A black background with a black square

Description automatically generated with medium confidenceMath Thrills: Putting Fun Into the Equation

**Activity Ideas**



**Math Thrills are a Math MUST!**

MUST is an acronym for four ways to nurture students’ competence and confidence in math:

* **M** is for the **messages** students get about math and their ability to learn it.
* **U** is for **understanding** math concepts and how thoughts and emotions affect learning.
* **S** is for **skills** that help you learn and use math — and manage anxiety, if it’s an issue.
* **T** is for **thrills** because students need positive experiences to help them discover the magic and satisfaction of math in a way that’s meaningful to them.

**What to do:** As you review these math activity ideas, highlight the ones you’d like to try. Consider your students’ needs, interests, and grade levels. Start with one or two activities that you can easily implement and already have the resources to do. Then look for ways to use these ideas throughout the program year.

**Why it matters:** If you work in an out-of-school time program, you know thrills aren’t frills. They’re a MUST, not just for math, but for keeping students engaged and coming back for more, day after day.

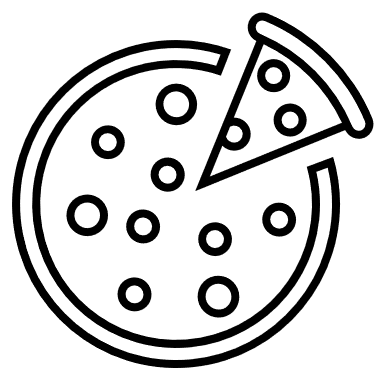
Here are some ways to bring “math thrills, not drills” to your program and get those endorphins going!

# The Thrill of Positive Experiences With Math

To help every student have positive experiences with math, provide I-R-A experiences. In this context, the letters I-R-A don’t stand for Investment Retirement Account. They stand for interesting, relevant, and amazing. Providing I-R-A experiences is a way to invest in students by grabbing their attention and getting them to focus on math in a positive way.

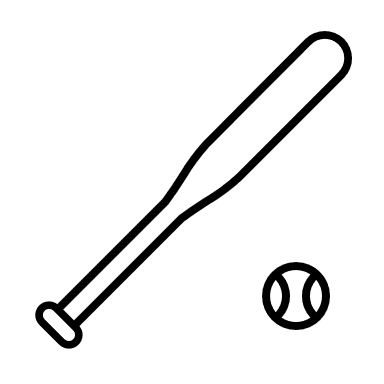
# Creating Interesting Math Experiences

Here are some ways to create student interest in math:

* **Student Interest Survey:** Students are interested in music. Let them pick a favorite song, show them the sheet music, and teach the relationship between the song’s rhythm and quarter notes, half notes, and so on.
* **Student Choice:** If you present a “problem of the day,” a read-aloud, or a math project, provide options and let students choose.
* **Mystery:** “The Mystery of the Missing Numerator” is more interesting than “solve for the missing number.”
* **Games:** Try the **Pepperoni Pizza Game**: Students roll a die twice. The first roll tells how many pizzas to draw. The second roll tells how many pepperonis to put on *each* pizza. How many pepperonis in all? Students write sentences to help them answer. For example: *I roll a die and get three, so I draw three big pizzas. I roll again and get five, so I draw five pepperonis on each pizza. I know 3 x 5 = 15, so there are 15 pepperonis in all.*
* **Movement:** Have student teams use various units of measure (e.g., feet, yards, meters, steps, pencils) to describe the length of a wall or fence line. Challenge them to invent a new measure and explain its pros and cons.

# Creating Relevant Math Experiences

To make an activity relevant to students, pay attention to the [four spheres of relevance](https://www.edutopia.org/article/how-make-math-concepts-feel-relevant-students?fbclid=IwAR1ykwBnYyr0c1md6mmCp4bQlzvLao1kSfdI_n8EXYOEK6TlG6R3s4vLdGE): self, community, culture, and the real world. Here’s an example that shows all four spheres of relevance in action:

* **Self:** You learn that several students love baseball.
* **Community:** You arrange a field trip for students to watch a minor or major league [baseball](https://www.mathworksheetscenter.com/mathtips/baseballmath.html) game, and you arrange for speakers to talk about how math is used everywhere in professional baseball (e.g., training, statistics, dimensions of the field).
* **Culture:** You invite student groups to do an interdisciplinary mini project on baseball to explore its historical development, social and economic aspects, influence on national and global culture, design of uniforms and equipment, how the rules have or haven’t changed, and what kinds of data marketers consider when they’re deciding how to maintain and grow the audience.
* **The real world:** The interdisciplinary mini project includes intersections with real-world use of data and statistics. So, you use these connections to help students “get their head in the game” of math and its real-world applications. For example: Given the distance between bases, and the average time it takes to throw someone out, how fast do you need to run to have a good chance of making it to first base if you hit a ball to center field? Knowing this info helps you set your target for training and increasing your speed.

# Creating Amazing Math Experiences

Challenge yourself and your program team to create amazing moments for your students. The best ones happen when they’re amazed at their own ability to learn or do something new, or when a mathematical fact, game, or concept provides a sense of wonder. Here are some ideas for you and your students to explore together:

* **Fractals:** These are geometric shapes that repeat with a complex structure. When you zoom in on a fractal, you often see the same structures appearing again and again. Examples include snowflakes, ferns, pine cones, and branching trees. If you search online, you can find many amazing images of fractals to share with students. Better yet, invite them to come up with examples, both online and in real life.
* **Pi:** The ratio between the circumference of a circle and its diameter. As a fraction, it’s expressed as about 22/7, or 3.14, but as an actual number, Pi is unknowable, and it’s called an irrational number. To find the area of a round pizza, you multiply Pi by the radius squared, and multiply area by height to find the volume. So, the volume of a pizza with a radius of “z” and a height of “a” can be expressed in the formula **Pi** x **z** x **z** x **a**. Also, if you enter Pi (3.14) in a calculator, then look at the calculator in a mirror, it spells “pie.”
* **A white rectangular frame with purple border

  Description automatically generatedPalindromic numbers:** A palindromic number is a number that’s the same whether you read it forward or backward, like 121 and 12321. Multiplying 1’s always gives you palindromic numbers. For example:

1 x 1 = 1

11 x 11 = 121

111 x 111 = 12,321

1,111 x 1,111 = 1,234,321

11,111 x 11,111 = 123,454,321

* **Jiffy:** If you tell someone you’ll finish something in a jiffy, it means you’ll do it in a very short amount of time. But in physics, “jiffy” is an actual measurement for the time it takes for light to travel across 1 centimeter, and there’s a formula for it: 33.3564 x 10-12 seconds.

# More Activity Ideas

Here are a few more ideas to spark your creativity!

## Gardening Activity (Example of Math Standards in Action for Grades 4 and 8)

This example shows how the five strands of mathematical proficiency in geometry can connect to a gardening activity at the fourth- and eighth-grade levels. By working with school-day teachers, you can use engaging academic enrichment activities like this to combat math anxiety while building students’ understanding of key math concepts to help them master State math standards.

## Grade 4 – Geometry: Area and Perimeter

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Students have been engaging in academic intervention activities to help them build knowledge and skills related to geometry. They’ve also been participating in a school gardening activity to practice and master the new skills and knowledge in real-life, relevant ways. This table shows some things fourth-graders will be able to say once they master each strand of proficiency:

| **Conceptual Understanding** | **Procedural Fluency** | **Strategic Competence** | **Adaptive Reasoning** | **Productive Disposition** |
| --- | --- | --- | --- | --- |
| I know the definitions of area and perimeter, and I understand the relationship between area and perimeter. | I know that to find the area of the garden, I need to measure the length and width, then multiply length times width. | I can use an array to represent the area and draw a square around the array to represent the perimeter. | I can adapt this knowledge to a new problem (e.g., if the garden area doubles). | I feel confident in explaining the relationship between area and perimeter, and I think it’s a helpful thing to know. |

## Grade 8 – Geometry: Area, Perimeter, Volume

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The gardening activity for eighth-graders differs from the one for fourth-graders since the types of skills they need to master are different. This table shows what eighth-graders will be able to say once they master each strand of proficiency:

| **Conceptual Understanding** | **Procedural Fluency** | **Strategic Competence** | **Adaptive Reasoning** | **Productive Disposition** |
| --- | --- | --- | --- | --- |
| I can connect the concepts of area and perimeter to volume by adding a third measurement (height) to the measurements used for area (length and width). | I know that to find the volume of the rectangular garden boxes, I need to multiply the measurements of length times width times height, using number sense. | I can use three-dimensional figures to model the rectangular boxes and find any of the values (length, width, height, or volume) to solve the problem. | I can adapt this knowledge to a new problem (e.g., if the width doubles). | I feel confident in explaining the relationships and differences between finding the area, perimeter, and volume. |

## Infographics

Infographics help students visualize patterns, trends, and relationships. A fun project might be to challenge students to find infographics on topics that interest them, then choose one to explain or interpret to their classmates. Maybe they’ll be inspired to create their own infographics.

## Interdisciplinary Connections

Challenge students to work in teams to create a list of 50 (or 100!) ways math connects to other disciplines and interest areas like these:

* Art
* Baking
* Careers
* Financial literacy
* Health
* Literature (including poetry)

## Math Scavenger Hunt

Scavenger hunts are fun and can help students see that “math is everywhere.” Your list might include “something that comes in sets of 12” and “a street name with a number in it.” Or it could include the numbers 1 through 10. You can find many ready-made scavenger hunt lists online. Look for one that matches the grade levels and concepts you want to teach.

## Math Talks

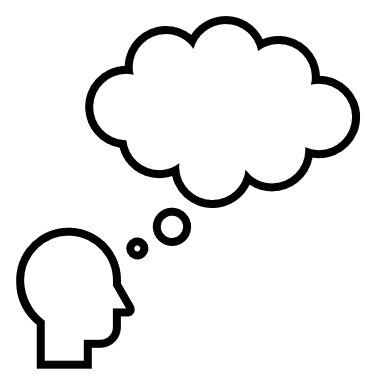
Math teachers and tutors sometimes use a structured format called “math talks” to help students think and learn about math. Students get supported as they discuss their problem-solving strategies, the reasoning behind their work, questions they may have, and observations about different approaches to math and problem-solving. Here are some informal ways to get students talking and thinking about math in your program:

* **Sentence starters:** Display some sentence starters and a short list of terms for students to use during discussions. For example, if you ask, “How long do you think it takes to get from here to Juno, Alaska?,” you might display the following sentence starters and key words:

**Sentence starters:**

* + Something I need to know before I can answer is …
  + Some factors that might affect it are …
  + The way I’d figure that out is …

**Key words:** time, distance, speed, measurement

* **Cartoon-inspired thought bubbles:** Show a picture or cartoon with an empty thought bubble. (If you’re using an existing cartoon, you can cover current thought bubbles with a paper cutout.) It might show a team working on a science project, someone shopping in a grocery store, or people working out in a gym, for example. Ask students to suggest math-related ideas for the thought bubble (or bubbles). For example, if a team is working on a project, various team members’ thought bubbles might say, “I wish I’d paid more attention in math class” or “I love using my math skills to solve problems.”
* **Word sorts:** English language arts teachers use word sorts to teach vocabulary. They might give students a list of words and ask them to identify ways the words are similar or different, or to categorize the words in some other way. You can use this method to teach math vocabulary. For example, if you’re starting a project that will require students to measure various things, your word list might include *mile, hour, inch, pound, minute, feet, yards, second, meter, ounce, kilogram, and quart.* In groups, students could sort the words in various ways — for example, U.S. customary units vs. metric system, or distance vs. weight vs. time vs. volume.

## Math Stations

If you use math stations, be sure they reinforce positive messages, and train staff and volunteers to use the Math MUSTs as they set up the stations and support students.

* **Guided Learning or Reciprocal Learning Station:** This station allows the teacher to interact with each student. Keeping the station to only a few students allows for individualized instruction and opportunities for students to interact. This would involve explicit instruction on specific math skills and concepts.
* **Interactive Whiteboard:** Games can be loaded or developed to allow students to work together to solve and learn in a fun and engaging way.
* **Computer Station:** Load skill-specific math software onto a computer, add headphones, and allow students to work on their skills. Generally, this type of software allows teachers to run reports on student progress and set lessons so that students are working on specific areas of need.
* **Game Station:** This can include math games that focus on students’ specific needs. Strive for “hands-on, minds-on” activities, and remember: this station may be indoors or outside!
* **Homework Station:** This station can include print and online resources, access to virtual or in-person homework helpers, and visual reminders of effective homework completion strategies.
* **Music**
* **Technology**
* **Other** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Math High-Q Cards

Start a “question bank” of index cards or slips of paper with intriguing questions you can pull out and use during just about any activity (whether it’s related to math or something else) to develop students’ curiosity, question-asking ability, and critical thinking. Here’s a starter set:

|  |  |
| --- | --- |
| Why do you say that? | What are some other possibilities? |
| How are those things connected or related? | What do you predict will happen? |
| What if … ? | What’s another strategy you could try? |
| Can you give an example? | How could you prove or confirm your answer? |
| How are they alike? How are they different? | Can you create a rule for when to use one approach instead of another? |
| If you wrote a book about it, what would the title be? | What conditions or variables might change the outcome? |
| Would you explain how you did that? | What would the world be like without \_\_\_\_\_\_? |
| What’s something you know now that you didn’t know then? | Have you ever experienced anything like that? |
| What do you think should be done? | What questions do you have? |

## Numbers in Stories, Legends, and History

Talk about stories and legends that involve numbers or mathematics. For example:

* Goldilocks and the Three Bears
* The Three Little Pigs
* Mount Rushmore was originally called the Six Grandfathers Mountain by the Lakota after a vision of the six sacred directions: west, east, north, south, above, and below. It was a place for prayer and devotion for the Native people of the Great Plains.

## Posters About Math

Coordinate with school-day staff to have your students create posters about math to use in school classrooms or common areas. Provide quotes about math or have students find or create a quote to include on a poster they create.

## Read-Alouds

See the **Math Booklist** for picture books to read aloud and talk about.

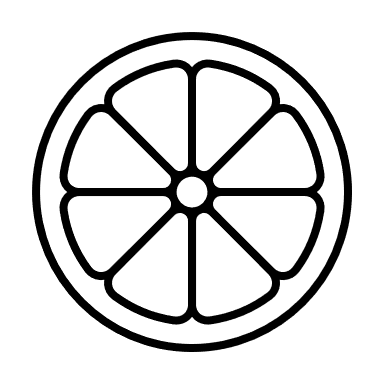
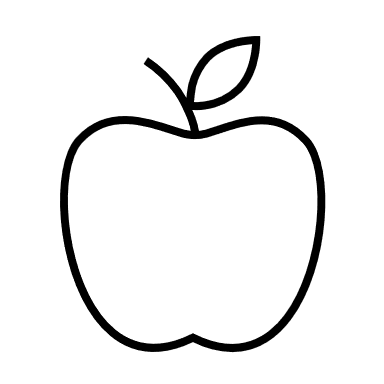
## Stories About People Who’ve Played a Role in Mathematics

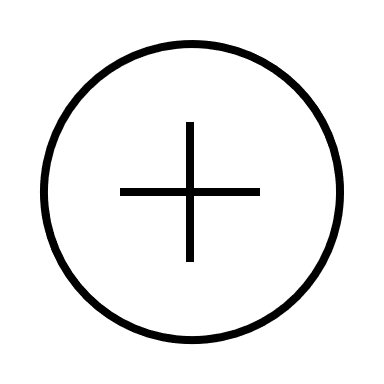
Share stories about people who’ve contributed to math or used math to accomplish something. Here are some ideas to get you started:

* Five Famous Scientists Who Struggled With Mathematics: <https://interestingengineering.com/lists/5-famous-scientists-who-struggled-with-mathematics>
* NASA: Women in Science: <https://chandra.si.edu/women/index.html>
* BookAuthority’s List of the 20 Best Mathematician Biographies of All Time: <https://bookauthority.org/books/best-mathematician-biography-books>

## Wait — What’s Math Got to Do With It?

Have students guess the meaning of idioms that use mathematical terms or concepts. Teaching about these idioms can also help students who are English learners.



*Back to square one — Catch 40 winks — Comparing apples to oranges — It’s part of the equation — Put two and two together — That’s a plus — That doesn’t add up — They’re a dime a dozen — Zero in on it*

You can find more idioms, including illustrated examples and videos, in The Free Dictionary’s Idioms dictionary: <https://idioms.thefreedictionary.com/>.

## Teacher outlineWhat Number Am I?

Select a student to be the first player. The student stands in front of the class with their back to the board. You write a number on the board so that the other students can see the number, but the player can’t. Students raise their hands if they want to give the player a clue (like “You’re the answer to 7 x 8”) to help the player guess the number. They must wait until the player calls on them to give their clue. When the player guesses the number that’s on the board, the player selects the next player to come to the board. This game is a fun way for students to learn math facts.

**Itching to Know More or to Try a New Idea?**

Here are some possible next steps:

* Talk to the math teachers at school about what students are learning in school and what math standards they’re meeting and not meeting.
* Find out what program staff, students, and families think and feel about math. Maybe you can do an activity where you share the **Math Anxiety Self-Assessment and Autobiography** tool.
* Assess what program staff, homework helpers, and tutors know (and need to know) about math anxiety and the Math MUSTs.

For more about the math MUSTs, see the 21st CCLC NTAC Math Toolkit for these tools:

* **Math Anxiety and Four MUSTs for Addressing It**
* **Math Messages That Build Confidence**
* **Math Understanding: Helping Students Think Conceptually**
* **Math Skills for Students to Learn and Practice**



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