Unit 4: Systems of Equations

In this unit we will solve problems involving:

- The **point of intersection** of a system of linear equations
- The **number of solutions** to a linear system
- Strategies for **solving** systems of linear equations **graphically and algebraically**

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Ch 8: Solving Systems of Linear Equations Graphically

In this chapter we will:

- create systems of linear equations and create graphs to **model situations**.
- **Solve** two-variable systems of linear equations **graphically**
- Explain what the **number of solutions** to a linear system mean.

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8.1 Systems of Linear Equations and Graphs

Recall: Relations can be represented numerically using a table of values, graphically and verified algebraically.

A **system of linear equations** is two or more linear equations involving common variables. It is often referred to as a **linear system**. It can be represented graphically in order to make comparisons or solve problems.

The **point of intersection** represents the **solution** to the system of linear systems. It is an ordered pair that **satisfies** both equations.

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Example: David earns $40 plus $10 an hour. Carmen earns $50 plus $8 an hour.

a) Represent the linear system relating the earnings numerically and graphically.

b) Identify the solution and explain what it represents.

a) D: $y = 10x + 40$

C: $y = 8x + 50$

b) $x = 5$ $y = 90$

After 5 hrs they both make $90.

D: $y = 10(5) + 40$

$y = 50 + 40 = 90$ ✓

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Example 2:

Consider the system of linear equations 2x+y=2 and x-y=7.

a) Identify the point of intersection of the lines.

b) Verify the solution algebraically.

1. Write in slope-intercept form.

$-2x+2=y$ $x-7=y$

intersect: (3, -4)

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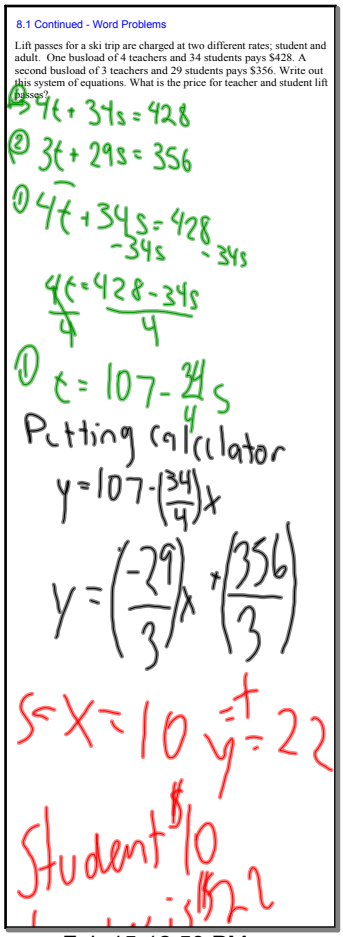

8.1 Continued - Word Problems

Lift passes for a ski trip are charged at two different rates; student and adult. One busload of 4 teachers and 34 students pays $428. A second busload of 3 teachers and 29 students pays $356. Write out this system of equations. What is the price for teacher and student lift passes?

① $4t+34s=428$

② $3t+29s=356$

① $4t+34s=428$ $-34s \quad -34s$

$\frac{4t}{4}=\frac{428-34s}{4}$

① $t=107-\frac{34}{4}s$

Putting calculator

$y=107-\left(\frac{34}{4}\right)x$

$y=\left(\frac{-29}{3}\right)x+\left(\frac{356}{3}\right)$

$s=x=10 \quad t=y=22$

Student $10

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Hmwk: Pg 427 #3, 4, 5ac, 7ac, 8, 10, 11

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Homework: System of Linear Equations Worksheet

Due: Feb 29th - After Teacher's Convention

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8.2 Modelling and Solving Linear Systems

Example: People can rent ski and snowboard equipment from two places at Winterland Resort.

Option A charges a one-time $30 fee plus $8 an hour.

Option B charges $14 per hour.

a) Create a system of linear equations to model the charges.

b) Solve the system graphically. What does the solution represent?

c) If you where planning to ski for 3h what plan would be best? What if you planned on skiing for 10 h?

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Example 2: Two pools start draining at the same time. The larger pool contains 54 675 L of water and drains at a constant rate of 25 L/min. The smaller pool contains 35 400 L of water and drains at a rate of 10 L/min.

a) Model the draining of the pools using a system of linear equations.

b) Represent the linear system graphically. Describe how the information shown in the graph relates to the pools.

$y = 54675 - 25x$

$y = -25x + 54675$

$X = 1285$

$y = 22550$

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Hmwk: Pg 440 #2, 3, 6, 10, 14
+ Finish Word Problem Worksheet

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8.3 Number of Solutions for Systems of Linear Equations

If we have two equations graphed on the same plane, what are the options for the number of intersections?

Hint: Remember parallel and perpendicular lines.

Hint: There are three options

same line → infinite

parallel → 0

perpendicular → 1

different slope → 1

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One Solution: Occurs when the two lines have different slopes.

No Solution: Occurs when the two lines are parallel.

Infinite Solutions: Occurs when the lines are identical. These lines are called **coincident lines**. These lines overlap completely.

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Predict and confirm the number of solutions of linear equations. Confirm each answer by graphing.

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

1

$$4x + 10y = 30$$
$$2x + 5y = 35$$

∞

$$10x - 6y = -12$$
$$21y = 42 + 35x$$

1

$$2x + 3y = 12$$
$$2x + 3y = 20$$

0

$$2x + 3y = 12$$
$$4x + 6y = 24$$

∞

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Hmwk: Pg 455# 4, 5, 6, 8, 9, 10, 13, 17

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Ch 8 Review pg 460-465

Ch 8 Review Online Quiz

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Ch 8 Review pg 460-465

Ch 8 Review Online Quiz

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