SAT Intensive Workshop - Day 13

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1 Today's Events

- Vocabulary quiz and Kahoot.
- Review of Math section 3 from 25 June.
- Reading section 1 practice exam.
- Lunch.
- Review of Reading section 1 from 25 June.
- Writing section 2 practice exam.
- Review of Writing section 2 from 25 June.
- Math section 4 practice exam.

1.1 Review of Math section 3 from 25 June

1.1.1 Vieta's Formulas

These come up frequently enough to where I think that it's worth understanding and remembering them. We also covered this on 12 June.

Theorem 3.3 [Vieta's Formulas for Quadratics]. Given a generic quadratic $ax^2+bx+c=0$ with roots r_1 and r_2, then

$$r_1 + r_2 = -\frac{b}{a}$$
$$r_1 r_2 = \frac{c}{a}$$

In particular, if the polynomial is monic, meaning that $a = 1$, then

$$r_1 + r_2 = -b$$
$$r_1 r_2 = c$$

Example 13.1. Write a polynomial whose roots are 5 and 3.

Proof. Using Vieta's formulas, we can set $a = 1$, and $b = -r_1 - r_2 = -5 - 3 = -8$, while $c = 5 \cdot 3 = 15$. So, a possible polynomial is $\boxed{x^2 - 8x + 15}$. □

1.1.2 Common factorizations

Some common factorizations that you should know:

- Square of a binomial. $(a+b)^2 = a^2 + 2ab + b^2$.
- Difference of squares. $a^2 - b^2 = (a-b)(a+b)$.
- Difference of cubes. $a^3 - b^3 = (a-b)(a^2+ab+b^2)$.
- Sum of cubes. $a^3 + b^3 = (a+b)(a^2-ab+b^2)$.

1.1.3 Simplifying complex fractions

Let's say we are given a fraction whose numerator and denominator are both complex numbers, $\frac{a+bi}{c+di}$. Furthermore, we want to write the denominator as a real number. To do so, we multiply by the complex conjugate of the denominator:

Definition 13.2. Given a complex number $\omega = x+yi$, then its *complex conjugate* is given by the expression $\overline{\omega} = x - yi$.

So, multiplying $\frac{a+bi}{c+di}$ by the complex conjugate of $c+di$, $c-di$, we get:

$$\frac{a+bi}{c+di}\cdot\frac{c-di}{c-di} = \frac{(a+bi)(c-di)}{(c+di)(c-di)} = \frac{(ac+bd)+(bc-ad)i}{c^2+d^2} = \frac{ac+bd}{c^2+d^2} + \frac{bc-ad}{c^2+d^2}i.$$

Example 13.3. Write $\frac{3-5i}{8+2i}$ in the form $a+bi$.

Proof. Let's multiply top and bottom by the conjugate of the denominator:

$$\frac{3-5i}{8+2i}\cdot\frac{8-2i}{8-2i} = \frac{(3-5i)(8-2i)}{(8+2i)(8-2i)} = \frac{24-6i-40i+10i^2}{64-16i+16i-4i^2} = \frac{14-46i}{68} = \boxed{\frac{7}{34} - \frac{23}{34}i}.$$ □

1.1.4 Degrees to radians

Definition 13.4. A *radian* is a measure of angle. π radians is defined to be equal to a half-circle, or 180°. Radians is frequently shortened to rad when using it in equations.

Example 13.5. Convert 30° to radians.

Proof. Since π rad = 180°, dividing both sides by 6 gives us that $30° = \boxed{\frac{\pi}{6}\text{ rad}}$. □

1.2 Review of Reading section 1 from 25 June

1.2.1 New words

- baffle (v) - to completely confuse or perplex.
- irksome (adj) - irritating or annoying.
- nuisance (n) - something causing inconvenience or annoyance.
- venture (v) - to do something potentially dangerous or unpleasant.

- tumult (n) - confusion or disorder
- fetish (n) - an object to which great reverence is given.
- antipathy (n) - a rooted feeling of dislike and hate.
- trifling (adj) - unimportant; trivial.
- sentinel (n) - a guard whose job is to keep watch and look out for danger.
- inexorable (adj) - impossible to stop or prevent.
- dismay (n) - distress.
- altercation (n) - a noisy argument, especially in public.
- adversarial (adj) - opposed or hostile.
- treacherous (adj) - dangerous.
- dreary (adj) - dull, bleak, and lifeless; depressing. Emo.
- sneer (v) - to laugh at scornfully.
- undulate (v) - to move up and down smoothly.
- calisthenics (n) - exercises to achieve fitness and grace of movement.
- aggrandize (v) - to increase the power, status, or wealth of something.
- inquisition (n) - a prolonged questioning session.
- sublunary (adj) - under the moon.
- subjugate (v) - to dominate, especially by conquest.
- dire (adj) - extremely serious; urgent.

2 Homework

Know all of the words in the New words section, as well as their definitions, parts of speech, and how to use them in a sentence.

Additionally, read the following excerpts:

1. https://literarydevices.net/logos/
2. https://literarydevices.net/ethos/
3. https://literarydevices.net/pathos/