Lab 14: Kitten Weights

Recently, my family fostered some kittens. It's pretty fun; you temporarily adopt them when they're about a month old, and you raise them (feed them, clean them, play with them, etc.) until they're big enough for someone to take to their forever home.

You can see that first foster crew at right, the day they were brought home. From left to right: Romeo, Stella, and Paulina.

One of the things that foster kitten parents have to do is track the kitten's weight every day. Open today's spreadsheet!

Please make sure you are on the "First 7 days" tab: you'll see each kitten's daily weight measurements over the first week they were fostered (we picked them up on "Day 0", but didn't start weighing them until Day 1).

Start by creating 3 scatterplots (one for each kitten) showing their weights over this first week (days should automatically become the horizontal unit, and weight the vertical). Remember to hold down the "ctrl" button to select columns of data that aren't next to each other. Also, adjust the vertical scale so that it starts at 1 pound and goes to 2 pounds (in case you forgot, you can do that under the "Customize" section of the "Chart editor" menu: pick "Vertical axis" and then adjust the "Min" and "Max"). You may need to drag your graphs around the Sheet (or resize them) so that you can see them all. Hey!

While you're in that "Customize" area, also change the "Horizontal Axis" to start at 0 Days – you'll thank me down in #4. ☺

1. **(3 points)** Take a screenshot of your three graphs and include them as your answer to this question! Make sure I can see them all!

For the two kittens whose weight data look roughly linear, add their trendlines to their scatterplots. Also make sure you can see the equations of these trendlines (remember, the instructions are in Part 1 of your previous lab).

2. **(1 point)** Select one of the two trendline equations you just made and give its slope (also tell me which kitten you're looking at!).

3. **(2 points)** What does that slope mean? Be sure to give the full unit on that number (remember, it's a "per").

4. **(2 points)** What does the ***y***-intercept represent in these equations, in the context of the kittens?

5. **(2 points)** One of the kittens ***definitely*** doesn't have linear-looking weight changes. Give one reason why that might be.

6. **(2 points)** Give ***another*** reason why that might be. If you're stuck on this one, check this out (the title should be enough to give you an idea. ☺)!

Now click over to the second tab of the spreadsheet: "First 14 days". I've already given you the scatterplots.

7. **(2 points)** Add the trendlines (with their equations) to the same two kittens' graphs that you did in the previous questions. How do the slopes of the 14-day weights compare to the 7-day weights?

8. **(2 points)** What does that mean about how those two kittens were adding weight during the first week compared to the second week?

Now we'll deal with that third kitten's data! Start by adding a trendline to their 14-day weight data (also make sure you can see the equation of the trendline). You'll notice that the slope of that trendline is much lower than the slopes of the other kittens' trendlines (it's only about 60% as steep). This is because of the initial data points in that dataset, which were very different from the other data points.

You see, when you ask a computer to add a best-fit line to data…it ***will***, even if it ***shouldn't***. That dataset is clearly not linear in the beginning. For whatever reason (you listed some possible ones back in #5 and #6), the initial data point or two were different enough from the rest to affect the model.

Let's take a look at what happens if we edit the data set a bit:

9. **(2 points)** Delete the first weight data point from **that** kitten's dataset (that is, delete the "Day 1" weight for that kitten, but not the whole "Day 1" row). When you do, the best-fit line changes; the best-fit line algorithm is now ignoring that data point that didn't fit the rest of the data. What's the new slope of the best-fit line?

10. **(2 points)** You might be able to argue that the Day 2 data point doesn't quite fit the rest of the data, either. Delete that Day 2 weight for the same kitten. What's the slope now?

11. **(2 points)** How does this adjusted slope of this kitten's weight increase compare to the slopes of the other two kittens' weight increases? If it helps, round them off to the nearest hundredth of a pound per day.

Now, it might have felt weird to ***remove*** data points from a dataset like that. However, there are a few reasons it makes sense in this case:

- From past experience, I know that kittens usually add weight linearly. If they're losing weight, something's wrong...and the kitten whose data you adjusted was healthy over those 14 days.
- I could see that, if we ignored the initial two points that you removed in #9 and #10, the slopes for all three kittens would be roughly equal. This makes sense, as the three kittens were from the same litter.
- Datasets often "glue together" differently-behaving sections. One part can have a certain characteristic, and others can have different ones. We'll explore that more in the next lab.

So, as consumers of data, you'll often have to look deeply at datasets to see what their underlying behavior is showing you. And, as contradictory as it might sound, one way to do that is to ***not*** look at ***all*** the data.

For the last question of the lab, we need to face this reality: at some point these kittens must go back to the Humane Society so that someone can adopt them and give them a forever home. Foster families are told to bring the kittens back when they reach 2 pounds.

12. **(3 points) (w)** Using any of three kittens' trendlines, figure out about which day they'll hit 2 pounds. Please explain exactly what you do!