5. 3 Some of One, None of the Other

A Solidify Understanding Task

Carlos and Clarita are comparing strategies for writing equations of the boundary lines for the "Pet Sitter" constraints. They are discussing their work on the *space* constraint.

- *Space*: Cat pens will require 6 ft² of space, while dog runs require 24 ft². Carlos and Clarita have up to 360 ft² available in the storage shed for pens and runs, while still leaving enough room to move around the cages.

Carlos' Method: "I made a table. If I don't have any cats, then I have room for 15 dogs. If I use some of the space for cats, I noticed that I can replace 1 dog with 4 cats. So, if I have 4 cats, I can board 14 dogs and so forth. From my table I know the y-intercept of my line is 15 and the slope is $-\frac{1}{4}$, so my equation is $y = -\frac{1}{4}x + 15$."

Clarita's Method: "I let x represent the number of cats, and y the number of dogs. Since dog runs require 24 ft², $24y$ represents the amount of space used by dogs. Since cat pens require 6 ft², $6x$ represents the space used by cats. So my equation is $6x + 24y = 360$."

1. Since both equations represent the same information, they must be equivalent to each other.

   a. Show the steps you could use to turn Clarita's equation into Carlos' equation. Explain why you can do each step.

   b. Show the steps you could use to turn Carlos' equation into Clarita's. Explain why you can do each step.

2. Use both Carlos' and Clarita's methods to write the equation of the boundary line for the *start-up costs* constraint.

    - *Start-up Costs*: Carlos and Clarita plan to invest much of the $1280 they earned from their last business venture to purchase cat pens and dog runs. It will cost $32 for each cat pen and $80 for each dog run.

3. Show the steps you could use to turn Clarita's *start-up costs* equation into Carlos' equation. Explain why you can do each step.

4. Show the steps you could use to turn Carlos' *start-up costs* equation into Clarita's. Explain why you can do each step.

In addition to writing an equation of the boundary lines, Carlos and Clarita need to graph their lines on a coordinate grid.

Carlos' equations are written in **slope-intercept form**. Clarita's equations are written in **standard form**. Both forms are ways of writing **linear equations**.

Both Carlos and Clarita know they only need to plot two points in order to graph a line.

5. Carlos' strategy: How might Carlos use his slope-intercept form, $y = -\frac{1}{4}x + 15$, to plot two points on his line?

6. Clarita's strategy: How might Clarita use her standard form, $6x + 24y = 360$, to plot two points on her line? (Clarita is really clever, so she looks for the two easiest points she can find.)