 - -1} = \frac{10}{0}$$

No slope

Line 2

$$\frac{-5 - -5}{12 - -9} = \frac{0}{21} = 0$$

Step 2: Find the y-intercept of Line 1 and Line 2.

Line 1

No y-intercept

Line 2

$$-5 = 0(-12) + b$$

$$b = -5$$

Step 3: Write the equation of Line 1 and Line 2 in $y = mx + b$.

Line 1 Equation: $x = -1$

vertical line

Line 2 Equation: $y = -5$

horizontal line

Step 4: Solve the system of equations by the substitution method.

Answer $(-1, -5)$