Types of Mathematics Active Learning Activities Explained

This document explains some of the main types of active learning activities that occur in mathematics classes at Clark College as part of our mathematics pathways curriculum. Feel free to add to or improve this document so it evolves along with our students and faculty.

An excellent reference explaining the various types of mathematics learning activities is available for download: https://activitytypes.wm.edu/MathLearningATs-Feb2011.pdf

1. **Sorting Activities**

   Cards or other physical items (eg, attribute blocks) that need to be sorted by students in small groups. A example of a simple card sort that involves problems relayed via graph, numerical data, equation, and verbally is:

   Canvas >> Mathematics Collaboration Group >> Files >>
   Card Sort Equations, Graphs, Ordered Pairs and Word Problems for Studying Lines.docx
   (https://clarkcollege.instructure.com/files/88423703/)

   These can be in the form of a "Bucket of Fun" where student pull a baggie of cards for sorting from a bucket to work in a small group. Once solved, they turn it in for a harder challenge from a second bucket, etc. This activity can be easily timed by limiting the time or number of challenge buckets. Online students can be provided the PDFs to cut up and work with other students via a group video chat.

2. **Bingo Game**

   Typical bingo cards have 5x5 squares with a numerical or simple expression in each, sometimes with "free" in the middle block. Each student gets a card and a set of flat markers to place on the blocks as that answer is called. For example, an answer in the block could be 3x, another 3x+1, another x^3. The instructor would call out (or display) simple expressions to be simplified such as x+2x and all those students with 3x on their card would mark them. Get 5 in a row, call bingo. The class should check for correctness as a group and discuss any errors. For variety to the 5-in-a-row, try asking students to complete their cards by forming a T, X, N, or Z shape with their markers.

   The cards can get as complicated as the class level requires. For example the cards could have expressions to be simplified and the instructor call out answers instead. Eg, cards with $(9x^2-1)/(3x-1)$ or $x(x+3)-(x^2-1)$ both of which would get marked for the answer 3x+1.

   http://www.sheffieldmaths.co.uk/Equation%20Bingo%20Level%206.pdf is an example of simple linear equation bingo cards.

https://www.mathcounts.org/sites/default/files/u49/Math.BINGO.2013-14.pdf is an example with a variety of math questions.

This free bingo card generator https://myfreebingocards.com/bingo-card-generator can be used to make cards with words – useful as a pre-test review of terminology. https://bingobaker.com (free account required) bingo game maker can produce printable cards or be played online.

3. **Jeopardy Game**

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Well known TV game show, this activity can take quite a bit of set-up writing questions for display. There are a variety of ways it can be run, including in a synchronous small group session in an online class. Templates are available at https://jeopardylabs.com/ Versions of pre-made math-related Jeopardy games (arithmetic through statistics) are available at http://www.math-play.com/math-jeopardy.html in JAVA format.

4. **Math Bees**

Like spelling bees, students line up single file around the room facing the instructor. The instructor asks the first student a question which the student has a few seconds to answer. If they do not answer or get it wrong the same question goes to the next student, and so on. Once someone does get it right, they move in front of the student who was first asked that question. Students "sift" toward the front of the line in this manner through a set of questions. An example is a foiling or factoring bee where the questions might be to FOIL or factor a not-too-complicated expression. Allow the students to have pencil and paper or to work as a 2-person team if needed.

5. **Card, Board, and Other Games**

Math specific card and board games are prevalent. Benefits of playing games in class include developing logic skills, improving critical thinking, and camaraderie. Board games typically take an entire class period or can be played in an extracurricular math club meeting. Examples include Equate (with advanced tiles), Prime Climb, any of the WFF 'N Proof games including Equations, Blokus, Go, or to practice arithmetic skills any of the Right Start Math Card Games (eg, Corners https://store.rightstartmath.com/card-deck-corners/).

An example of a quick in-class game is the strategy game NIM https://plus.maths.org/content/play-win-nim which has very simple rules and minimal equipment/set-up. There are online Java versions that can be played in online classes with students paired-up or solo against a robot https://www.archimedes-lab.org/game_nim/play_nim_game.html and reporting back screenshots of the results.

6. **Quick Activities**

Three quick activities easy to use amid lecture to break it up and check for understanding. Each can also be used in an asynchronous discussion forum in an online class, just allow 24 hours for the thread to be open before locking.

A. **Heads Together**

Students are asked to pair up and given 1-2 minutes to discuss/solve a problem. This activity works best if the instructor initiates as, "How would you go about solving …" so the emphasis is on the solving strategy rather than final solution.

B. **Pair and Share**

Students are asked to pair up with roles of explainer and listener and a specific term or process given for one student to explain to the other. At the 1-minute mark reverse roles and re-explain in your own words. For example, "How do you determine the range of a function given its graph?"

C. **1-Minute Essay**

This is a solo activity where students are provided 1-minute to write a few sentences explaining their understanding of a specific term or process. For example, "What does it mean algebraically for an ordered pair to be a solution to a linear system?"

D. **Resources for more quick classroom assessment techniques (CATs)**

The standard reference on CATs is *Classroom Assessment Techniques: A Handbook for College Teachers*, 2nd edition, by Thomas A. Angelo and K. Patricia Cross (Jossey-Bass, 1993). Includes 50 CATs indexed in a variety of useful ways.

Examples of CATs from George Washington University at https://library.gwu.edu/utlc/teaching/classroom-assessment-techniques-cats

More examples of CATs from Iowa State University at http://www.celt.iastate.edu/teaching/assessment-and-evaluation/classroom-assessment-techniques-quick-strategies-to-check-student-learning-in-class/