Wednesday, February 19, 2020

1.6 Solving Linear Systems Using Algebra - Elimination (Continued)

Bellwork:

1) Explain what you would do to eliminate x from the given system of equations. What would you do if you had to eliminate y? Choose a variable to eliminate and solve.

① $3x - 4y = 5$
② $-(3x + 5y = 2)$

$-9y = 3$

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

$y = -\frac{1}{3}$

- Subtract to eliminate x
- To get rid of y, multiply ① by 5 and ② by 4 to get a coefficient of 20, then add.

Sub $y = -\frac{1}{3}$ into ①: $3x - 4\left(-\frac{1}{3}\right) = 5$

$3x + \frac{4}{3} = 5$

$9x + 4 = 15$

$9x = 11$

$x = \frac{11}{9}$

2) List some advantages to solving using elimination.

- more efficient → especially when we don't have to multiply!

3) What are some disadvantages to, or common errors that occur when we use elimination to solve?

Sign errors when subtracting

4) How are substitution and elimination similar?

The process to find the second variable is identical!

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1.6 Solving Linear Systems - Elimination (Continued)

Reminders about word problems:

- Write 'let' statements;
- Write a system of equations;
- Solve using substitution or elimination;
- Write a concluding (∴) statement.

Remember that your 'let' and 'therefore' statements must relate back to the question!

Let's solve #3 on p. 54 together:

Let x be the hourly rate for the welder.
Let y " " " " " apprentice.

$3x - 5y = 175$ ① ×8 → $24x + 40y = 1400$

$7x + 8y = 346$ ② ×5 → $-35x + 40y = 1730$

$-11x = -330$

$\frac{-11x}{-11} = \frac{-330}{-11}$

$x = \$30/\text{hour}$

Sub $x = 30$ into ①

$3(30) + 5y = 175$

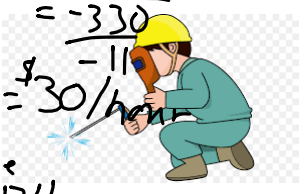
$90 + 5y = 175$

$5y = 85$

$\frac{5y}{5} = \frac{85}{5}$

$y = \$17/\text{hour}$

∴ The welder earns $30/h & the apprentice earns $17/h



Some Common Types of Word Problems:

1) Relative Value Problems

These questions sound like riddles and make you figure out values using other unknowns.

Example:

The difference between two numbers is 45. Three times the larger number less five times the smaller number is 75. Find the numbers.

Let x be the larger #.
Let y " " smaller #. Sub into ②

① $x - y = 45 \rightarrow x = 45 + y$

② $3x - 5y = 75$

$3(45 + y) - 5y = 75$

$135 + 3y - 5y = 75$

$-2y = -60$

$\frac{-2y}{-2} = \frac{-60}{-2}$

$y = 30$

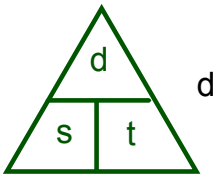
$x - 30 = 45$

$x = 75$

∴ The #s are 30 and 75.

## 2) Rate Problems

****ALWAYS make time your unknown here****




distance = speed x time

Use a table like the one shown below to organize your information.

| | Speed | Time | Distance |
|---|---|---|---|
| A | | | |
| B | | | |
| Total | ---- | | |

The shaded columns will contain your equations if you do this properly!

ex/ Kyra goes on a ski trip, driving 393 km from her home in LaSalle to Blue Mountain on Lake Huron. She travels at an average speed of 70 km/h along the highway, and then at 50 km/h on the narrow roads leading to the mountain. The journey takes her 6 hours. How long did Kyra spend driving on narrow roads?

| | Speed | × | Time | = | Distance |
|---|---|---|---|---|---|
| Highway | 70 | | $x$ | | $70x$ |
| Narrow Roads | 50 | | $y$ | | $50y$ |
| Total | ---- | | 6 | | 393 |

Let $x$ be time on the highway

Let $y$ be time on narrow roads.

① Total Time: $x + y = 6 \xrightarrow{\times 50} 50x + 50y = 300$

② Total Distance: $70x + 50y = 393$

$70x + 50y = 393$

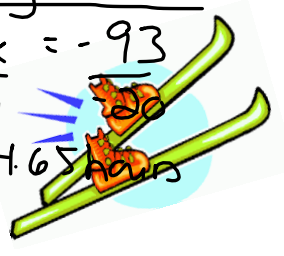
$-20x = -93$

$\frac{-20x}{-20} = \frac{-93}{-20}$

$x = 4.65$ hours

∴ She spent 1.35 hours on narrow roads.

$0.35 \text{ hours} \times 60 \frac{\text{minutes}}{\text{hour}}$



3) Mixture Problems

Two different kinds of coffee beans were blended. Individually, they cost $2.30/kg and $3.20/kg. How much of each kind was used if 200 kg of the resulting mixture cost $3/kg?

**When you are dealing with mixture problems, remember that you will often need to multiply the constant term as well as the variables with a rate!**