



# **To meet the Math Challenge,**

**Emphasize Math Practice 1 to make sure that students think strategically before they solve a problem.**

**Make Sense of Problems,  
then Solve them Strategically and Persistently!**



## Math Activities and Assessments

### Formative Assessment Approaches

1. Complete graphic organizer
2. Complete glossary with examples
3. Make self guide
4. Students construct questions and answers
5. Students correct a math problem solution that has errors
6. Solve problem, justify the solution

### Activities

1. Create math problems
2. Demonstrate
3. Exchange questions
4. Write math guides
5. Start to solve problems, then exchange start-up part, complete each other's work
6. Students write "rules of the road" for different kinds of math problems
7. Make diagrams
8. Visually represent the parts of a math problem
9. Write or co-author responses to math question
10. Write math poetry
11. Make math money simulations as well as problems—"your own business"
12. Change math questions, provide answer guide

### Instruction Strategies

1. Pre-assess to determine initial status
2. Check for misunderstanding and respond immediately
3. Model
4. Post-assess to determine and validate progress
5. Relate to contexts (MPS4—model with mathematics)
6. "Think out loud"
7. Demonstrate strategic use of tools (MPS5)
8. Post "paths"—how to solve a kind of problem
9. Focus on one outcome each week, specify objective for the day, explain how it relates to the BIG outcome
10. Adjust level of challenge to accommodate students needing support and students who can advance
11. Organize practice activities that have game-like features
12. Students demonstrate
13. Students collaborate—pair, compare, repair
14. Math "Bowl"—students solve a variety of problems in teams



## ***Expand students' strategy repertoire.***

Here are some strategies to solve a math problem.

**They all start with read the problem carefully to figure out what it asks.**

- ✓ Read each sentence carefully to make sure you comprehend it.
- ✓ Decide what the problem includes that you need to use to solve it.
- ✓ Notice any numbers written as words—be sure you include them in your problem solution.
- ✓ Look for context--kinds of numbers—money, time, size.

Then use a strategy you know to figure out the answer.  
Start by estimating what the size of the answer will be.

Here are some strategies you can use.

- List information you need to use.
- Use a model.
- Use a rule you know.
- Make a table.
- Make a diagram.
- See if it will take just one step to solve it or more steps.
- Choose an operation to start.
- Guess, check, then correct if I need to.
- Look for a pattern.
- Draw a picture so I see what the problem includes.
- Figure out what information I need.
- Underline the information I need and cross out the things I don't need.
- Make a graph.
- Make a list of operations—the steps to take.
- Make a table or chart.
- Work “backwards”.
- Think of two different ways to solve it, then choose the one you think will work better.
- Write it as a number sentence.

### **Most important: Think carefully and clearly.**

Work with precision—make sure you know what the words in the problem mean.

Make sure you are careful to check your work.

*That is Math Practice Standard 6. Attend to precision.*



## Math Problem Solvers Make Sense of Problems then Solve them Strategically and Persistently

(CCSS Math Practice Standard 1)

**The Problem**—What will you figure out?

**Your Strategy**

**The Solution**

**Answer:**



## I can solve a problem strategically!

*Common Core Math Practice Standard 1: Make sense of problems and persevere in solving them.*

*Note to Teachers: This organizer is designed to guide student problem solving. It also is an **instant assessment**. If students cannot complete steps 1, 2, or 3, the teacher learns what the kinds of help the student needs to comprehend a word problem and decide which strategies and skills to use.*

What is the question asking me to figure out?	
How will I solve it?	
What information do I need to solve it?	

Your teacher will tell you how to take the next step.

You may complete it by yourself or...

pair and share—work together with another student to solve it

or

pair to compare—solve it yourself then compare your work with another student's



## STRATEGIC MATH PROBLEM SOLVER

*Common Core Math Practice Standard 1: Make sense of problems and solve them persistently.*

1. <b>What are you going to figure out?</b>	
2. <b>How</b> will you solve the problem?	
3. What <b>information</b> will you use?	

4. Solve it here. If you need more space use the back of the page.

4. What rule or idea does your solution show?	
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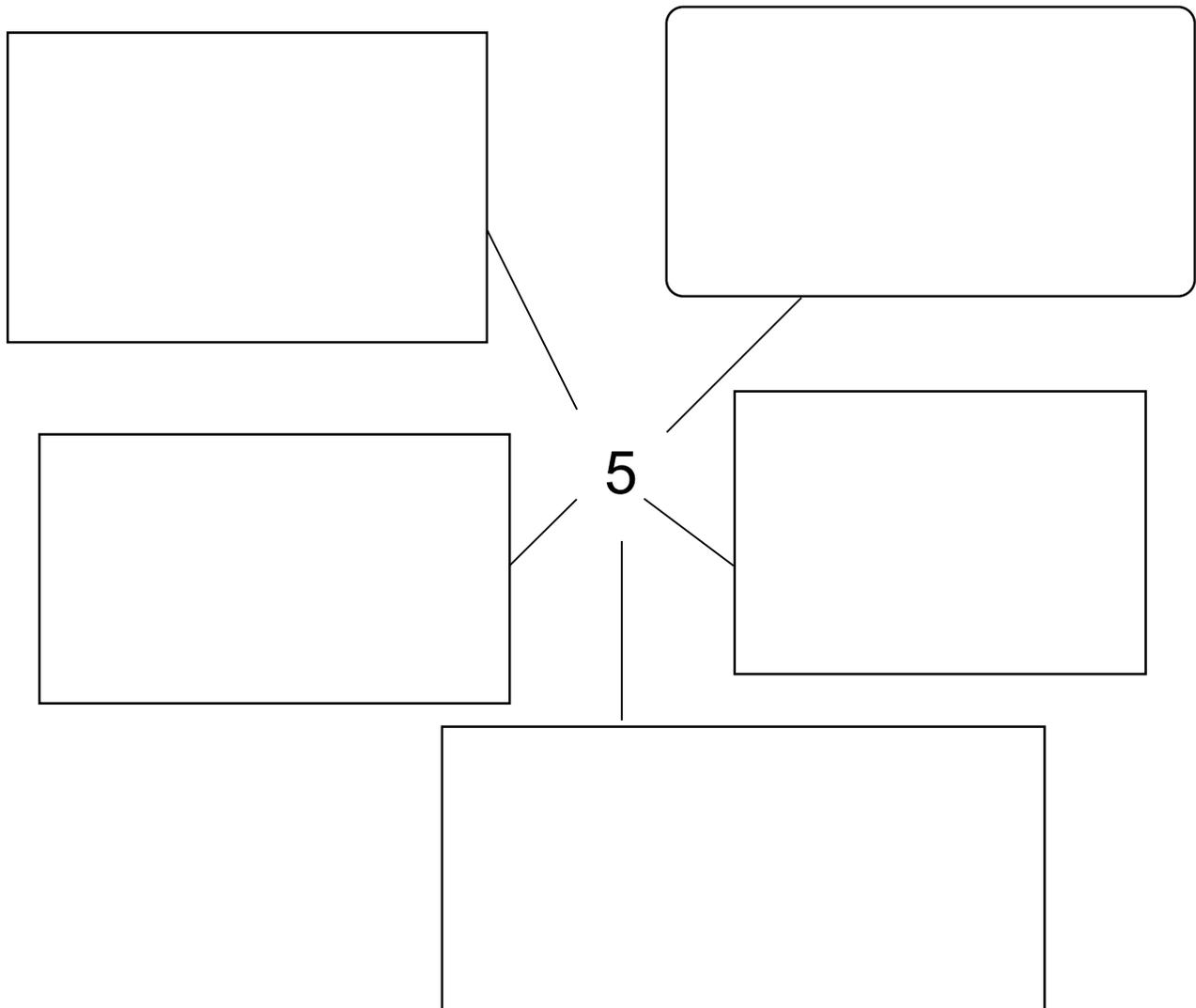
*This guide was developed through funding from the Institute for Education Sciences, US Department of Education*



**Students need to know math facts.  
They will learn those facts if they are interesting.**

CCSS Math Practice Standard 2. Reason abstractly and quantitatively.

Task: Use the math you know to show five different ways to make equations that result in 5. It could be fraction equations or multi-step addition or...



**MY MATH GLOSSARY**

Term or Symbol	What It Means	My Example

**Use words from your glossary to explain a math topic.**

# Online Math Resources for Students

*Useful Online Resources Available at No Cost*

## **Math Practice Resources and Games**

To achieve success with Common Core standard 1—make sense of problems, then solve them persistently, students need math skills.

The key to getting skills is practice.

The key to keeping skills is using them to solve problems.

Here are free useful math sites you can use to help students practice math skills and then solve realistic problems.

## **Early Childhood Games**

<http://www.ictgames.com/resources.html>

## **Infants and Toddlers**

<https://www.pbs.org/parents/earlymath/>

## **Primary Games from Public Television**

<http://pbskids.org/games/math/>

## **Math Games for Grades 3-5**

<http://pbskids.org/cyberchase/math-games/>

## **Advanced Challenges from the Museum of Math**

<http://momath.org/activities/>

## **Activities for After-School Programs from the Exploratorium**

<http://www.exploratorium.edu/education/publications/math-explorer>

## **Lots of activities that will help your child practice math skills.**

<http://resources.woodlands-junior.kent.sch.uk/math/>

## **Great games to practice math facts.**

<http://www.maths-games.org>

## **Math Hunt**

With the help of the character “Number Cruncher” scour the web to find social studies and science information to help crack math problems.

<http://teacher.scholastic.com/mathhunt/>

## **Math Maven’s Mysteries**

Use math to help crack open mystery cases

<http://teacher.scholastic.com/maven/>



## **Counting/Number Activity Sites**

### **Bobbie Bear**

Use counting strategies to make as many outfits for Bobbie Bear as you can, using different colored shirts and pants.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=3>

### **Chairs**

Explore the number of chairs needed when tables are arranged in a restaurant.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=144>

### **Electronic Abacus**

Explore an abacus model for representing numbers and performing addition.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=8>

## **Operations Activity Sites**

### **Primary Krypto**

Use five number cards and arithmetic operations to create the "target" number in this fun math game.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=173>

### **Product Game**

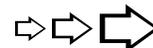
Exercise your skill with factors and multiples.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=29>

### **Times Table**

Practice multiplying single-digit numbers with this interactive multiplication table.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=155>



## **Operations Activity Sites**

### **Around the World in 80 Seconds**

Help Maggie fly around the world. Pick addition, subtraction, multiplication, division or a mix of all four. Each question answered correctly gets Maggie to her next stop.

<http://teacher.scholastic.com/activities/adventure/math2.htm>

### **Deep Sea Duel**

Play a strategy game that requires you to select cards with a specified **sum** before your opponent.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=207>

### **Determine the Missing Operation Study Jams**

Sometimes to solve a word problem or story problem, you need to figure out which symbol to use. Follow this step-by-step strategy

[http://teacher.scholastic.com/activities/studyjams/math\\_operations/](http://teacher.scholastic.com/activities/studyjams/math_operations/)

### **Flashcards for Basic Arithmetic**

Flashcards for all operations, organized by level.

<http://free-ed.net/sweethaven/Math/arithmetic/arithDrill02.asp>

### **Operations with Signed Numbers**

Use these "flash cards" to work with an endless list of signed-number problems-- addition, subtraction, multiplication, and division of both positive and negative numbers.

[http://www.free-ed.net/sweethaven/Math/arithmetic/SignedValues01\\_EE.asp](http://www.free-ed.net/sweethaven/Math/arithmetic/SignedValues01_EE.asp)

### **Operations with Whole Numbers**

A complete set of activities featuring arithmetic operations with whole numbers.

Activities can be assigned according to level of difficulty as well as special features such as division with/without remainders.

[http://207.5.42.159/sweethaven/math/pre-algebra/prealg01/ee/wholenuml02\\_ee.asp](http://207.5.42.159/sweethaven/math/pre-algebra/prealg01/ee/wholenuml02_ee.asp)

### **Order of Operations with Integers**

This is a set of endless drills that build confidence with solving integer operations that involve combinations of addition, subtraction, multiplication, and division. There are four levels of difficulty.

[http://www.waybuilder.net/sweethaven/Math/pre-algebra/PreAlg01/ee/IntegerPrec01\\_EE.asp](http://www.waybuilder.net/sweethaven/Math/pre-algebra/PreAlg01/ee/IntegerPrec01_EE.asp)

### **Periods of Place Values**

Rewrite numbers separating each period of place values with a comma

<http://www.waybuilder.net/sweethaven/Math/pre-algebra/drills/wholeNums01.asp>



## **Geometry Activity Sites**

### **Proof Without Words: Pythagorean Theorem**

Watch a dynamic, geometric "proof without words" of the Pythagorean Theorem.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=30>

### **Scale Factor**

A common misconception is that when the dimensions of an object are doubled, the area is doubled, too. But this is not true! Use this applet to investigate how changes in the scale factor influence the ratio of perimeters and the ratio of areas between figures.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=176>

### **Shape Cutter**

Draw and cut shapes, then use slides, turns, and flips to move the cut pieces around.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=72>

### **Shape Sorter**

Sort shapes according to their properties using Venn diagrams.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=34>

### **Shape Tool**

Draw, color, paste, slice, rotate, reflect, expand, and contract various shapes.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=35>

### **Tessellation Creator**

Create patterns to cover the screen using regular polygons.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=202>

### **Turtle Pond**

Estimate length and angle measure while guiding a turtle to a pond.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=83>

### **Interactive Geometry Dictionary: Areas in Geometry**

Understand and investigate the area of the rectangle, parallelogram and triangle.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=21>

### **Patch Tool**

Design a pattern using geometric shapes.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=27>

### **Perimeter, Area, and Volume of Common Geometric Figures**

[http://www.waybuilder.net/sweethaven/Math/pre-algebra/PreAlg01/ee/geometry/PreGeom01\\_EE.asp](http://www.waybuilder.net/sweethaven/Math/pre-algebra/PreAlg01/ee/geometry/PreGeom01_EE.asp)



## **Geometry Activity Sites**

### **Angle Sums**

Explore the sum of the interior angle measures for various polygons.  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=9>

### **Area Tool**

Investigate how changes in the base and height of trapezoids, parallelograms, and triangles affect their area.  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=108>

### **Circle Tool**

Compare the circumference and area of a circle to its radius and diameter.  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=116>

### **Cube Nets**

Examine various two-dimensional figures to determine which ones can be folded into a cube.  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=84>

### **Computing Pi**

Compare two methods for computing pi.  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=161>

### **Cubes**

Determine the volume of a box by filling it with cubes, rows of cubes, or layers of cubes.  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=6>

### **Fractal Tool**

Explore iteration and patterns in shapes and numbers with fractals.  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=17>

### **Geometric Solids**

Manipulate various geometric solids. Color the solid to investigate properties such as the number of faces, edges, and vertices.  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=70>



## **Time, Speed, and Distance Activity Sites**

### **Distance to Horizon**

Investigate the relationship between your height above the Earth and the distance you can see to the horizon.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=150>

### **Sound Sketch Tool**

Sketch and quantify sound using two different representations.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=36>

### **Vector Investigation: Boat to the Island**

Adjust the magnitude and direction of a velocity vector to "drive" a boat.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=42>

### **Vector Investigation: Dual Vector, Airplane Storm Chaser**

Adjust the magnitude and direction of a velocity vector and a wind vector to "fly" a plane.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=43>

### **Word Problems: Time, Speed, and Distance**

Practice your knowledge of time, speed, and distance with word problems

<http://www.waybuilder.net/sweethaven/Math/pre-algebra/dstProblems01.asp>

## **Probability Activity Sites**

### **Adjustable Spinner**

Create a spinner and examine the experimental and theoretical outcomes for a specified number of spins.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=79>

### **Fire**

Simulate the spread of a wildfire using a probability applet.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=143>

### **Random Drawing Tool—Individual Trials**

Explore the relationship between theoretical and experimental probabilities.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=67>



## **Fractions, Decimals, and Percentages Activity Sites**

### **Concentration**

Play a matching game with different representations of equivalent items — match quantities to their numerals, shapes to their names, or fractions to decimals and percents.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=73>

### **Equivalent Fractions**

Create equivalent fractions by shading squares and circles.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=80>

### **Fraction Game**

Explore relationships among fractions while playing this interactive game.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=18>

### **Fraction Model**

Explore different representations for fractions.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=45>

### **Fractions, Fractions, Fractions**

This is version 2.0 of the popular fractions "flash cards." Fractions are learned by looking at a lot of examples and they are mastered by doing a lot of problems.

<http://edgeroamer.com/sweethaven/math/ee/fracs03.asp>

### **Fractions Study Jams**

Watch a video and take a quiz about understanding fractions

<http://teacher.scholastic.com/activities/studyjams/fractions/>

### **Free Ride**

Use this applet to explore fractions using the context of a bicycle and gear ratios.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=178>

### **Mastering Decimal Fractions**

This is a complete set of endless drills with decimal arithmetic. You can select among 24 different activities that are arranged according to type of operation and level of difficulty.

[http://www.waybuilder.net/sweethaven/Math/pre-algebra/Decimals01\\_EE.asp](http://www.waybuilder.net/sweethaven/Math/pre-algebra/Decimals01_EE.asp)

### **Rounding Decimal Fractions**

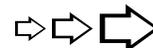
Activities for practice of rounding decimal fractions

[http://www.sweethaven.com/sweethaven/Math/pre-algebra/PreAlg01/ee/DecRound01\\_EE.asp](http://www.sweethaven.com/sweethaven/Math/pre-algebra/PreAlg01/ee/DecRound01_EE.asp)

### **Working with Percents**

Practice percent problems, converting between decimals and percents, and determining parts and rates

[http://www.waybuilder.net/sweethaven/Math/pre-algebra/PreAlg01/ee/Percent01\\_EE.asp](http://www.waybuilder.net/sweethaven/Math/pre-algebra/PreAlg01/ee/Percent01_EE.asp)



## **Algebra Activity Sites**

### **Algebraic Transformations**

Explore commutativity and associativity within a geometric situation.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=193>

### **Pan Balance—Expressions**

Investigate the concept of equivalence by "weighing" numeric and algebraic expressions.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=108>

### **Pan Balance—Numbers**

Find equivalent numerical expressions using a balance scale.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=26>

### **Pan Balance—Shapes**

Explore relationships among weights of various objects by placing them on either side of a balance scale

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=33>

### **Roots and Powers**

Some problems require the aid of a calculator, while others encourage the learner to work the problem "on paper."

[http://www.free-ed.net/sweethaven/Math/pre-algebra/RootPow01\\_EE.asp](http://www.free-ed.net/sweethaven/Math/pre-algebra/RootPow01_EE.asp)

### **Solving Linear Equations in One Variable**

A list of activities for solving linear equations in one variable for independent learners

[http://www.waybuilder.net/sweethaven/Math/algebra/linearEq/LinEqOne01\\_EE.asp](http://www.waybuilder.net/sweethaven/Math/algebra/linearEq/LinEqOne01_EE.asp)

## **FACTORS**

### **Factor Game**

A game that exercises your factoring ability. Test your skills against a human or the computer.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=12>

### **Factorize**

Divide numbers into two factors, and build arrays to represent each factorization.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=64>



## **Graphing Activity Sites**

### **Bar Grapher**

Create a customized bar graph with your own data, or display a bar graph from an included set of data.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=63>

### **Box Plotter**

Create a customized box plot with your own data, or display a box plot of an included set of data.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=77>

### **Circle Grapher**

Create a customized circle graph with your own data, or display a circle graph from an included set of data.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=60>

### **Histogram Tool**

Create a customized histogram with your own data, or display a histogram from an included set of data.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=78>

### **Introduction to Graphing**

Here is a selection of graphic activities, from plotting points to plotting linear equations.

[http://www.free-ed.net/sweethaven/Math/GraphOps/GraphPlotters/graphing02\\_EE.asp](http://www.free-ed.net/sweethaven/Math/GraphOps/GraphPlotters/graphing02_EE.asp)

### **Isometric Drawing Tool**

Create dynamic drawings on isometric dot paper. Draw figures using edges, faces, or cubes, and then shift, rotate, color, decompose, or view them in 2-D or 3-D.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=125>

### **Line of Best Fit**

Use this applet to plot a set of data and determine a line of best fit.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=146>

### **Linear Regression**

Investigate a regression line and determine the effects of adding points to a scatterplot.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=82>

### **Mean and Median**

Investigate the mean, median, and box-and-whisker plot for sets of data that you create.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=160>

### **State Data Map**

Use color-coding to represent state information, such as population, area, and gasoline usage.

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=151>