SIW 18 June

Tomas Matzner

June 2019

1 Today's Events

- Vocabulary quiz.
- Vocabulary Kahoot.
- Math section 3 practice exam.
- Review of Writing section 2 from 17 June.
- Review of Reading section 1 from 17 June.
- Lunch.
- Partial review of Math section 4 from 17 June.
- Reading section 1 practice exam.
- Writing section 2 practice exam.

1.1 Review of Writing section 2 from 17 June

Some of you seemed to struggle with dangling modifiers. Be sure to go back to section 2.2.3 of the 11 June notes and review that information. The notes are there for your use. Apart from that, everyone is missing only a couple of questions out of the 44 pretty consistently, so I don't think I'll have to lecture that much more about grammar. Do let me know if there are any topics or concepts you'd like to see, though.

1.1.1 New words

- encroach (v) - to intrude upon.
- invasive (adj) - tending to spread widely and undesirably. With regard to humans, tending to intrude on a person's thought.
- invigorate (v) - give strength or energy to.
- lumber (v) - to move in a slow or awkward way.
- lurch (v) - to make an abrupt or uncontrolled movement.
- cavort (v) - to jump/dance/move around excitedly.
- hurtle (v) - to move at high speeds, typically uncontrolled.
- summon (v) - to authoritatively call upon someone.
- consort (v) - to associate regularly with someone, often at the disapproval of other people.
- consort (n) - the significant other of a monarch.
- convene (v) - to come together or assemble, especially for a meeting.
- fraternize (v) - to form a friendship with someone, especially at the disapproval of other people.

1.2 Review of Reading section 1 from 17 June

1.2.1 New words

- anemic (adj) - literally suffering from anemia, but commonly used to mean lacking in color and vitality.
- equine (adj) - having to do with horses.
- bovine (adj) - having to do with cows.
- feline (adj) - having to do with cats.
- canine (adj) - having to do with dogs.
- punctilious (adj) - showing great attention to detail or correct behavior.
- whelp (v) - of a female dog, to give birth to puppies.
- meager (adj) - small; lacking.
- meticulous (adj) - showing great attention to detail; very careful and precise.
- affluent (adj) - having much money.
- derisive (adj) - expressing contempt or ridicule.
- quizzical (adj) - questioning.
- consummate (v) - to engage in sexual intercourse for the first time after marriage.
- consummate (adj) - showing a great degree of skill.
- adverse (adj) - harmful or unfavorable.
- stark (adj) - bare in outline; sharply delineated.
- sporadic (adj) - occurring irregularly.
- vindication (n) - the act of clearing someone of blame.
- redemption (n) - the act of being saved from evil.
- livid (adj) - extremely mad.
- obscene (adj) - inappropriate, repugnant, especially of sexual matters; lewd.
- objectionable (adj) - arousing distaste; unpleasant; offensive.

1.3 Partial review of Math section 4 from 17 June

The questions we didn't get to in this section contain some important concepts. I don't want to rush through them, so we'll finish reviewing this test first thing tomorrow morning.

1.3.1 Dimensional Analysis

Since we spent so much time on this subject, I expect all of you will know how to convert between units very readily. Dimensional analysis is a simple concept; the only tricky part is knowing that you can cancel units if they appear in both the numerator and the denominator of a fraction. Some examples might be illuminating:

Example 7.1. Convert 55 miles per hour to inches per second.

Proof. Recall that there are 12 inches in a foot, and 5280 feet in a mile. Our starting units are $\dfrac{\text{miles}}{\text{hour}}$, and we want to get to $\dfrac{\text{inches}}{\text{second}}$. Let's first convert from hours to seconds:

$$55\,\frac{\text{miles}}{\text{hour}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{1 \text{ minute}}{60 \text{ seconds}} = 55\,\frac{\text{miles}}{\cancel{\text{hour}}} \cdot \frac{1 \cancel{\text{ hour}}}{60 \cancel{\text{ minutes}}} \cdot \frac{1 \cancel{\text{ minute}}}{60 \text{ seconds}} = \frac{55}{60 \cdot 60}\,\frac{\text{miles}}{\text{second}} = 0.0153\,\frac{\text{miles}}{\text{second}}.$$

Now, we convert from miles to inches.

$$0.0153 \ \frac{\text{miles}}{\text{second}} \cdot \frac{5280 \text{ feet}}{1 \text{ mile}} \cdot \frac{12 \text{ inches}}{1 \text{ foot}} = 0.0153 \ \frac{\cancel{\text{miles}}}{\text{second}} \cdot \frac{5280 \ \cancel{\text{feet}}}{1 \ \cancel{\text{mile}}} \cdot \frac{12 \text{ inches}}{1 \ \cancel{\text{foot}}} = 0.0153 \cdot 5280 \cdot 12 \ \frac{\text{inches}}{\text{second}} =$$
$$\boxed{969 \ \frac{\text{inches}}{\text{second}}}. \qquad \square$$

Example 7.2. Find out how much 4000000 atoms of carbon-12 weighs in grams.

Proof. Recall that there are $6.02 \cdot 10^{23}$ atoms in one mole, and that there are 12 grams of carbon-12 in one mole. So, our conversion goes as follows:

$$4000000 \text{ atoms} \cdot \frac{1 \text{ mole}}{6.02 \cdot 10^{23} \text{ atoms}} \cdot \frac{12 \text{ grams}}{1 \text{ mole}} = 4000000 \ \cancel{\text{atoms}} \cdot \frac{1 \ \cancel{\text{mole}}}{6.02 \cdot 10^{23} \ \cancel{\text{atoms}}} \cdot \frac{12 \text{ grams}}{1 \ \cancel{\text{mole}}}. \text{ This, in turn,}$$
equals $\frac{4000000 \cdot 12}{6.02 \cdot 10^{23}}$ grams $= \boxed{7.98 \cdot 10^{-17} \text{ grams}}$. $\qquad \square$

Note that you don't actually have to know what the units are or what they mean, but rather just the conversions between them. Dimensional analysis allows you to just take the units and cancel them top and bottom efficiently. Also, while you're still getting familiar with dimensional analysis, you should write out the conversions explicitly in terms of fractions – it will help eliminate mistakes.

1.3.2 Direct and Inverse Proportion

Definition 7.3. Two values, x and y, are said to be in *direct proportion* if there exists some real number k such that

$$x = ky.$$

k is called the *constant of direct proportionality*, although this is shortened to constant of proportionality, as the direct can be inferred from context. Direct proportion is also sometimes called *linear proportion*.

Definition 7.4. Two values, x and y, are said to be in *inverse proportion* if there exists some real number c such that

$$xy = c.$$

c is called the *constant of inverse proportionality*, although this is shortened to constant of proportionality, as the inverse can be inferred from context.

Another perhaps more clear way of writing the relation in Definition 7.4 is x and y are in inverse proportion if $x = \frac{c}{y}$.

What are these definitions actually saying, though? For direct proportion, all it's saying is every time y goes up by 1, x goes up by k. For inverse proportion, it's saying that every time x gets multiplied by n, y gets multiplied by $\frac{1}{n}$ for any number $n \neq 0$. Let's look at some examples.

Example 7.5. Your parents pay you \$5 per chore you do well. If x is how much money you make per week, and y is the number of chores you do per week, write an equation relating x and y.

Proof. Note that we have a direct proportion between x and y; every time y goes up by 1, x goes up by 5. So, the equation of direct proportionality we get is $\boxed{x = 5y}$. $\qquad \square$

Example 7.6. The intensity of a speaker is governed by the relation $I = \dfrac{P}{4\pi r^2}$, where P is the power output of the speaker. If the intensity of the music is 16 times louder for Alice than it is for Bob, then who is closer to the speaker, and by how many times?

Proof. Clearly, Alice is closer to the speaker since she hears a louder sound. Let $c = \dfrac{P}{4\pi}$. Then, it becomes clear that I and r^2 (not just r, think about why) are in inverse proportion, since they are governed by the equation

$$I = \frac{c}{r^2}.$$

Since Alice's intensity is 16 times greater than Bob's, her r^2 is $\frac{1}{16}$ of Bob's. So, her r is $\sqrt{\frac{1}{16}} = \frac{1}{4}$ of Bob's. Thus, Alice is $\boxed{4}$ times closer to the speaker than Bob. $\qquad\square$

2   Homework

Know the words in the New words sections, as well as their definitions and how to use them in a sentence.

Also, in my opinion, the best way to get better at reading comprehension, and thus the Reading section, is to simply read a lot. I mean read good literature. You should struggle to get through the book – it shouldn't be 100% easy reading. The Newbery award goes out every year to the best fiction book for young adults. The list can be found at:

http://www.ala.org/alsc/awardsgrants/bookmedia/newberymedal/newberyhonors/newberymedal

You should start reading some of these books, especially the older ones. Try reading things from the 50s, from the 80s, even from the 20s. It'll help you become more comfortable with formal grammar, and with older grammar. English is an evolving language, as is every other language, so it might be useful to get a snapshot of what the language was like in, say, 1955. Then, when a passage comes up from the 1950s, it won't be quite so foreign to you.