

Ch 9: Solving Systems of Linear Equations Algebraically

In this chapter we will:

- **Model situations mathematically**
- **Determine and verify** solutions to two-variable systems of linear equations **algebraically**
- Select an **appropriate method** to solve.

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9.1 Solving Systems of Linear Equations by **Substitution**.

Solving by substitution is when we replace one variable by something that is equal to it. This helps us get rid of one variable. We have already used this method to help us solve.

Example from Ch 7:

Advance tickets for a concert sold for \$8 and tickets at the door were \$12. If revenue from the sales was \$1120 and there was twice as many advance tickets then tickets sold at the door, how many of each ticket were sold?

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Solve using substitution:

$$4x + 5y = 26$$

$$\frac{3x}{3} = \frac{y-9}{3}$$

$$4\left(\frac{1}{3}y-3\right) + 5y = 26 \quad x = \frac{y-9}{3} = \frac{1}{3}y-3 = x$$

$$\frac{4}{3}y - 12 + 5y = 26$$

$$= \left(\frac{1}{3}\right)(6) - 3 = x$$

$$\frac{4}{3}y + 5y - 12 = \frac{26}{12}$$

$$2 - 3 = x$$

$$\frac{4}{3}y + 5y = 38$$

$$\boxed{-1 = x}$$

$$\left(\frac{3}{11}\right) \frac{11}{3} y = 38 \left(\frac{3}{11}\right)$$

$$\boxed{y = 6}$$

$(-1, 6)$
would be intersection
point if they
graphed it.

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Solve using substitution:

$$3x + 5y = 27$$

$$\frac{4x}{4} = \frac{16}{4}$$

$$3(4) + 5y = 27$$

$$\underline{x = 4}$$

solution as
ordered
pair.
 $(4, 3)$

$$12 + 5y = 27$$

$$\frac{5y}{5} = \frac{15}{5} \quad \underline{y = 3}$$

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9.2 Solving Systems of Equations by **Elimination**

For this method to work, a variable in both equations must have the same or opposite coefficient. It is often necessary to multiply one or both equations by a constant.

Example:
$$\begin{array}{r} 4x + 3y = 8 \\ -4x - 5y = -24 \\ \hline 0x + 8y = 32 \end{array}$$

Now we subtract these two equations so that we will **eliminate** the variable x .

Since x has the same coefficient already we do not need to multiply.

$$\begin{array}{l} 8y = 32 \\ \frac{8y}{8} = \frac{32}{8} \\ y = 4 \end{array}$$

$$\begin{array}{l} 4x + 3(4) = 8 \\ 4x + 12 = 8 \\ 4x = -4 \\ x = -1 \end{array}$$

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Solve by **Elimination**

$$\begin{array}{r} 7x - 4y = -3 \\ 2(3x + 2y = 11) \\ \hline 7x - 4y = -3 \\ 6x + 4y = 22 \\ \hline 13x + 0y = 19 \\ 13x = 19 \\ x = \frac{19}{13} \end{array}$$

$$\begin{array}{l} 7\left(\frac{19}{13}\right) - 4y = -3 \\ -4y = -3 - 7\left(\frac{19}{13}\right) \\ -4y = -13.23.. \\ y = 3.3... \\ y = \frac{43}{13} \end{array}$$

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Hmwk:

Substitution: Pg 474 #4a, 6, 8, 9, 14

Elimination: Pg 488 #1, 2, 3, 7

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Substitution & Elimination Worksheet

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Solve using substitution:

In the 1995-1996 NHL season, Mario Lemieux scored 161 points. He scored 23 fewer goals than assists. How many goals and assists did Mario have that year? (Each goal and assist in hockey is one point).

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Solve by **Elimination**

$$6a + 5b = 24$$

$$4a + 3b = 12$$

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Solve by **Elimination**

$$2x - 4y = 13$$

$$4x - 5y = 8$$

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9.2 Solving Systems of Equations by **Elimination**

David operates a snow-blowing business. He charges \$15 for a small driveway and \$25 for a large driveway. One weekend, he earns \$475 by clearing snow from 25 driveways. How many of each type of driveway did he clear?

Kirk dreams of being a farmer. The other night Kirk dreamt that on his farm he had a bunch of goats and chickens, however he can't remember how many of each there are. He does remember that in total, there were 124 legs and 44 heads. How many of each animal did he have on his dream farm?

A rectangular parking pad for a car has a perimeter of 12.2 m. The width is 0.7 m shorter than the length. Use a linear system to determine the dimensions of the pad.

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Hmwk: Pg 489 #7, 9, 10, 11, 15

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9.3 Solving **Problems** using Systems of Linear Equations

We can solve systems of linear equations by:

- Graphing it and finding the intersection
- Algebraically - elimination or substitution

Depending on the situation either graphing, substitution, or elimination may be most appropriate.

You need to know how to use ALL of these methods, however when asked a multiple choice question you can use whichever method you want.

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Let's solve the following using substitution, elimination, and graphing.

$$3x - 4y = 17$$

$$4x + 5y = 48.5$$

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(home)work pg 498 #1-8, 13

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Ch 9 Review pg 502-505

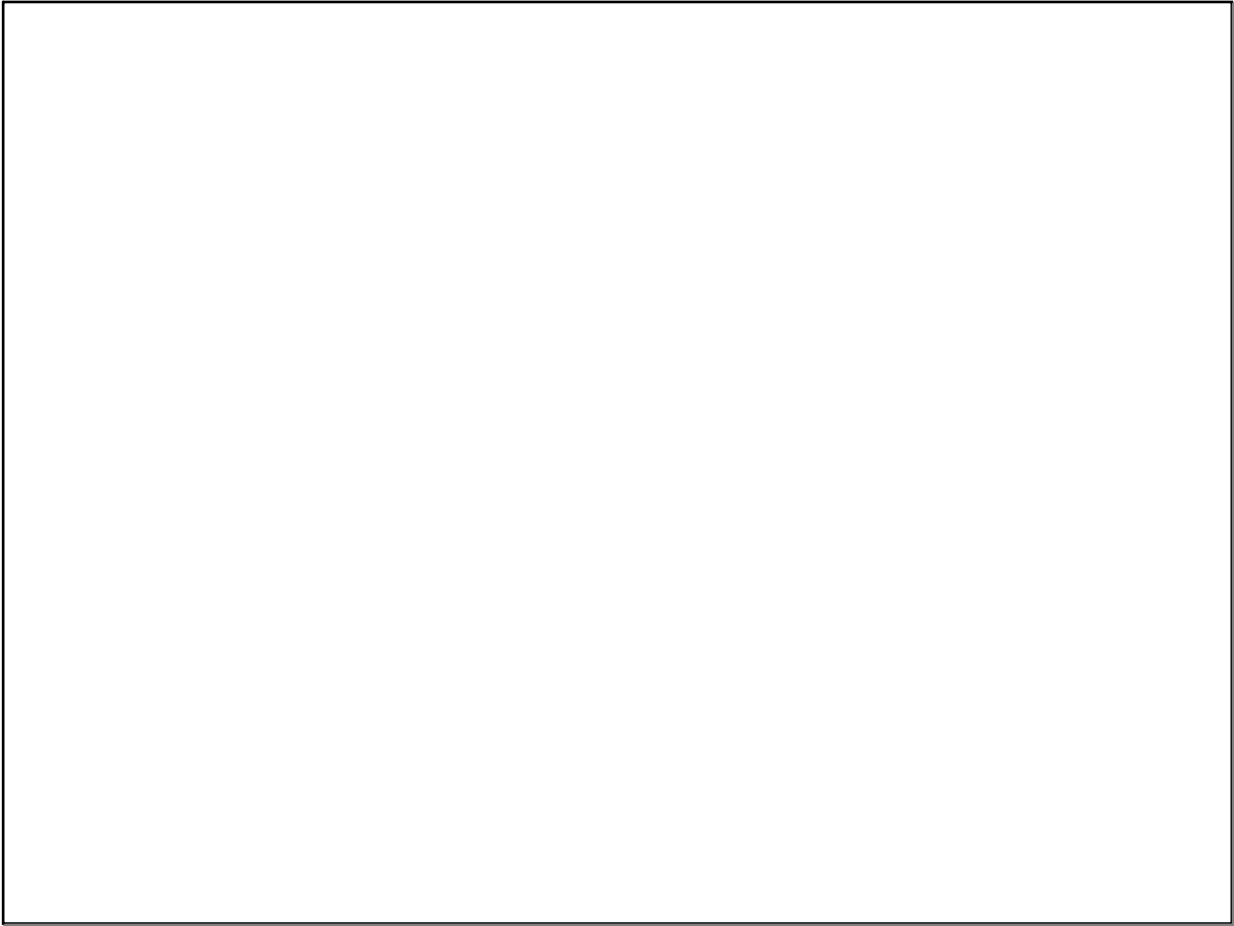
Ch 9 Online Review Quiz

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Ch 9 Online Review Quiz

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