

# Formative Assessment and Strategies in Secondary Mathematics

## ‘Assessment for learning involves:

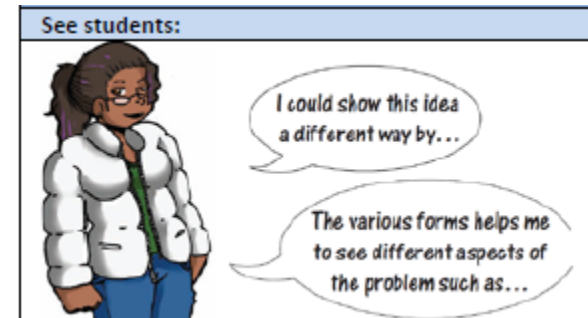
- gathering and interpreting evidence about students’ learning; and
- Learners and their teachers use that evidence to decide where students are in their learning, where they are going and how to take the next steps.’



## Assessment for and as Learning with Mathematical Processes

**Goal: engaged thinkers in math.** The document below has some clear and practical ideas for assisting students in reflecting on their own understandings. [Click here](#) to download a copy of a two page pdf document provided by Math GAINS and TIPS4RM which connects Assessment *for* and *as* learning with the mathematical processes.

- The first page provides Sample Questions and Sample Feedback divided into the processes Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting and Representing (a nice overlap with our 7 processes)
- The second page reminds us of the Key Features of Effective Mathematics Instructions with Sample Indicators and Questions you may ask yourself to reflect on your own teaching.
- I found this document extremely beneficial for all math teachers reminding us of different ways to question our students for their understanding and also providing a checklist for us to reflect on our teaching practices.



## Formative Assessment Resources

1. [50 Ideas for AFL in the Math Classroom](http://www.lancsngfl.ac.uk) -- [www.lancsngfl.ac.uk](http://www.lancsngfl.ac.uk)
2. [Tic-Tac-Toes](#) - Tic-Tac-Toes (Think-Tac Toes or Choice Boards) have been commonly used for Differentiated Instruction. They can also be used to indicate the level that a student is at with a specific concept.

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- [Click here](#) to listen to one way you can use Tic-Tac-Toes in your classroom to assess for learning.
- [Click here](#) to download an editable WORD copy of Math 20-2 Rationalizing Denominators Tic-Tac-Toe
- [Click here](#) to download a PDF copy of Math 20-2 Rationalizing Denominators Tic-Tac-Toe

## Entrance and Exit Slips

Entrance/Exit slips are a very powerful formative assessment tool that you can use as a teacher to get lots of information very quickly. There are many ways to use entrance and exit slips. I will share how I use them in the class. I like to use them to exit a lesson, not a class.

- Once a lesson is complete, I allow time to work on assigned work in class. Enough time is provided to complete these questions based on good work ethic. The students know this and they work hard since they do not want homework.
- Once they have finished the assigned work, they show me and we go over any questions they may have. I then give them the exit slip. I can easily look at the answers to the exit slips and base my groups accordingly the next day. (Please note that students who do not hand in their exit slip will be placed in a group that requires more assistance).

## Math 30-2 Sinusoidal Functions

Provided below are Exit Slips for the unit in Word format. Please feel free to adapt them to your learning environment.

- [Lesson 8.1 Exit Slip](#)
- [Lesson 8.2 Exit Slip](#)
- [Lesson 8.3 Exit Slip](#)
- [Lesson 8.4 - 8.6 Exit Slip](#)

## Websites that Provide Additional Ways of Using Entrance and Exit Slips in High School Mathematics

[Exit Slips to Activate Students as Owners of Their Learning](#) -- John Scammell

[Exit Slips as Practice](#) -- John Scammell

## Questioning Techniques

Questioning is used not only as a pedagogical tool but also as a deliberate way for the teacher to find out what students know, understand and are able to do.

[Questioning and Plenary](#)

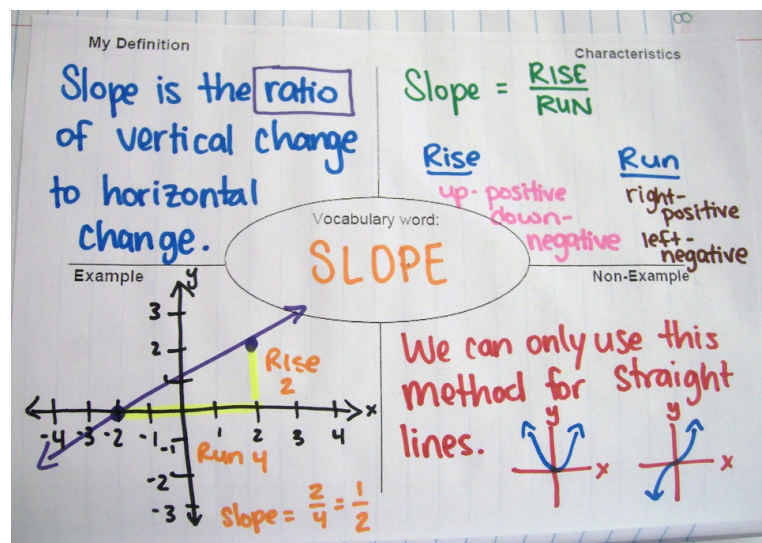
## Quadratic Functions Open - Ended Questions

1. Explain how points on the function  $f(x)$  pre-image are mapped onto the image.
2. Explain what components are critical in describing the shape, location, and the opening or orientation of the graph (parabola).
3. Present a graphical image of a parabola without its symbolic or algebraic representation, then introduce three choices of the polynomial form ( $y = ax^2 + bx + c$ ) with varying coefficients. Ask the students which function best describes the parabola and have them explain.
4. Explain what condition(s) will make quadratic a linear function, or what's the effect of making the coefficient of  $x^2$  less than 0, equal to 0, greater than 0?

Again, these open-ended questions can also be assigned as individual homework or small group activities and students are free to choose their mode of responding to the questions such as by voice thread, oral explanations, essay format, sample problems, slides, graphical solutions, algebraic solutions, etc.

## Framer Model

The Frayer model organizes student's knowledge graphically about a concept or mathematical term into a written description, characteristics/illustrations, examples, and non-examples. Shown is an example of how a student used the Frayer model to describe Slope.



Here are some different ways you can use the Frayer Model in your math classroom.

1. Math 10C - Slope, Parallel Lines and Perpendicular Lines [CN], [V] [PDF Document](#)
2. Math 10C - Domain and Range [CN], [V] [PDF Document](#)

It is important that a student can determine the domain and range in four different ways, written, set builder notation, interval notation, and using lists. This is a great way to ensure that your students are comfortable with all four representations.

3. Math 20-1 Solving Quadratic Equations [CN], [T], [V] [PDF Document](#)

This Frayer Model confirms if a student can solve a quadratic equation by completing the square, factoring, graphing and using the quadratic formula.

4. Math 20-2 Solving Quadratic Equations [CN], [T], [V] [PDF Document](#)

This Frayer Model confirms if a student can describe general characteristics of a quadratic equation, and can solve equations by factoring, graphing and using the quadratic formula.

## Row Games

Check out the [Row Game](#) document for details on how row games are implemented and row games for other topics.

1. **Math 30-2 Permutations & Combinations** (Download: [RG-Permutations & Combinations.docx](#))