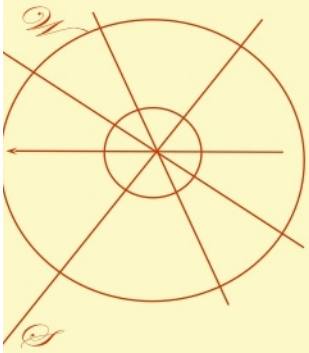


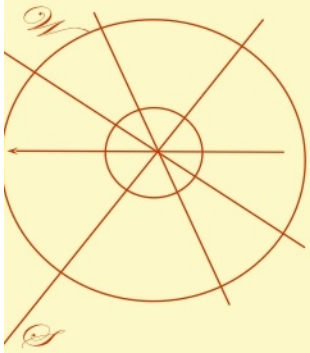
Cedar River Academy

MathQuest

Imbedding Math Skills in Student Minds

Cedar River Academy educators define MathQuests for every developmentally aligned student group, making math skill development interesting, fun, and permanently embedded in student minds.

MathQuest Introduction



MathQuests are integrated, hands-on math activities and projects that are created by teachers for students in developmentally aligned groups. These activities are always based upon a piece of literature that is being used in classroom theme studies. MathQuests are generally open-ended and never include exact descriptions of what students should do to solve the problem. Many MathQuests ask students to exercise inferential reasoning to extract the problem from the story. There is always room for individual perspective in a MathQuest activity.

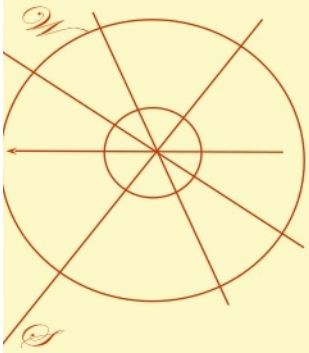
MathQuests always require the student to understand a math skill (operation) such as counting, addition, subtraction, multiplication, division, fractions, or place value. Along with the math skill, MathQuest activities and projects work within a math strand such as patterns, measurement, geometry, probability, logic, algebra, or graphing. Within each problem and project there are opportunities for many different solutions and answers to the central question. Students are provided opportunities to work with various, self-chosen math manipulatives to solve the problems, or show their mathematic thinking process. MathQuests are designed to meet the mathematic needs of all students in a classroom and are always a fun part of any student's day.

MathQuests are Important

MathQuest is an important part of Cedar River Academy's math curriculum. This hands-on, integrated approach to mathematic learning allows students to construct their own understanding of math, instead of simply memorizing a transmitted message. MathQuest allows teachers to design more mathematically significant learning experiences and help students connect thinking with mathematics. MathQuests are hands-on experiences that involve students in math. Students experiment with physical objects and have a concrete experience before they apply or learn abstract mathematic concepts. MathQuests focus on core concepts and critical thinking processes. This is important to assure that students create and re-create mathematic concepts and relationships in their minds. MathQuests provide authentic, integrated experiences to students. They allow students to explore, discover, discuss and construct mathematic concepts and relationships in contexts that are familiar, relevant, and interesting.

MathQuest Creation Process

Teachers spend several days each week practicing skills and math concepts with students in individual or small group sessions. Thereby, teachers introduce a new skill or concept, guide student understanding, and provide ample opportunities for students to practice their newly learned skill or concept in isolation. As small groups or individual students acquire understanding and begin to make connections between the new skill and previously learned skills, teachers begin to plan a MathQuest project or activity. This MathQuest is designed to require students to use the learned skill or concept in a new, open-ended way that helps the student create connections to real world problems and situations. MathQuests allow students to construct their own understanding of the math skill or concept and apply this concept to thematic learning.



When a teacher develops a MathQuest, the math strand and operations to be used are chosen first. These are chosen based on current or past learned skills and strands. Often, various operations may be used in a single MathQuest, allowing individual students to find solutions to the problems in individual ways. For example, a MathQuest for young students may be focused on using the skill of addition for many students in a classroom. However, students who still struggle with understanding the concept of addition may find the solutions to the problem using counting skills; those who have mastered this skill may be using repeated addition, or multiplication, to find a solution to the MathQuest problem.

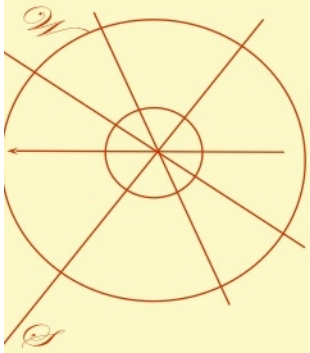
Once a math strand operations are chosen, the teacher will choose a piece of literature to be the basis of the MathQuest story and problem. Often this literature will be a book that is currently being used in the classroom. Other times, teachers will base their MathQuests on thematic picture books, poetry, or even pertinent newspaper or journal articles. The teacher will thoroughly read the literature and creatively choose a way to tie in the literature, character, or plot line with a new, teacher created original problem.

For example, if a teacher uses the book Where the Wild Things Are, he or she may create a new problem for the main character, Max. In the traditional story Where the Wild Things Are, Max travels to an imaginary land where he meets monsters. Here, he and the monsters have a wild rumpus complete with gnashing teeth and terrible roars. In the teacher's MathQuest, the teacher may extend the story of Max and the monster's wild rumpus, asking her students to create sustenance for the hungry, hungry monsters. The new story may have a silly or disgusting recipe for a type of monster food. Students would then be asked to determine the amount of food needed to fill up each terrible monster, how many terrible monsters were at the wild rumpus, and how much of each ingredient would be needed to make enough of the recipe for all members of Max's wild rumpus. The teacher will create a story page for the students. This might be a colorful, artistic, typed page with the extension story written on it as well as illustrations, photographs, quotations, or art from the book.

This new story that has been created will ask students to use addition or multiplication of fractions within the measurement math strand. All students will be using the measurement math strand, but will choose to either show their math thinking with counting fractions, adding fractions, or multiplying fractions, whichever they feel most comfortable with. The teacher will ensure this happens by intentionally writing the story to accommodate all ability levels in the classroom. The teacher will also accommodate all types of learners in his or her classroom by asking students to have a visual representation of his/her problem solving (art piece, picture, etc.), as well as showing their problem solving with numbers and finally writing about their problem solving process. This ensures that several learning styles are integrated into the MathQuest activity.

MathQuest in the Classroom

Before the MathQuest story page is introduced to students, the teacher presents the literature to the students during a read aloud session or another whole group experience. Teachers may read the entire book to the class, read sections or chapters, or read until their story extension would



take place. This procedure assures that all children have similar background information about the characters, setting, plot and subplots of the literature. Discussion questions are used during this time to assure student comprehension of the story, and to generate excitement and anticipation.

The teacher then presents the MathQuest story page to the students, reading it aloud as a whole group, or asking small groups or individuals to read it independently. Students will likely begin discussing the story, it's problem, known and unknowns, and math manipulatives that can be used to solve the problem. Many students will gather their materials (depending on the problem, some require art supplies, math tools, or other materials) and begin the problem solving process. The teacher will be available to guide students though the problem solving process, if needed. Some students may need help deducting the problem from the story, identifying the known or unknown information, or choosing a path to start problem solving. The teacher and other students will have discussions with those struggling to begin work, guiding each student with questions, ideas, or hints, but never directly telling a child what needs to be done.

Assessing and Analyzing MathQuest Learning

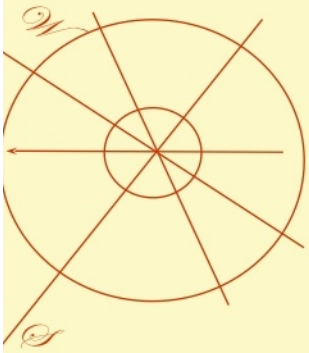
As students work on their MathQuest problem, the teacher takes anecdotal notes of observations of student's understanding. Attention wis paid to how math tools are being used and the level of difficulty of manipulative the student chose to use. The teacher observes the student's problem solving process, accuracy of skill work, ways in which data is collected or shown, and student's ability to move from step to step in the MathQuest process. Teachers will guide, challenge, and question each student as they work to solve their problems, helping them move through the levels of understanding.

As students complete their MathQuests, they present their ideas to the teacher, explaining the reasoning for their problem solution(s). The teacher will note this discussion in the student's anecdotal records, photograph the MathQuest creation and/or written work, and add it to the student's online portfolio.

Teachers use every student's MathQuest learning to guide math instruction planning. Teachers may notice that some students need additional help with a skill, or didn't use the skill previously taught in small groups while completing their MathQuest. In this case, teachers may review the skill, teach it in a different way or integrate the skill into another, similar MathQuest activity and work on it alongside the student(s) that need additional practice.

For students who successfully used the intended skill, or an advanced skill, teachers have several options. They may use this MathQuest activity as evidence that a child has mastered or exceeded expectations of this skill. The teacher may also use this activity as evidence that the student is developing new, advanced skills, which may be assessed again with another MathQuest or similar activity. Often the teacher will create an extension to an original MathQuest story to determine whether a student can use these advanced skills consistently, and in multiple activities or projects.

MathQuests Engage Students



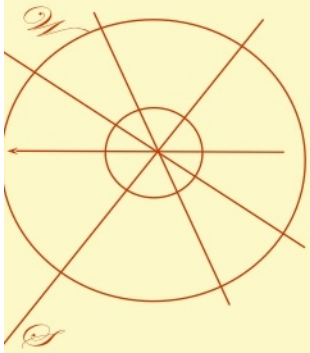
In traditional classroom settings, teachers have observed that girl students' interest and success in math is lower than the interests and success of boys in their classes. Girls often demonstrate lower math ability, lack of interest in math, science, and technology, and a lack of confidence in these subjects than do boys. The MathQuest process is a solution this gender related issue. Cedar River Academy applies MathQuests to help all students succeed in, and enjoy math.

MathQuests engage all CRA students in interesting, thematic, real-world problem solving simulations that encourage learners to think critically and creatively. They ask students to use their imagination to help them solve problems with several correct solutions and help learners to feel empowered to solve problems in ways that are natural and interesting to them.

MathQuests are designed to embody multiple solutions, enable students to use a variety of math tools, and help students avoid feeling judged or inferior if they get an incorrect answer. This practice builds math confidence in all CRA students, helping each to become more interested and engaged in the math process, and in related fields or subjects related. CRA teachers have observed a close relationship between student interest and confidence. If students believe that they can complete MathQuest activities, it builds their interest and confidence in mathematics.

Applying the MathQuest Model to Other Subjects

The MathQuest model can be applied to other subject areas, or integrated into the classroom's theme learning. For example, MathQuest processes can be directly adapted to create a ScienceQuest activity, where new problems are identified based on background knowledge, science study topics, and problems from literature. Students could be asked to solve real-world science problems and use various science tools, technology, and artistic representations to share their problem solving strategies, solutions, and newly created technology or programs that they have invented in their problem solving. Teachers may build a ScienceQuest activity based on science strands (physical science, earth science, life science, and technology), as well as various scientific concepts and skills within each strand. ScienceQuests could be designed to support student progression through scientific concepts from kindergarten through eighth grade (observing, measuring and identifying properties; seeking evidence; recognizing patterns and cycles; identifying cause and effect and extending the senses; designing and conducting controlled experiments).



Creating a MathQuest

Step 1: Choose Number Operations (Counting, Place Value, Addition, Subtraction, Multiplication, Division, Fractions)

Example:

Mrs. Riley's first and second grade class completed a math unit on multi-digit addition and subtraction during the first term. The first graders are able to add and subtract two digit numbers with regrouping. The second grade students are able to add and subtract three and four digit numbers with regrouping. Therefor, the ***number operations for this MathQuest will be addition and subtraction****.*

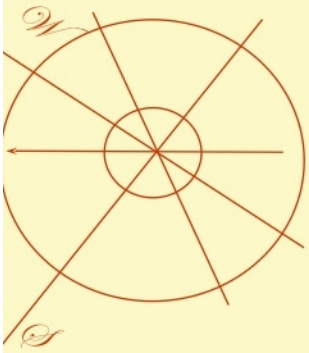
Step 2: Choose a Math Strand (Patterns, Measurement, Geometry, Probability/Logic, Graphing)

Example:

During term two, the first and second grade students are working within the measurement math strand. Over the past two weeks, the first and second grade students have been completing the investigations curriculum books on measurement. There are various first and second grade math standards in term two that are based on measurement. Standards that first graders are working on include:

- *Explains why objects used to measure must be consistent in size.*
- *Describes the connection between size of the measurement and the number of units needed to measure something.*
- *Compares length, weight, volume, temperature, and time using direct comparisons or nonstandard units.*
- *Measures to inches.*
- *Standards that the second graders are working on include:*
- *Uses nonstandard units that approximate metric and US customary units to estimate length and weight.*
- *Measures length to the nearest whole unit in both metric and US customary units.*
- *Estimates length using metric and US customary units.*

Therefor, the ***math stand for this MathQuest will be measurement.***



Step 3: Identify Classroom Theme and Literature (What book will you use?, What is the tie-in?)

Example:

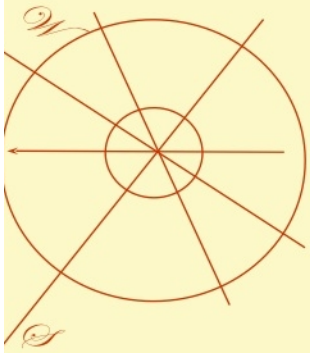
The yearlong theme for the 2011-2012 school year is discovery. In Mrs. Riley's first and second grade class our term two unit is journeys of discovery. We have just begun reading Roald Dahl's James and the Giant Peach. This MathQuest will be based on the book James and the Giant Peach. We have just finished chapter 6, in which Aunt Spiker and Aunt Sponge are watching the peach growing on the peach tree, which has never before grown a peach. They are excited to see the peach growing before their very eyes. This is where we will begin our MathQuest.

Step 4: Write the Story (Remember to make it difficult enough to accommodate all ability levels)

Step 5: Implement the MathQuest (Read the MathQuest with students or allow them to read independently. Guide students (if necessary) through the problem solving process.)

Example:

As students are working on their MathQuest, the teacher is working with one or two students at a time, asking about their constructions, clarifying their problem solving strategies, and guiding students who need more assistance in solving the problem. Most students will think of a way for James to trick his Aunts by using the supplies provided to build new peaches, substitute or alter balls or other fruit for peaches, etc. Other students may need other questions asked of them or to look in a book for ideas. As students begin and finish their peach constructions, they will begin to measure them. Some might choose one measurement tool to measure all peaches, another might use different tools for different peaches, depending on their sizes.



Step 6: Assess Student Work (Provide opportunities to help students move to the next level of understanding)

- What is the difficulty of manipulative the student chose to use? (Unifix Cubes, Centimeter Cubes, Multilinks, Pattern Blocks, Fraction Tiules, Base Blocks, Cuisinare Rods, Geo Blocks)
- How is the student using the manipulative(s)? (Action: Pre-Operational, Concrete, Investigation) – Manipulative: Manipulative Abstraction)

Example:

Anecdotal notes will be taken during MathQuest based on teacher observations of student work. Pictures should be taken of students using various math manipulative(s) and how students are using math these math manipulative(s). Teachers will be constantly questioning students to make them think on a different level. For example, if one student decides to measure all three peaches with links, the teacher might ask, "What if James only had ___ links? How many of these connecting cubes is equal to one link? If two connecting cubes is equal to one link, how many connecting cubes long/wide/tall/in circumference is this peach?" Students should be recording their thinking on graph paper and teachers should be taking anecdotal notes and photos of student progress. The difficulty of the manipulative(s) as well as how the student is using manipulative(s) should be noted by the teacher.

Step 7: Adjust, Continue, or Create (Adjust the MathQuest as needed, continue with another, similar MathQuest, or create a new MathQuest focusing on another operation and strand.)

"What is the matter with you?" Aunt Sponge demanded.
"It's growing!" Aunt Spiker cried. "It's getting bigger and bigger!"
"What is?"
"The peach, of course!"
"You're joking!"
"Well, look for yourself!"
"But my dear Spiker, that's perfectly ridiculous. That's impossible. That's-that's-that's-Now, wait just a minute-No-No-that can't be right-No-Yes-

"Great Scott!

That thing really is growing!"

James, who was still hiding near the tree's trunk, looked up at what Aunt Sponge and Aunt Spiker were pointing at.
He looked once..
He looked twice...
He looked a third time...
He couldn't believe his eyes!

He saw not one, not two, but three giant peaches! His dear old Aunt Spiker and his lovely old Aunt Sponge, grabbed him at once and told him that he must NEVER pick those peaches. Instead, he was to climb up in the tree and use his tools to measure the peaches. But, while he was perched upon the branches, he was overcome by hunger and temptation. He quickly gobbled up all three peaches! Immediately he regretted his decision and decided that he must make his old Aunts think that he had never eaten the peaches.

He came up with a plan to replace the peaches and quickly go to work tricking his Aunts. Sooner than later he was ready to see how big his new peaches were.

How will James trick his Aunts?
How big were each of his peaches? How big were they all together?
How do you know?

Mean old Aunt Spiker and nasty old Aunt Sponge stole James' math tools after they found out that he had tricked them! Instead of math tools, all James had left to measure with are tiny, little, green things!

Quick! James needs your help! He needs to know the measurements of the peaches in tiny, little green things by dinner or he has to go to bed hungry!

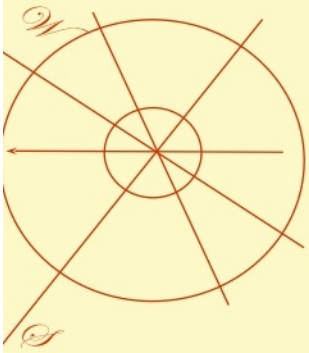
There's only one problem...

A second grader's and first grader's tiny, little, green things are different sizes...

Units... inches... centimeters... cubes...links...and feet, oh my!

My tiny, little, green thing is _____ long.

How many tiny, little, green things do you need to measure one peach? Two peaches? All three peaches? Record your math thinking on graph paper.



Cedar River Academy, Ltd.
3333 Griffin Avenue
Enumclaw, WA 98022
360 825-8080
www.CedarRiverAcademy.com