

## Trigonometry

### Activity 7a - General Solution to Systems of Linear Equations

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Motivating Example: I'm looking to rent a car while on vacation. Rental Place A offers me only \$25/day + \$250 non-refundable deposit, and Rental Place B offers \$75/day, but only a \$50 deposit. Which company should I rent from? Answer: If I will use the car for 4 days or less, I should use Rental Place B; if I will use the car for more than 4 days, I should use Rental Place A. How did I figure this out? With the power of linear systems of equations!

1. **Group 1** - Solve the following system of linear equations for  $x$ .

$$ax + by = p$$

$$cx + dy = q$$

by doing the following.

- Multiply the top equation by  $d$ .
- Multiply the bottom equation by  $-b$
- Add the two new equations.
- Solve for  $x$

- Group 2** - Solve the following system of linear equations for  $y$ .

$$ax + by = p$$

$$cx + dy = q$$

by doing the following.

- Multiply the top equation by  $-c$ .
- Multiply the bottom equation by  $a$
- Add the two new equations.
- Solve for  $y$

#### Both groups

Returning to the motivation example: The two equations are

$$y = 25x + 250$$

$$y = 75x + 50$$

Rewrite the above system of equations in the form

$$ax + by = p$$

$$cx + dy = q$$

and use the formulas to find  $x$  and  $y$ . The value of  $x$  is the number of days where the two plans are the same, the value of  $y$  is the cost for  $x$  days.

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2. Solve the following system of linear equations for  $x$ .

$$ex + fy + gz = r$$

$$hx + iy + jz = s$$

$$kx + ly + mz = t$$

by doing the following.

- Multiply the top equation by  $-j$ .
- Multiply the middle equation by  $g$
- Add the two new equations to get equation (\*).
- Multiply the bottom equation by  $-j$ .
- Multiply the middle equation by  $m$
- Add the two new equations to get equation (\*\*).
- Solve the system of equations (\*) and (\*\*).