

*Challenging Math Activities:  
A Resource and Curriculum Guide to  
Alabama Course of Study  
Math*

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# Introduction

*Challenging Math Activities: A Resource and Curriculum Guide Aligned to the Alabama College and Career Ready Standards*, is a companion document to the Grades K-12, 2013 Revised Alabama Course of Study: Mathematics (Code of Alabama, 1975, §16-35-4). The Alabama Course of Study: Mathematics was developed by a task force consisting of early childhood, intermediate school, middle school, high school, and college educators and selected business and industry leaders, and was adopted by the Alabama State Board of Education in November, 2010. Content standards contained within the course of study document may be accessed on the Alabama Department of Education Web site at [www.alsde.edu](http://www.alsde.edu).

Educators are reminded that content standards indicate minimum content, what all students should know and be able to do by the end of each grade level or course. Local school systems may have additional instructional or achievement expectations and may provide instructional guidelines that address content sequence, review, remediation, and challenge.

*Challenging Math Activities: A Resource and Curriculum Guide Aligned to the Alabama College and Career Ready Standards* provides alternate lessons for students, including those with Individual Education Plans (IEPs), who have demonstrated mastery of grade-level content, providing assignments and activities that address the mastered objective with added depth, complexity, and creativity. Student choice is often incorporated into these assignments, allowing those who learn differently to approach required content according to diverse learning styles. This allows students who are capable of working above grade level to engage in rigorous course work while addressing the required course of study standards. By pre-assessing to identify strengths, teachers may plan appropriate response to instruction (RtI) for high functioning students, while still working with all students toward achievement of the same standards. Educators are encouraged to use this document to:

- Assist in tiered lesson planning as (RtI),
- Plan for RtI Problem Solving Team meetings,
- Deliver consultative and collaborative services,
- Design professional development programs,
- Provide parent information and plan for parent conferences,
- Develop curriculum-based assessments, and
- Prepare for state assessments.

Teachers can access this document electronically by going to the Alabama State Personnel Development Grant Web site at <http://www.alspdg.org>, or the Alabama Math, Science, and Technology Initiative (AMSTI) Web site at <http://www.amsti.org/>. To locate the document on The Alabama State Department of Education Web site at [www.alsde.edu](http://www.alsde.edu), click on Department Offices, Office of Learning Support, Special Education Services, Gifted, and then Curriculum. Scroll down to *Challenging Math Activities: A Resource and Curriculum Guide Aligned to the Alabama Course of Study*. Student pages can be downloaded and saved for interactive use on the computer or printed for paper and pencil application.

## Organization of the Curriculum Guide

The organizational components of this guide include science content standards, advanced standards for those who have mastered the grade-level standards, and “going forward” standards. Also included are suggested lesson plans for each advanced standard; including vocabulary, literature and Web site resources, student pages, and suggested rubrics and graphic organizers for use with some activities.

Grade level or course is displayed at the top, right side of each page. Below is an example of the information displayed within the body of the document for Grades K-8 and directions for interpretation.

**Instructional Objectives:** Each new Alabama College- and Career-Ready Standard (ACCRS) is denoted by a double bordered table. Grade level (Grades K-8) or Course (Grades 9-12) is listed next to the term, ACCRS, followed by the standard number. Column 1 in the second row of the table, entitled, Mastered, lists the standard that students are expected to have mastered before attempting the alternate activities. Column 2, entitled Present, repeats the same standard with added depth/complexity. This is the standard for students who have demonstrated mastery are to address. Column 3, entitled Going Forward, adds further challenge and is an optional extension for students who have mastered the standard in Column 2 (Present).

**Example:** Standards in Grades K-8 are identified by grade level.

**Alabama College and Career Ready Standard (listed at the start of each new standard)**

**Grade Level**

**Content Standard Number**

<b>ACCRS: 4.1</b> Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.		
<b>Mastered:</b> Students can interpret a multiplication equation as a comparison.	<b>Present:</b> Students will apply multiplication comparison strategies in words and equations to complete a multiplication math rebus story.	<b>Going Forward:</b> Students will complete the Think Fast activity to demonstrate a more complex understanding of multiplication theory.

What students already know and can do    ↑    Standard with added depth/complexity    ↑    Optional extension    ↑

**Example:** Standards in Grades 9-12, are identified by course name rather than grade level.

**Alabama Course of Study Standard (listed at the start of each new standard)**

**Course**

**Content Standard Number**

<b>ACCRS: Geometry 1</b> Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment based on the undefined notions of point, line, distance along a line, and distance around a circular arc.		
<b>Mastered:</b> Students know precise definitions of angle, circle, perpendicular line, parallel line,	<b>Present:</b> Students will use real world examples to define geometry terms.	<b>Going Forward:</b> Students will search the Internet for unusual photographs of geometry terms.

and line segment based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

**What students already know and can do** ↑

**Standard with added depth/complexity** ↑

**Optional extension** ↑

Each standard component contains the following elements: Career connections, Present and Going Forward Vocabulary, one or more Alternate Activities aligned to the standard, and Literature/Resources Connections.

**Career Connections:** Careers listed in the boxes are aligned to each standard. We encourage teachers to emphasize these or other connected careers both to spark student interest in further investigation and to assist students in making real-world connections.

**Career Connections:**

Actuary, Computer Programmer, Mathematicians, Architect, Surveyor, Photographer

**Vocabulary:** Present and Going Forward Vocabulary words are specialized terms used by practicing professionals or those studying the discipline/s in which this standard would be integral.

**Present and Going Forward Vocabulary:**

Angle, circle, perpendicular line, parallel line, circular arc

**Advanced Understanding & Activity (Alternate activity):**

**Say Cheese!**

**Student Instructions:** Using a digital camera, collect pictures of geometry terms in the real world. Take pictures and create a slide show. Include an explanation of how the photograph illustrates the vocabulary word. The entire lesson plan and all needed materials are located at:

[http://www.education.com/activity/article/Geometry\\_Scavenger\\_high/](http://www.education.com/activity/article/Geometry_Scavenger_high/)

Teachers may want to change or add additional vocabulary words to the list included in the lesson plan.

**Advanced Understanding & Activity (Alternate Activity):** Alternate activities are specifically defined, with accompanying, full size, printable student sheets found in Appendix A. In addition, student activity sheets are available on the CD Rom version of this document. They can be saved to a computer and completed electronically or printed.

**Literature Connections/Resources:** Web sites listed in this document are also found on the CD Rom version, where they are in clickable format. Simply click on the Web address or copy and paste into the address bar to go to the selected site. All sites have been previewed by the ALSDE and are safe and appropriate for student access. A separate page found in Appendix D also lists these resources.

**Literature Connections/Resources:**

- [http://www.education.com/activity/article/Geometry\\_Scavenger\\_high/](http://www.education.com/activity/article/Geometry_Scavenger_high/)
- <http://mdk12.org/instruction/curriculum/science/safety/handling.html>

**Types of Alternate Activities:** Many formats are used to differentiate the lessons in this document, most of which will be familiar to the user. Explanations and examples of some which may not be familiar, such as RAFT, Tic-Tac-Toe Choice Boards, ThinkFast, Kaplan’s Depth & Complexity, I can..., and Thinker Keys follow.

### **Roll, Audience, Format, Topic (RAFT)**

Students are required to research a given topic and answer study questions to assist them in gaining the necessary understanding to complete the RAFT assignment. Then they assume the **role** (Column 1) of an animate or inanimate object or character from the unit of study. They choose an **audience** (Column 2) from the universe of anyone/anything that would be interested in the topic. The **format** (Column 3) can be any suitable method of communication, including verbal, musical, kinesthetic, artistic, etc. The **topic** is often adapted from a clever saying, a song, or a cliché (Column 4), and serves as the title for the RAFT. For example, in the set of RAFTs below, a student might choose to be a balance, talking to blocks through a comic strip, debating the topic, “To be balanced, or not to be balanced.”

<b><u>ROLE</u></b>	<b><u>AUDIENCE</u></b>	<b><u>FORMAT</u></b>	<b><u>TOPIC</u></b>
Balance	Blocks	Comic Strip	To be balanced or not to be balanced

### **Tic-Tac-Toe Choice Board**

The Tic-Tac-Toe menu provides students with choices of activities that address different learning styles or different levels of complexity. Students contract with the teacher to complete three, moving across, down, or diagonally. For example, in the Tic-Tac-Toe menu below, a student might choose to complete Activities 2, 5, and 8 to complete the Tic-Tac-Toe contract.

ACTIVITY 1	ACTIVITY 2	ACTIVITY 3
ACTIVITY 4	ACTIVITY 5 STUDENT CHOICE (with teacher approval)	ACTIVITY 6
ACTIVITY 7	ACTIVITY 8	ACTIVITY 9


### **Think Fast**

Students are asked to answer a series of questions concerning a major topical concept (spelled out vertically in Column 1). Answers should begin with the corresponding letter of each row. For example, in row one, students are asked to list three symbols or signs used in mathematics, and all answers must begin with the letter “S.”

<b>S</b>	List three symbols or signs used in mathematics.
<b>Y</b>	Solve for Y in this equation. $[Y(26+4) + (6 \times 5)] = \{[10(16+4)] - (4 \times 15)/3\}$
<b>M</b>	Why is Math a “universal language”? Are there any other universal languages? What are they? Explain.
<b>B</b>	Think of at least four other areas in life besides mathematics that depend upon the use of symbols to convey meaning. Make a poster categorizing and showing examples of these.
<b>O</b>	Name at least three reasons why symbols are a necessary part of mathematics.
<b>L</b>	What are the kinds of thinking necessary in order to be a good mathematician?



## Kaplan's Depth & Complexity

In this activity, students think about a given topic in one of a possible 11 different contexts, each of which adds depth or complexity to their topical study. First, they choose one of 11 possible elements (Column 1). After answering questions and/or participating in an activity to facilitate understanding (Column 2), students culminate with an authentic product (Column 3). The 11 possible elements are Details, Language of the Discipline, Patterns, Trends, Unanswered Questions, Big Ideas, Rules, Ethics, Change over Time, Multiple Points of View, and Interdisciplinary Relationships.

ELEMENT	QUESTION/ACTIVITY	PRODUCT(S)
 LANGUAGE OF THE DISCIPLINE		

### Thinker Keys

Thinker Keys offer students choices in ways to think about a given topic in 20 different ways, based on questions, activities, and research opportunities that encourage creativity and abstract thought, while strengthening higher order thinking skills. The keys consist of What If?; Reverse Listing; Disadvantages; Combination; BAR-Bigger, Add, Replace; Alphabet; Variations; Picture Transformations; Prediction; Different Uses; Ridiculous; Commonality; Brainstorming; Inventions; Brick Wall; Construction; Forced Relationships; Alternatives; and Interpretation. Students choose one or more of the keys from Column 1 and complete the activities from Column 2. See the example below.

 <b>What If?</b>	What if there were no decimals? Make a list of the things in everyday life that would change, the problems that would arise, and think of a possible solution for at least three of your ideas.
 <b>Reverse Listing</b>	List three other ways to write a decimal without using a decimal point. Show examples and explain how these numbers are equivalent.



## How Can Teachers Most Effectively Use This Document?

- Become familiar with the *Alabama Course of Study: Mathematics* 2013 Revised. (Code of Alabama, 1975, §16-35-4)
- Pre-assess students to determine mastery of each objective.
- Pre-assess all students at first. Later in the year, pre-assess those whom you strongly believe might have already mastered the material as well as any student who requests it.
- Use advanced activities **in place of** not in addition to the “regular” or grade-level lessons and assignments. The length of time to complete alternate assignments should be comparable to the length of time allotted to complete the regular assignment.
- Emphasize the importance of students taking ownership of their learning.
- Establish clear rules for behavior so that students know what is expected of them in all work situations. Be consistent in enforcing rules and follow through with consequences for rule infractions. (Behavior contracts may be a useful tool.)
- Best practices suggest awarding students a letter grade of “A” for each of the “regular” or grade-level activities. Evaluation of the alternate activities should be in the form of extra points, teacher narrative reports, rubrics, or shared student and teacher evaluations.
- Prior to beginning a new objective, browse through Resource and Curriculum Guides in order to obtain necessary literature, classroom materials, etc.
- Prepare sufficient student pages and materials for lessons in Resource and Curriculum Guide ahead of time to be ready for students who show mastery of grade-level material. (The number of students who need these materials may be reduced as the year progresses, especially during the second semester.)
- Organize student pages and materials needed to complete advanced lessons for easy access by students.
- Prepare all students for the probability that all may not be working on the same content at the same time nor in the same way. Help them to understand that each is unique and; therefore, may need to learn differently.
- Use graphic organizers and student planners when suggested in the Resource and Curriculum Guide or when otherwise necessary.
- Ask for collaborative or consultative assistance from the gifted specialist when necessary.

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