

## Some of One, None of the Other

### A Solidify Understanding Task

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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 ft<sup>2</sup> of space, while dog runs require 24 ft<sup>2</sup>. Carlos and Clarita have up to 360 ft<sup>2</sup> 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 4 cats, then I can have 14 dogs. With 8 cats, I have room for 13 dogs. For each additional dog run that I don’t buy, I can buy 4 more cat pens. 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 cat pens require 6 ft<sup>2</sup>, 6*x* represents the space used by cats. Since dog runs require 24 ft<sup>2</sup>, 24*y* represents the amount of space used by dogs. 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.

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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.)