SAT Intensive Workshop - Day 11

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24 June 2019

My apologies for not putting out notes on Friday – I wasn't entirely sure who would be in my class, so I didn't assign any homework. I've included some material from yesterday in these notes for your convenience.

Also, welcome to Joan and Karen!

1 Class Policies

This is mostly for the use of our new students, but perhaps it would do some of you good to reread this.

1.1 Class Homepage

All class materials will be posted on my Github, https://github.com/TomasMatzner/SAT-Intensive-2019. I will post the day's materials no later than 6:45 PM, unless I say otherwise. You are responsible for the material in all of the files (except the LICENSE and README files - please ignore them).

1.2 Class Conduct

Like I said, I plan to keep it fairly casual in the classroom. You are not in middle school anymore, and college is not far off. As such, I plan to give you more privileges than you might get at school. For example, just tell me you're going to the restroom – it's not like I'm going to say no anyway. However, these privileges are just that – privileges. They can be taken away if you abuse them.

I am more than happy to allow class-related discussion while I am presenting, as I believe that learning happens best within peer groups and with laughter. However, I do ask that we pay attention when a fellow student is talking or presenting – getting up to talk is no small feat, and we want to make sure that everyone feels supported in their academic endeavors.

1.2.1 Regarding Noise

If you get too loud, I reserve the right to take away electronics, cancel plans for the rest of the day, and just administer exams for the entire day. Some of you got to experience this, and I assure you it was just as unenjoyable for me as it was for you. I hate having to discipline people, so let's keep the volume at a respectable level.

1.3 Electronics

Cell phones should be used sparingly, if necessary, throughout the day. Checking notifications every once in a while for critical messages is fine with me, as long as it doesn't turn into an extended Snapchat story browsing session, etc. I do expect phones to be put away immediately if I ask you to do so. If you finish a practice exam, have double-checked your work, and feel confident about your answers, using your cell phone under the table is fine, but the screen must be out of view of the other students in the room. I do not anticipate this being a problem, but if I feel that a student is using their phone too much, I reserve the right to ask them to put it away.

Regarding laptops – some of you have expressed the desire to type some essays to save your hands. I agree. I probably won't be able to read some of your handwriting, so typed essays sound good to me too. However, we will do some handwritten essays to simulate the actual test-taking experience. This is a privilege, not a right – if I see anyone using their laptops for non-academic work, laptop privileges will be revoked for everyone in the classroom.

Of course, I reserve the right to change these rules should electronic use interfere with anyone's daily learning.

1.4 Tardy Die

We decided to come up with a tardy system. If someone is late, then they will get to roll... the punishment die!

1. 10 chest-to-ground burpees.
2. Bring food for everyone.
3. Sing a song of the class's choosing, with choreography.
4. Bring food for everyone.
5. One quality pushup. And by quality, I mean good form, all the way down slowly, and all the way back up slowly.
6. Bring food for everyone.

A brief note about food: this should be something small, like snacks or drinks. It should really not total more than $5 worth of food. After all, the punishment die is more of a mechanism with which to have fun, not an *actual* punishment.

2 New Material from Last Week

Here are some notes on what we covered on Thursday and Friday of last week.

2.1 Math

Problem 11.1. *In the xy-plane, the point (p, r) lies on the line with equation $y = x + b$, where b is a constant. The point with coordinates $(2p, 5r)$ lies on the line with equation $y = 2x + b$. If $p \neq 0$, then what is the value of $\frac{r}{p}$?*

Proof. Since (p, r) lies on $y = x + b$ and $(2p, 5r)$ lies on $y = 2x + b$, we plug each point into its respective equation to get the following system of equations:

$$r = p + b \tag{1}$$
$$5r = 2(2p) + b \tag{2}$$

Now, let's keep in mind what we want to find. We want to find $\frac{r}{p}$. Currently, we have two equations in r, p, and b. The only variable we don't want is b, so we look to eliminate it. We do so by subtracting equation (1) from equation (2) to get

$$(5r) - (r) = (4p + b) - (p + b) \implies 4r = 3p.$$

Now, we want $\frac{r}{p}$, so dividing both sides by p gives $\frac{4r}{p} = 3$. Then, dividing both sides by 4 gives us $\frac{r}{p} = \boxed{\frac{3}{4}}$.

Note that the key realization was knowing to eliminate b. In general, if a variable appears in a problem and you don't care about it at all, do your best to eliminate it somehow. Here, we canceled it by subtraction. □

Moving on to statistics, recall that we discussed what standard deviation is, how to solve for it explicitly, and how to figure out if it is big or small by looking at a set of data.

Definition 12.2 [Informal]. Given a set of data, its *standard deviation* is, on average, how far away data points are from the mean of the set of data.

What does this definition mean? If the data points are clustered around the mean, then the standard deviation is low. If the data points are far away from the mean, then the standard deviation is high.

Now, let's look at how to explicitly calculate the standard deviation.

Definition 12.3 [Formal]. The standard procedure for calculating the *standard deviation* of a set of data $\{x_1, \ldots, x_n\}$ goes as follows:

1. Calculate the mean of the data, $\mu = \dfrac{x_1 + \cdots + x_n}{n}$.
2. Create a new list of data by calculating the distance squared of every point from the mean. So, the new list of data looks like $\{(x_1 - \mu)^2, (x_2 - \mu)^2, \ldots, (x_n - \mu)^2\}$. Note that all of these values are positive, since each of the values is the square of a real number.
3. Find the mean of this new list, $\sigma = \dfrac{(x_1 - \mu)^2 + \cdots + (x_n - \mu)^2}{n}$. This value is called the *variance* of the original data set $\{x_1, x_2, \ldots, x_n\}$.
4. Finally, the standard deviation of the data set $\{x_1, \ldots, x_n\}$ is given by the value $\sqrt{\sigma}$.

That's a lot of symbols, so let's look at a concrete example.

Example 12.4. Find the standard deviation for the data set $\{2, 4, 9\}$.

Proof. Let's go through each of the steps presented in Definition 12.3.

i) First, we find the mean of our data set. $\mu = \dfrac{2+4+9}{3} = \dfrac{15}{3} = 5$.

ii) Now, we create a new list of data by finding the square of the distance of each value from the mean. This gives us the list $\{(2-5)^2, (4-5)^2, (9-5)^2\}$, or $\{9, 1, 16\}$.

iii) We calculate the mean of this new data set. $\dfrac{1+9+16}{3} \approx 8.67$.

iv) Finally, we take the square root of that mean to get our standard deviation, $\sqrt{8.67} \approx \boxed{2.94}$.

If it appears on the calculator section, your calculator should also be able to find the standard deviation of a set of data. □

2.2 Reading

While we didn't get to any writing sections on Thursday or Friday, we did manage to review a couple of passages of the reading section. Here are some of the words we came across.

2.2.1 New words

- malignant (adj) - evil or malevolent.
- benign (adj) - not evil, neutral.
- chafe (v) - to make sore by rubbing against.

Also, we talked about the following Latin phrases:

- Nota bene (n.b.) - literally means note well. Used when you want the reader to pay close attention to what you want to say.
- Exempli gratia (e.g.) - literally means to explain something. Used as a substitute for "for example". Not to be confused with i.e.
- Id est (i.e.) - literally means it is. Used as a substitute for "in other words". Not to be confused with e.g.
- Modus operandi (m.o.) - literally means mode of operation. Used to describe a method of doing something.
- A priori - literally means before. Used to mean before, most of the time.

3 Today's Events

- Icebreakers.
- Review of Reading section 1 from 21 June.
- Math section 4 practice exam.
- Review of Math section 3 from 21 June.
- Lunch.
- Reading section 1 practice exam.
- Basic essay mechanics lecture.
- Review of Math section 4 from 20 June.
- Writing section 2 practice exam.

3.1 Review of Reading section 1 from 21 June

3.1.1 New words

- miser (n) - someone who hoards wealth and spends little, usually stingily.
- refuge (n) - a safe haven, something providing shelter.
- clout (n) - influence.
- connoisseur (n) - an expert judge in matters of taste.
- null (adj) - having no binding force; invalid; empty.
- loosey-goosey (adj) - informal language, means imprecise or excessively disorganized.
- glom (v) - informal language, means to stick to.
- feeble (adj) - weak, of little strength.
- dawdle (v) - to move slowly and idly; also, to waste time.
- meander (v) - to follow a winding course.
- subsequent (adj) - coming after something; following.
- melodramatic (adj) - exaggerated or sensationalized.
- histrionic (adj) - overly theatrical in character or style.

4 Homework

In addition to the new words in sections 2.2.1 and 3.1.1, you should also know the following words, their parts of speech, their definitions, and how to use them in a sentence:

- abrogate (v) - to cancel, deny, or repeal.
- blasphemy (n) - speech which offends, usually against religious ideas.
- credible (adj) - believable.
- enigma (n) - a puzzle or mystery.
- harbingers (n) - bringers of warnings; indicators.
- labyrinthine (adj) - complicated or highly not straightforward. Base word is labyrinth.
- nuzzle (v) - to cuddle or snuggle. Alternatively, to "glom".
- plaudit (v) - to give strong praise, to exalt.
- reprehensible (adj) - shameful or extremely bad.
- tardy (adj) - delayed beyond reasonable expectations; late or overdue.

You should also know the Latin phrases in section 2.2, and how to use them appropriately.