Math Lab Lesson #3:
Test-Taking, Studying, and Introduction to Rational Number

What are some test-taking strategies?

How can we create and use flashcards as a study tool?

How can we work with rational numbers?

SITUATING THE LESSON:

During Saturday Academy and Weekday, students have:

- Reviewed material and taken a Mid-Semester Quiz
- Some students have been introduced to different models to make sense of the fraction $\frac{a}{b}$ (i.e. the part-whole model, the partitive/sharing model, the quotative/measuring model, and the number model.

Summary: In this lesson, students will take a step back and reflect on how they feel about taking tests and their own personal experiences. They will read and discuss the "How to Solve It" decision tree, and focus on ways to identify different areas of "Content." They will then grade a hypothetical student's exam and identify this student's mistakes. The questions on this hypothetical exam mirror the Closing Assessment. They will use this exam (and previous work) as the content bank from which to create flashcards, and then practice using these flashcards as a studying tool, both by studying alone and by studying with a partner.

Finally, students will watch a short video introduction to rational number, and complete a group activity based on this video.

Preparation Before Class: Work through all problems and watch videos in advance. Read through and annotate the Lesson Plan in a way that will be useful to you.

Materials:

- **Math Lab Lesson #3: Classwork** (1 per student and instructor)
- **Math Lab Lesson #3: Group Activity** (1 per student and instructor)
- **Math Lab Lesson #3: How to Solve It** (1 per student and instructor)
- **Math Lab Lesson #3: Grading an Exam** (1 per student and instructor)
- **Math Lab Lesson #3: Instructor Answer Key** (instructor only)

1st Hour

1. Lesson Launch (25-30 min)

A) SATURDAY ACADEMY AND WEEKDAY REVIEW (5 MIN)

- Ask students what they have been learning in Saturday Academy and Weekday. What has been interesting? What have they struggled with? Take a few responses and jot them on the board.

B) DISCUSSION OF STANDARDIZED TESTING (10 – 15 MIN)

- Students just took a Mid-Semester Quiz. When they bring this up, have them turn to the first page on their Math Lab Classwork and individually answer the three questions about their experience taking this quiz. After a few minutes, have them share out in small groups and then in a large group discussion. Record common responses on the board.
- During this discussion, encourage students to say exactly what they are thinking. Validate their perspective. If students express frustration and annoyance at testing, for example, feel free to validate this! In other words, it is okay to have a broader conversation about their perspectives on testing based on their previous school experience.
- Explain that there are three goals for the SEO math curriculum: 1. To prepare students to succeed in college level math (if they choose to pursue it); 2. To prepare students to take the SAT, which will play a role in the college admission process; and 3. To develop an appreciation for both pure and applied mathematics, and an understanding of the ways in which math permeates our everyday lives. Ideally, these three goals will align! Sometimes they do not.
- If students bring it up or you feel comfortable doing it, frame the SAT (or standardized tests in general) as assessments that are out to get them. In particular, the SAT is designed to trip students up and divide students based on their score. Frame the studying/preparation that SEO Scholars engage in as a way to "get back at'" the test-makers, and to show them that they won't win this time.

C) DISCUSS THE "HOW TO SOLVE IT?" DECISION TREE (10 MIN)

- Hand out the "How to Solve It?" decision tree, and go over it with the class. Have the students try to explain it to you. Challenge students to find examples of math problems that could be attacked using the "Questions to Ask Yourself" prompts.
- Ask students "what do you think 'Content Area' means?" Share out.

- Give students a minute to work on Ex #1 using this decision tree. Share out as a group.
- Ask students what Content Areas they have already seen in SEO or their HS math classes.

Some examples:

  - Base-10 system
  - Factoring
  - Solving equations/algebra
  - Linear relationships (from HS)
  - Etc…

- Explain that before we can engage with a problem, it is often beneficial to identify what content area the problem relates to. Once you have narrowed this down, then you can think about all of the things you know about this content area!
- Sometimes it is better to identify specific content areas instead of general ones. For example, "algebra" could be used to describe a lot of stuff (procedures/concepts). However, we could break this large content area down into smaller content areas, for example "linear equations" "quadratic equations" "exponent equations" "radical equations." While all of these are algebra, they each have some peculiarities in terms of the kinds of operations/manipulations that students should engage in.
- Explain that often in math, when you hear a word or see a problem (i.e. "line"), a bunch of formulas, pictures, key words, and ideas pop into your head based on your previous experience.
  - Ask students for examples of this if you say the word "line". They will likely say $y = mx + b$ and $m = \frac{\Delta y}{\Delta x}$. Have students come to the board to draw the picture that they have in their minds when they hear the word "line"
  - If you have time, do the same thing for "proportion."
- The goal of studying for an exam is to increase the amount of stuff (formulas, pictures, ideas) that pop into your head, while at the same time making sure that you know what they mean and how to use them!
- Explain that today we are going to spend some time later on in the lesson on developing one studying strategy in depth: using flashcards.

2. Grading an Exam (20 min)

- Hand out the "Grading an Exam" packets. Explain that you took this exam, and you'd like their help grading your work. Allow students to work in pairs. Explain that their goal is to:
    - Identify the content area of each question
    - Determine which of the answers are correct and incorrect
    - For the ones that are incorrect, identify the mistakes that were made and correct them by actually giving written comments on the paper.
- After students are finished, share out and clear up any content-related confusion.
- During this share-out, challenge students explain how they could have used the "How to Solve It" decision tree to approach some of these problems.

3. Break (5 min)

2nd Hour

4. How to Create and Use Flashcards (30 min)

- Direct students to the Video "Studying Tip: How to Create and Use Flashcards." After they have watched this, direct students to use the sample Exam that they just graded as a basis for making some flash cards.
- Help them create flashcards that will be useful to them. For example, if there is too much information on one side of a flashcard it may not be that useful. The goal is to get small and manageable chunks of information on each flashcard.
- Once students have created a set of flashcards (aim for 10 if possible), give them time to practice using the flashcards in an appropriate way. In particular, they should start with one or two flashcards and gradually introduce other flashcards to the mix one at a time. They should also "shuffle" them around so that they don't memorize things based on the order of the flashcards.
- After students have had some time to study on their own, have them pair up and test each other using the flashcards.

5. **Introduction to Rational Number** (25 min)

- Direct students' to watch the video "Introduction to Rational Number" and take notes in their classwork (as always).
- Once everyone is done, have students make one flashcard based on what was covered in the video. This could vary among students.
- Hand out the Group Activity and have them work on this and present their work for the rest of the period.
- Encourage them to use the "How to Solve It" decision tree while working on the Group Activity.
- Note that this is just the introduction to rational number, and many of the ideas/concepts in these Group Activity problems will be explicitly addressed during Saturday Academy.

