Mathematics
Transitional Course
College & Career Readiness Mathematics (270718)

A Collaborative Effort by:
Kentucky Department of Education
Southern Regional Education Board
The Kentucky Council on Postsecondary Education
Kentucky Community and Technical College System
Education Development Center
Kentucky State University
Northern Kentucky University
Eastern Kentucky University
Anderson County Schools
Adair County Schools
Kenton County Schools
Laurel County Schools

May 18, 2011 Final
Introduction
Mathematics Transitional Course

On March 26, 2009, Governor Steve Beshear signed Senate Bill 1 into law. This significant piece of legislation led to the implementation of several education initiatives impacting college readiness and degree completion in Kentucky.

Included in these initiatives was a mandate for the Kentucky Council on Postsecondary Education (CPE), the Kentucky Board of Education (KBE), and the Kentucky Department of Education (KDE) to develop a unified strategy to reduce college remediation rates of recent high school graduates by at least fifty percent by 2014 from the rates in 2010, and to increase the college completion rates of students enrolled in one or more remedial classes by three percent annually from 2009 to 2014. The vision of the Kentucky Board of Education is to ensure that all students reach proficiency and graduate from high school ready for college and careers. The board’s vision is informed by a changing economy that requires P-12 schools to prepare students for a more complex and competitive workplace.

Listed below are each of the strategies in KDE’s College and Career Readiness Delivery Plan:
- Strategy 1: Persistence to Graduation
- Strategy 2: Course and Assessment Alignment
- Strategy 3: Unbridled Learning Accountability Model
- Strategy 4: Targeted Interventions
- Strategy 5: Career Readiness Pathways
- Strategy 6: Acceleration
- Strategy 7: Academic and Career Advising
- Strategy 8: Priority Schools

This intervention falls under Strategy 4: Targeted Interventions.

A statewide team of secondary and postsecondary mathematics educators were tasked to assist regional school districts and high schools in designing and implementing transitional mathematics courses. Meetings were held in 2010 to develop college readiness transition courses. These transitional courses center on a framework of content and concepts aligned with the revised Kentucky Core Academic Standards and aligned with college and career readiness standards.

This course should be adapted to meet the specific needs and conditions in each high school. It may be offered as an actual full semester course, but it could also be offered as an intervention for students before or after school, as a supplement to existing mathematics courses or a course in which students have flexible entry and exit based on pre-assessment scores. The flexibility of the course is designed to provide schools with multiple options to meet student needs without compromising the other opportunities available to them.

Teachers in each school are charged with designing instructional plans based on the curriculum provided by the Mathematics Transitional Course Work Team. Additional materials such as worksheets, class notes, and measurement instruments (quizzes and tests) for teachers can be developed or provided by programs successfully implementing college readiness programs.

A system for including pre- and post-testing, diagnostics, and scores for developmental and non-developmental placement is necessary and essential for tracking data related to these courses. Mechanisms need to be in place to record pertinent data, review procedures, and disseminate.
information to other interested school districts and state agencies. For additional information, please see the information page on College and Career Readiness in Kentucky at the end of this document.

The Kentucky Council on Postsecondary Education uses the following three assessments to determine placement of students in college mathematics/developmental classes.

- ACT
- KYOTE
- COMPASS
Introduction for Teachers

Purpose of course: The purpose of this course is to enable students to transition into credit-bearing college mathematics classes which require a minimum benchmark mathematics score of 19 on the ACT. This course is a direct result of implementing Senate Bill 1 legislation which requires the development of a “unified strategy to reduce college remediation rates by at least fifty percent (50%) by 2014 from what they are in 2010” (“Unified strategy for college and career readiness,” 2010).

Course objectives: After completing the transitional course and meeting the college placement test criteria, students will be able to:
- enroll in a college credit-bearing mathematics course.
- increase the likelihood for successful completion in subsequent college mathematics courses.

Background Development: Numerous secondary and postsecondary educators and multiple KDE offices met to plan and develop the framework for the mathematics transitional course. Course developers included high school and college faculty who are currently immersed in successful transitional program pilots within their own institutions. Data and expertise from these groups supported the development of a course framework that will provide students with the fundamental background for the successful placement and completion of a credit-bearing college course. While differences exist among public institutions in the tiered course requirements, all public postsecondary institutions must place students in developmental or supplemental coursework if their ACT falls below a 19 or the student does not demonstrate proficiency on a placement test. Material has also been included that will provide students with content necessary for successful placement and completion of College Algebra, which requires an ACT benchmark of 22. An example of a multi-track approach to placing students in college credit-bearing courses is provided below.
Suggestions for course delivery: In order for this transitional intervention to be most effective, it is important for the teacher to fully understand and utilize best practices for mathematics instruction. To be the most effective for students, the intervention should be as individualized as possible. Below, you will find several tips and resources for implementation of mathematical interventions.

- Diagnostic testing before beginning a unit – the sample problems in the course may be used as a diagnostic if students haven’t been tested using a different instrument
- Differentiation – using the diagnostic and knowledge about each student, a learning plan should be created for each individual
- Projects and activities – studies have shown that students work best when engaged in hands-on learning activities
- CCSSI Standards for Mathematical Practice (see below)
- Characteristics of Highly Effective Teaching and Learning (see below)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

Mathematical Practices
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Characteristics of Highly Effective Teaching and Learning (CHETL): These characteristics describe the role of the teacher and student in an exemplary mathematics instructional environment. The characteristics are based on research and they articulate the vision for highly effective mathematics instruction. Beyond the characteristics and the supporting research, we have provided tools that may be used as resources to support high quality mathematics instruction. These tools include videos of Kentucky teachers that represent snapshots of teaching across Kentucky to engage conversations around CHETL.

http://www.education.ky.gov/KDE/Instructional+Resources/Highly+Effective+Teaching+and+Learning/Characteristics+of+Highly+Effective+Mathematics+Teaching+and+Learning.htm
Course Format: The course framework consists of seven (7) teaching units. The first three units (Units 1, 2, and 3) are broken down into smaller sections in order to isolate particular skills or concepts for ease of lesson planning. In each section, you will find the objective(s), lessons necessary to teach the section or unit, sample problems, and resources.

Objective: Each section includes a specifically stated objective which outlines the concept(s) that the student will need to know at the conclusion of the section. The objectives are skills based and are easily measured to ascertain student progress. The objectives also enable an educator to use the course as an intervention opportunity for students who may not need to complete the entire course if they show that they have already mastered certain objectives.

In parentheses, following the unit objective, you will find the annotation for the Kentucky Core Academic Standards. These have been provided to help assure curriculum alignment and for the ease of lesson planning for the teacher. Please note that this course is not intended to cover all core standards for a particular topic, but is meant to address student college readiness levels. For example, not every Geometry standard is addressed in this transitional intervention course framework because this is not intended to be a Geometry class. However, those Geometry standards which are pertinent to college readiness have been included.

Lessons: The lessons are a breakdown of topics necessary to master the content for the section or unit. This particular document is a framework, or course outline, for teachers to follow. In order to develop the lessons, teachers will need to provide modeling of skills, practice problems and opportunities for application of knowledge for students.

The Quantile measure for each lesson has been listed within the Lessons section. The Quantile Framework measures a student's mathematical achievement and concept/application solvability on the same scale, enabling educators to use Quantile measures to monitor a student's development in math and forecast performance on end-of-year tests. You may find more information at www.quantiles.com.

In addition to this coursework, it is recommended that teachers include components for computational fluency, numeracy, college readiness, appropriate use of technology, and self-directed learning.

Sample Problems: The sample problems included in the course framework represent the types of problems that need to be mastered by students in order to satisfy the objective. The sample problems are the benchmark problems and represent the highest necessary level of difficulty. If students can complete problems similar to those in the course outline, they are proving their ability to solve higher order problems.

Resources: These are websites, online activities, or videos that will be useful to you as you are teaching a given lesson. The list is not exhaustive, but is meant to give you some guidance to resources that can be helpful for instruction.

Below is a general list of websites that can also prove helpful.

- Quantiles (http://www.quantiles.com)
- Merlot (http://www.merlot.org/merlot/index.htm)
- Thinkfinity (http://www.thinkfinity.org/)
- Hippocampus (www.hippocampus.org)
- ck12 – Flexbooks: Free Online Customizable Textbook (http://www.ck12.org/flexbook/)
- NCTM Illuminations (http://illuminations.nctm.org/)
- Khan Academy (http://www.khanacademy.org/)
- National Library of Virtual Manipulatives (http://nlvm.usu.edu/)
# Table of Contents

Unit 1: Preliminary Concepts
- 1.1 Basic Operations with Integers ........................................... 7
- 1.2 Defining Properties of Real Numbers ..................................... 8
- 1.3 Order of Operations .......................................................... 9
- 1.4 Absolute Value .............................................................. 10
- 1.5 Basic Operations with Fractions ......................................... 11
- 1.6 Conversions To and From Fractions, Decimals, and Percents .... 12
- 1.7 Applications of Proportional Thinking Related to Fractions, Decimals, and Percents .................................................... 13
- 1.8 Applications of Proportional Thinking .................................. 14
- 1.9 Cartesian Plane .............................................................. 15

Unit 2: Simplifying Expressions
- 2.1 Exponent Rules and Scientific Notation .................................. 16
- 2.2 Simplifying Polynomials ..................................................... 17
- 2.3 Factoring Polynomials ....................................................... 18
- 2.4 Rational Expressions ......................................................... 19
- 2.5 Radical Expressions ......................................................... 20

Unit 3: One-Variable Linear Equations and Inequalities
- 3.1 Solving One-Variable Linear Equations ................................. 21
- 3.2 Solving One-Variable Linear Inequalities ............................... 22
- 3.3 Solving Absolute Value Equations ...................................... 23

Unit 4: Literal Equations and Lines
- 4.1 Literal Equations .............................................................. 24
- 4.2 Slope and Rate of Change .................................................. 25
- 4.3 Graphing Linear Equations ................................................... 26
- 4.4 Writing Equations of Lines .................................................... 27

Unit 5: Quadratic Equations

Unit 6: Systems of Equations ................................................... 28

Unit 7: Geometry ................................................................ 29

Unit 8: Supplementary Materials for College Algebra
- 8.1 Rational Functions and Equations ....................................... 30
- 8.2 Radical Functions and Equations ......................................... 31

Appendix: College and Career Readiness in Kentucky .................... 32

May 18, 2011 Final
Unit 1: Preliminary Concepts

In the Preliminary Concepts unit, students will strengthen their knowledge of algorithms of arithmetic. Operations with integers, properties of real numbers, order of operations, absolute value, basic operations of fractions and decimals, and applications of proportional thinking are the key topics in this unit. **Limited use of a calculator in this unit is recommended as automaticity of basic arithmetic is a goal of this unit.**

* This unit should be prerequisite knowledge for students scoring 19 or above on the ACT.

**For students who score below 16 on the ACT, teachers will need to expand this unit, spending more time and ensuring proficiency before moving on to the next unit.**

1.1 Basic Operations with Integers
1.2 Defining Properties of Real Numbers
1.3 Order of Operations
1.4 Absolute Value
1.5 Basic Operations with Fractions
1.6 Conversions To and From Fractions, Decimals, and Percents
1.7 Applications of Proportional Thinking Related to Fractions, Decimals, and Percents
1.8 Applications of Proportional Thinking
1.9 Cartesian Plane
## Unit 1: Preliminary Concepts
### Section 1: Basic Operations with Integers

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to add, subtract, multiply, and divide integers. (7.NS)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Addition and subtraction (800Q)  
2. Multiplication (810Q)  
3. Division (810Q) |
| Sample Problems for College Readiness | Addition and Subtraction  
-3+2  
2-6-4-8  
8-(-6)  
-7 – 12  
4 + -3  
-10 + 5 – 3 – 4  
Multiplication  
(-23)(3)  
6(-2)  
8 · -4 · (-3)  
Division  
84 ÷ -4  
\(\frac{12}{4}\)  
-36 ÷ 9 |
| Resources | Videos:  
- Multiplying and Dividing: [http://khanexercises.appspot.com/video?v=d8lP5tR2R3Q](http://khanexercises.appspot.com/video?v=d8lP5tR2R3Q)  
Resources:  
- Free ACT and COMPASS online practice test: [http://www.analyzemath.com/practice_tests.html](http://www.analyzemath.com/practice_tests.html)  
# Unit 1: Preliminary Concepts

## Section 2: Defining Properties of Real Numbers

### Objective
After completing this section, students will be able to identify examples of basic properties of real numbers. (6.EE.3, 6.EE.4)

### Lessons
1. Commutative property (820Q)
2. Associative property (820Q)
3. Distributive property (820Q)
4. Identity property (820Q)
5. Inverse property (820Q)

### Sample Problems for College Readiness

#### Pretest
- £ Example:

#### Posttest
- £ Example:

#### Lessons
- £ Example:

*Sample problems represent the highest necessary level of difficulty*

### Sample Problems for College Readiness

#### Commutative Properties of Addition and Multiplication
- £ Example:

#### Associative Properties of Addition and Multiplication
- £ Example:

#### Distributive Property of Multiplication Over Division:
\[ 3(x+2) = 3x + 6 \]

#### Identity Property of Addition:
\[ x + 0 = x \]

#### Identity Property of Multiplication:
\[ 3(1) = 3 \]

#### Inverse Property of Addition
- £ Example:

#### Inverse Property of Multiplication
\[ y \left( \frac{1}{y} \right) = 1 \]

Also provide problems where students will use properties to rewrite expressions.

### Resources

**Video:** Hippocampus  
(https://www.hippocampus.org/homework-help/Algebra/Basic%20algebra%20principles_Associative,%20commutative,%20distributive%20properties.html)

**Resources:**
- £ Example:

- £ Example:

- £ Example:

- £ Example:

- £ Example:
# Unit 1: Preliminary Concepts
## Section 3: Order of Operations

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to simplify numeric expression using order of operations. (6.EE.1, 6.EE.2)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Basic explanation of PEMDAS (500Q)  
2. Lots of examples with explanations connected to PEMDAS |
| Sample Problems for College Readiness | Use only exponents with squares and cubes. Use only \* and parentheses for multiplication. Answers should be only integers. |
|          | -12+5(3)  
-10÷2-3(-4)(3)  
-4(2+3)-4÷2²  
Given \(f(x) = 3x^3 - 5x\), evaluate \(f(-2)\)  
Evaluate the following expressions for \(a = -1\) and \(b = 4\)  
- \(5a^2 - 2(b + 1)\)  
- \(3a^2b + 6ab^2\) |
| Resources | *Sample problems represent the highest necessary level of difficulty* |
| Video: | [http://mathplayground.com/howto_pemdas.html](http://mathplayground.com/howto_pemdas.html) |
| Resources: |  
# Unit 1: Preliminary Concepts  
## Section 4: Absolute Value

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to evaluate expressions containing absolute value. (7.NS.1)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Absolute value as distance (900Q)  
|           | 2. Expressions containing absolute value (990Q)  
|           | 3. 911 mapping (see resources) |

### Sample Problems for College Readiness

#### Pretest
- Simplify.
  - $|−6|$
  - $|8|$
  - $−|−8|$
  - $−|(2−3)|$
  - $−2 + |7−9|$
  - $−4 + |9−7|$
  - $4 - |2−3|$
  - $−3|−2 + 3|$
  - Given $f(x) = |3 − x^2| + 4$, evaluate $f(-2)$

#### Posttest
- Example: 1500 N. Broadway is 1.5 miles from the next intersection
- Example: 158 N. Broadway is 0.158 miles from the next intersection
- A sample problem might be: 2 homes on the same road have the addresses 529 Jones Road and 683 Jones Road. Approximately how far apart are the 2 houses? Interstate exits: You want to go to Exit 11 and you are at mile marker 63. How far are you from your exit?

### Resources

#### Videos
- [http://sites.google.com/site/mathlovin/videos_algebra1](http://sites.google.com/site/mathlovin/videos_algebra1)

#### Web Resources:
- Examples: [http://www.purplemath.com/modules/absolute.htm](http://www.purplemath.com/modules/absolute.htm)
- Absolute Value Inequalities: [http://lionsden.tec.selu.edu/~sgoodly/etec644/avilesplan.html](http://lionsden.tec.selu.edu/~sgoodly/etec644/avilesplan.html)
# Unit 1: Preliminary Concepts

## Section 5: Basic Operations with Fractions

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to perform basic operations with fractions and simplify the results. (5.NF)</th>
</tr>
</thead>
</table>
| Lessons    | Simplify answers throughout  
1. Simplifying fractions (590Q)  
2. Add/Subtract fractions (790Q)  
3. Multiply fractions (820Q)  
4. Divide fractions (870Q) |
| Sample Problems for College Readiness | Simplify:  
- 5/10  
- 12/36  
- -5/6 + 2/9  
- -5/7+2/7  
- 3/8-5/8  
- \( \left(2 \frac{4}{9}\right) \left(-3 \frac{2}{7}\right)\)  
- \( \frac{10}{9} \div \left(-\frac{25}{18}\right)\) |

*Sample problems represent the highest necessary level of difficulty*

Web Resource:  
- Understanding Ratios of Areas of Inscribed Figures (NCTM Illuminations)  
- Activity:  
[http://www.earthwalk.com/Education/eClassroom/LessonPlans/InteractiveFractions.html](http://www.earthwalk.com/Education/eClassroom/LessonPlans/InteractiveFractions.html) |
## Unit 1: Preliminary Concepts
### Section 6: Conversions To and From Fractions, Decimals, and Percents

<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th>After completing this section, students will be able to convert to and from fractions, decimals, and percents. (4.NF.5, 4.NF.6, 6.RP.3)</th>
</tr>
</thead>
</table>
| **Lessons**   | 1. Fraction to decimal (710Q)  
2. Decimal to fraction (710Q)  
3. Fraction to percent (400Q)  
4. Percent to fraction (400Q)  
5. Decimal to percent (400Q)  
6. Percent to decimal (400Q) |
| **Sample Problems for College Readiness** | - Convert to decimal and percent: ½  
- Convert to fraction and percent: 0.5  
- Convert to decimal and fraction: 50% |
| **Resources** |  
**Videos:**  
http://www.teachertube.com/viewVideo.php?video_id=24266 (Mr. Duey)  
**Web Resources:**  
- Free Ride (Illuminations activity)  
  http://illuminations.nctm.org/ActivityDetail.aspx?ID=178  
- Lesson/Activity:  
  http://www.moneyinstructor.com/lesson/fracdecimalpercent.asp  
- Trashketball Activity:  
  http://www.learnnc.org/lp/pages/3950  
- Baseball Fun Activity:  
  http://www.learnnc.org/lp/pages/3910  

*Sample problems represent the highest necessary level of difficulty*
# Unit 1: Preliminary Concepts

## Section 7: Applications of Proportional Thinking Related To Fractions, Decimals, and Percents

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to solve real world problems (fraction, decimal and %) related to proportional thinking. (6.RP.3)</th>
</tr>
</thead>
</table>
| Lessons | 1. Percent problem with unknown part (ex: 20% of 80 is what?) (820Q)  
2. Percent problem with unknown percent (ex: 15 is what percent of 75?) (820Q)  
3. Percent problem with unknown whole (ex: 20 is 30% of what?) (820Q)  
4. Real world problems applying #1,2,3 (Recipes, medication problems, etc.) (870Q) |
| Sample Problems for College Readiness |  
- **Pretest**  
- **Posttest**  
- **Lessons**  
  *Sample problems represent the highest necessary level of difficulty*  
  - 52% of 70 is what?  
  - What % of 82 is 54?  
  - 23% of what is 92?  
  - A basketball player made 4 baskets in 5 attempts. What fraction of baskets did he make? What was his shooting percentage?  
  - If sales tax is 6%, how do you write that as a decimal? What would tax be on $1.00? What would tax be on $20.00? |
| Resources |  
- **Videos**  
  - [http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Wall-E_Learns_About_Proportion.html](http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Wall-E_Learns_About_Proportion.html)  
  - Movie proportions: [http://avoca37.org/allend/files/2010/03/Ch8menuREG.pdf](http://avoca37.org/allend/files/2010/03/Ch8menuREG.pdf)  
  - **Web Resources - NCTM Illuminations lessons:**  
## Unit 1: Preliminary Concepts
### Section 8: Applications of Proportional Thinking

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to convert measurement within and between systems. (7.RP.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lessons</td>
<td>Lessons to correlate the types of problems on pretest and sample problems – all real world examples (820Q)</td>
</tr>
<tr>
<td>Sample Problems for College Readiness</td>
<td>Proportions related to conversions (Use fractions and decimals as well)</td>
</tr>
<tr>
<td></td>
<td>- Conversions within metric: How many meters is 50 cm?</td>
</tr>
<tr>
<td></td>
<td>- Conversions within English: Joey is 49” tall. He has to be at least 4 feet tall to ride a roller coaster. Is he tall enough?</td>
</tr>
<tr>
<td></td>
<td>- Conversions between English and metric: Ann drives 12 miles to work each day. How many km does she drive?</td>
</tr>
<tr>
<td></td>
<td>- Real world proportion problems: A child can run at a rate of 2 1/2 blocks per 2 minutes. How long does it take the child to run 7 blocks?</td>
</tr>
<tr>
<td></td>
<td>- MPH to feet/seconds, drip rate, IV problems:</td>
</tr>
<tr>
<td></td>
<td>- Kelsey is driving 72 miles per hour. What is that in feet per second?</td>
</tr>
<tr>
<td></td>
<td>- You have an order to start a dopamine drip at 5mcg/kg/min. Your patient weighs 212 lbs. The gtt factor is 60 and the dopamine solution is 400mg/250mL. How fast do you run the drug on the pump?</td>
</tr>
<tr>
<td></td>
<td>- Recipe conversions, cooking: A recipe calls for the following ingredients. What amounts are needed to cut the recipe in half?</td>
</tr>
<tr>
<td></td>
<td>- 3 cups flour</td>
</tr>
<tr>
<td></td>
<td>- 1 tsp. baking powder</td>
</tr>
<tr>
<td></td>
<td>- 1 cup butter</td>
</tr>
<tr>
<td></td>
<td>- 2 cups sugar</td>
</tr>
<tr>
<td></td>
<td>- 2 eggs</td>
</tr>
<tr>
<td></td>
<td>- Moles to grams (chemistry): How many moles are in 5 grams of O₂?</td>
</tr>
<tr>
<td></td>
<td>- Solve for x and y given that A’C’</td>
</tr>
</tbody>
</table>

*Sample problems represent the highest necessary level of difficulty*
## Resources

<table>
<thead>
<tr>
<th>Web Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>- National Library of Virtual Manipulatives—Converting Units (link below)</td>
</tr>
<tr>
<td>- Downloadable translator that is free where students can check conversions. <a href="http://translatorbar.com/unitconverter.php">http://translatorbar.com/unitconverter.php</a></td>
</tr>
<tr>
<td>- Another conversion. Easy to use online and a great way to check work. <a href="http://www.onlineconversion.com/">http://www.onlineconversion.com/</a></td>
</tr>
<tr>
<td>- Hitting Your Mark—an NCTM Illuminations activity that is free at: <a href="http://illuminations.nctm.org/LessonDetail.aspx?id=L787">http://illuminations.nctm.org/LessonDetail.aspx?id=L787</a></td>
</tr>
<tr>
<td>- Constant Dimensions—an NCTM Illuminations activity that is free at: <a href="http://illuminations.nctm.org/LessonDetail.aspx?id=L572">http://illuminations.nctm.org/LessonDetail.aspx?id=L572</a></td>
</tr>
<tr>
<td>- Lessons: <a href="http://www.purplemath.com/modules/units.htm">http://www.purplemath.com/modules/units.htm</a></td>
</tr>
<tr>
<td>- Lessons: <a href="http://www.mrnussbaum.com/measurement.htm">http://www.mrnussbaum.com/measurement.htm</a></td>
</tr>
</tbody>
</table>
# Unit 1: Preliminary Concepts
## Section 9: Cartesian Plane

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to plot and name points, and identify location by quadrant. (6.NS.8)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Plot points (in each quadrant and on the axis) (850Q)  
2. Name coordinates of points based on graph. (850Q)  
3. Name quadrants that a point is in. (850Q)  
4. In which quadrant is the y-value negative? (850Q) |
| Sample Problems for College Readiness | ● Plot points (include all quadrants and axes)  
   o (2, -3)  
   o (3, 0)  
   o (-5, -1)  
   o (1, 2)  
   o (0, -1)  
   o (-2, 1)  
● Identify coordinates of points (this may possibly be combined with #1)  
● Given coordinates of a point, name the quadrant in which the point lies.  
● Pay close attention to characteristics of the coordinates of the points related to their locations (ex: If the first coordinate is 0, what do you know about it?) |
| *Sample problems represent the highest necessary level of difficulty | |
| Resources | Video Intro:  
   ● NASA-created You Tube video with real world coordinate system  
   [http://www.youtube.com/watch?v=cHpUhk8OhBM&feature=related](http://www.youtube.com/watch?v=cHpUhk8OhBM&feature=related)  
Web Resources:  
   ● Interactive Cartesian Coordinates:  
   ● Hit the Coordinates Game:  
   [http://www.mathsisfun.com/data/click-coordinate.html](http://www.mathsisfun.com/data/click-coordinate.html)  
   ● You Tube video explaining coordinate axis:  
   [http://www.youtube.com/watch?v=HdrCwFNcXGU&feature=related](http://www.youtube.com/watch?v=HdrCwFNcXGU&feature=related)  
   ● Activity: [http://shodor.org/succeed-1.0/curriculum/MEX/CartesianCoord.html](http://shodor.org/succeed-1.0/curriculum/MEX/CartesianCoord.html)  
   ● Game:  
   [http://www.shodor.org/interactivate/activities/GeneralCoordinates/](http://www.shodor.org/interactivate/activities/GeneralCoordinates/) |
Unit 2: Simplifying Expressions

This unit includes work with polynomial evaluation, simplification, and factoring. Simplify, add, subtract, multiply and divide rational expressions and radical expressions are also components of this module.

2.1 Exponent Rules and Scientific Notation
2.2 Simplifying Polynomials
2.3 Factoring Polynomials
2.4 Rational Expressions
2.5 Radical Expressions
# Unit 2: Simplifying Expressions

## Section 1: Exponent Rules and Scientific Notation

### Objective
After completing this unit, students will be able to simplify expressions using the product, quotient, and power rules of exponents, convert numbers between scientific notation and standard notation, and solve applied problems involving scientific notation. (N.RN.1, 8.EE.3, 8.EE.4)

### Lessons
1. Product, quotient, and power rules with integer exponents (1000Q)
2. Scientific notation (910Q – 1000Q)

### Sample Problems for College Readiness
- **Pretest**
- **Posttest**
- **Lessons**

*Sample problems represent the highest necessary level of difficulty*

- Simplify
  - \(x^7 \cdot x^3\)
  - \(x^6\)
  - \(x^4\)
  - \(x^{-8}\)
  - \(\frac{(x^2)^3}{(x^{-5})^{-3}(x^7)^{-1}}\)
  - \(x^{-2}y^{-3}\)
  - \(\frac{x^5}{xy^5}\)
  - \((3a^3c^5)^2\)
  - Write 1400 as scientific notation
  - Expand scientific notation. Example: \(2.76 \times 10^{-3} = .00276\)
  - Add, subtract, multiply or divide
    - \(\frac{3.2 \times 10^4}{2.6 \times 10^{-3}}\)
    - \((2.9 \times 10^5)(4.6 \times 10^7)\)
  - The number of hairs on the human head is estimated to be about \(1.5 \times 10^5\). If there are approximately \(6 \times 10^9\) people in the world, estimate the number of human hairs in the world.

### Extensions for College Algebra
- \(\left(\frac{2x^2}{y^{-4}}\right)^{-3}\)
- \(a^6b^7(5a^3b^4)^2\)

### Resources
- **Videos:**
  - Video: [http://www.youtube.com/profile?user=SpreadingtheMuse Type exponent into search engine, misconceptions addressed](http://www.youtube.com/profile?user=SpreadingtheMuse Type exponent into search engine, misconceptions addressed)

### Web Resources:
- **Lessons:**
- **Lesson:** [http://www.purplemath.com/modules/exponent3.htm](http://www.purplemath.com/modules/exponent3.htm)
## Section 2: Simplifying Polynomials

### Objective

After completing this section, students will be able to: identify and classify polynomials and determine the degree, evaluate polynomials, add and subtract polynomials, multiply polynomials, and divide a polynomial by a monomial. (A.APR)

### Lessons

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Identify and classify polynomials and determine the degree of the polynomials. (820Q)</td>
</tr>
<tr>
<td>2.</td>
<td>Evaluate polynomials (1180Q)</td>
</tr>
<tr>
<td>3.</td>
<td>Add and subtract polynomials (1050Q)</td>
</tr>
<tr>
<td>4.</td>
<td>Multiply polynomials (1050Q)</td>
</tr>
<tr>
<td>5.</td>
<td>Divide a polynomial by a monomial (1180Q)</td>
</tr>
</tbody>
</table>

### Sample Problems for College Readiness

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Sample problems represent the highest necessary level of difficulty</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evaluate ( f(x) = 2x^2 - 3x + 4 ), find ( f(-2) )</td>
</tr>
<tr>
<td></td>
<td>Simplify</td>
</tr>
<tr>
<td></td>
<td>- ( f(x) = (3x^2 + 2x - 1) + (4x^2 - 3x + 2) )</td>
</tr>
<tr>
<td></td>
<td>- ( f(x) = (x^3 - 2x^2) - (2x^3 + 3x - 4) )</td>
</tr>
<tr>
<td></td>
<td>- ( f(x) = -2x^2 (x^2 - 3x + 7) )</td>
</tr>
<tr>
<td></td>
<td>- ( (2x - 3)(4x + 5) )</td>
</tr>
<tr>
<td></td>
<td>- ( (4x - y)(2x^2y - 3xy + 3) )</td>
</tr>
<tr>
<td></td>
<td>- ( 3x^3 \cdot 6x^2 + 9x )</td>
</tr>
<tr>
<td></td>
<td>- ( 15x^4 - 10x^7 + 25x^4 )</td>
</tr>
<tr>
<td></td>
<td>- ( \frac{3x}{5x^4} )</td>
</tr>
<tr>
<td></td>
<td>- ( (3x - 4)(2x^2 - 5x + 6) )</td>
</tr>
<tr>
<td></td>
<td>State degree of ( 5x^7 - 10x^2 + 3 )</td>
</tr>
<tr>
<td></td>
<td>Classify as monomial, binomial, trinomial: ( 2x^2 - 3x )</td>
</tr>
<tr>
<td></td>
<td>Is the following a polynomial? Explain. ( 2x + 4\sqrt{x} - 10 )</td>
</tr>
</tbody>
</table>

### Extensions for College Algebra

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lesson: Divide a polynomial by a binomial – synthetic division (A.APR.6)</td>
</tr>
<tr>
<td></td>
<td>( \frac{x^3 - 9x^2 + 26x - 24}{x - 2} )</td>
</tr>
<tr>
<td></td>
<td><a href="http://mathworld.wolfram.com/SyntheticDivision.html">http://mathworld.wolfram.com/SyntheticDivision.html</a></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.youtube.com/watch?v=bZoMz1Cy1T4">http://www.youtube.com/watch?v=bZoMz1Cy1T4</a></td>
</tr>
</tbody>
</table>

### Resources

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Videos:</td>
</tr>
</tbody>
</table>
| Web Resources: | |}

- FREE Math Worksheets - math-worksheet.org
- Activity: [http://alex.state.al.us/lesson_view.php?id=23833](http://alex.state.al.us/lesson_view.php?id=23833)
- Lesson: [http://teachers.net/lessonplans/posts/3048.html](http://teachers.net/lessonplans/posts/3048.html)
# Unit 2: Simplifying Expressions
## Section 3: Factoring Polynomials

### Objective
After completing this section, students will be able to factor special case polynomials including common factor, difference of squares, quadratic with leading coefficient of 1 or not 1, ac-method, grouping, perfect trinomial squares. (A.SSE.1, A.SSE.2, A.SSE.3)

### Lessons
Factoring special case polynomials
1. Common factor (1130Q)
2. Difference of squares (1130Q)
3. Quadratic with leading coefficient of 1 (1130Q)
4. Quadratic with leading coefficient of NOT 1 (1130Q)
5. ac-method (1130Q)
6. Grouping (1130Q)
7. Perfect trinomial squares (1130Q)

### Sample Problems for College Readiness

- **Pretest**
- **Posttest**
- **Lessons**

*Sample problems represent the highest necessary level of difficulty*

Factor – use GCF when necessary:
- $4x^4 + 6x^2$
- $x^2 - 2x - 8$
- $2d^2 - 5d - 3$
- $4x^2 - y^2$
- $m^3 + 3m^2 + 2m$
- $x^2y^5 - xy^3$
- $4x^2 + 12x + 9$

### Extensions for College Algebra
Lesson: Other factoring
- $a^3 + a^2 - a - 1$
- $x^4 - 2x^2 - 8$
- $q^4 - 16$

[http://www.mathsisfun.com/algebra/factoring.html](http://www.mathsisfun.com/algebra/factoring.html)

### Resources
**Video:**
- Factoring by grouping and factoring completely: [http://khanexercises.appspot.com/video?v=X7B_tH4O- s](http://khanexercises.appspot.com/video?v=X7B_tH4O- s)

**Web Resources:**
- Lesson and Practice: [http://www.lessonplanspage.com/MathFactoringPolynomialsSquaresAndCubes912.htm](http://www.lessonplanspage.com/MathFactoringPolynomialsSquaresAndCubes912.htm)
- Activity: [http://alex.state.al.us/lesson_view.php?id=4152](http://alex.state.al.us/lesson_view.php?id=4152)
# Unit 2: Simplifying Expressions
## Section 4: Rational Expressions

### Objective
After completing this section, students will be able to:
- simplify rational expressions involving monomials and polynomials,
- multiply and divide rational expressions involving monomials and polynomials,
- add and subtract rational expressions with monomial or simple binomial denominators and numerators. (A.APR.1, A.APR.7)

### Lessons
1. Simplify rational expressions involving monomials and polynomials (1310Q)
2. Multiply and divide rational expressions involving monomials and polynomials (1310Q)
3. Add and subtract rational expressions with monomial or simple binomial denominators and numerators (1310Q)

### Sample Problems for College Readiness
- **Pretest**
- **Posttest**
- **Lessons**

*Sample problems represent the highest necessary level of difficulty*

<table>
<thead>
<tr>
<th>Simplify:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \frac{10r^3s^4}{5rs^2} ]</td>
</tr>
<tr>
<td>[ \frac{y^2+8y+15}{y^2-2y-15} ]</td>
</tr>
<tr>
<td>[ \frac{9xy^2}{2x^3} \div \frac{3x^2y}{4y} ]</td>
</tr>
<tr>
<td>[ \frac{x^2+2xy+y^2}{x^2-y^2} \cdot \frac{3x-3y}{4x+4y} ]</td>
</tr>
<tr>
<td>[ \frac{4}{x+2} + \frac{x}{x+3} ]</td>
</tr>
<tr>
<td>[ \frac{1}{5+x} - \frac{3}{xy} ]</td>
</tr>
<tr>
<td>[ \frac{2x^2y}{x+2} + 2 ]</td>
</tr>
</tbody>
</table>

### Extensions for College Algebra
Lesson: Add and subtract rational expressions with polynomial denominators and numerators.

- \[ \frac{5}{x^2-4} + \frac{2x}{x+2} \]
- \[ \frac{4}{x^2+3x+2} - \frac{6}{x^2-1} \]
- \[ \frac{1}{x+1} + \frac{x}{x-6} - \frac{5x-2}{x^2-5x-6} \]

<table>
<thead>
<tr>
<th>Resources</th>
<th>Web Resources:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Lessons and Activities:</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.onlinemathlearning.com/math-search.html?cx=partner-pub-9460199170054827%3Ar6p3zy-g6i5&amp;cof=FORID%3A11&amp;q=rational+expressions#0">http://www.onlinemathlearning.com/math-search.html?cx=partner-pub-9460199170054827%3Ar6p3zy-g6i5&amp;cof=FORID%3A11&amp;q=rational+expressions#0</a></td>
</tr>
<tr>
<td></td>
<td><a href="http://search.freefind.com/find.html?id=5014414&amp;pageid=r&amp;mode=ALL&amp;n=0&amp;query=rational+expressions">http://search.freefind.com/find.html?id=5014414&amp;pageid=r&amp;mode=ALL&amp;n=0&amp;query=rational+expressions</a></td>
</tr>
</tbody>
</table>
## Unit 2: Simplifying Expressions
### Section 5: Radical Expressions

<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th>After completing this section, students will be able to: simplify radical expressions, multiply radical expressions, add and subtract radical expressions. (N.RN.1, N.RN.2)</th>
</tr>
</thead>
</table>
| **Lessons**    | 1. Simplify radical expressions (1180Q)  
2. Multiply and divide radical expressions (1180Q)  
3. Add and subtract radical expressions (1180Q) |

<table>
<thead>
<tr>
<th><strong>Sample Problems for College Readiness:</strong></th>
<th><strong>Simplify.</strong></th>
</tr>
</thead>
</table>
| Pretest                                    | \( \sqrt{12} \)  
| Posttest                                   | \( 4\sqrt{27} \)  
| Lessons                                    | \( 5x\sqrt{18x^2} \)  
| *Sample problems represent the highest necessary level of difficulty* | \( \sqrt{20x^{5}y^{7}} \)  
|                                            | \( \sqrt{x^3} \cdot \sqrt{x^2} \)  
|                                            | \( (3\sqrt{5})(4\sqrt{10}) \)  
|                                            | \( 3\sqrt{2} + 4\sqrt{2} \)  
|                                            | \( 2\sqrt{12} + 5\sqrt{27} \)  
|                                            | \( \sqrt{20x^{2}y^{10}} \)  
|                                            | \( \sqrt{49x^{14} + x^8} \) |

<table>
<thead>
<tr>
<th><strong>Extensions for College Algebra</strong></th>
<th>Lesson: Examples with higher-index roots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Write ( x^{\frac{2}{3}} ) in radical notation.</td>
</tr>
<tr>
<td></td>
<td>( \sqrt[3]{64} )</td>
</tr>
<tr>
<td></td>
<td>( (25)^{1/2} )</td>
</tr>
<tr>
<td></td>
<td>( \sqrt[4]{80x^6y^6} )</td>
</tr>
<tr>
<td></td>
<td>( \sqrt[3]{x} \cdot \sqrt[4]{x} )</td>
</tr>
</tbody>
</table>

http://www.coolmath.com/algebra/algebra-practice-lines-etc.html  
http://www.youtube.com/watch?v=6QJlWfiyZo

<table>
<thead>
<tr>
<th><strong>Resources</strong></th>
<th>Videos:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Web Resources:</td>
</tr>
<tr>
<td></td>
<td>Lessons: <a href="http://www.hippocampus.org/search.do?cx=006492936616870087083%3Aiyqkoic0ojy&amp;cof=FORID%3A11&amp;q=radical+expressions#1022">http://www.hippocampus.org/search.do?cx=006492936616870087083%3Aiyqkoic0ojy&amp;cof=FORID%3A11&amp;q=radical+expressions#1022</a></td>
</tr>
<tr>
<td></td>
<td>Lessons: <a href="http://search.freifind.com/find.html?id=5014414&amp;pageid=r&amp;mode=ALL&amp;n=0&amp;query=radical+expressions">http://search.freifind.com/find.html?id=5014414&amp;pageid=r&amp;mode=ALL&amp;n=0&amp;query=radical+expressions</a></td>
</tr>
</tbody>
</table>
Unit 3: One-Variable Linear Equations and Inequalities

In this module students will solve single variable linear equations and linear inequalities. They will also solve problems dealing with absolute value equations and inequalities, and show solutions graphically and in interval and set notation when appropriate.

3.1 Solving One-Variable Linear Equations

3.2 Solving One-Variable Linear Inequalities

3.3 Solving Absolute Value Equations
# Unit 3: One-Variable Linear Equations and Inequalities

## Section 1: Solving One-Variable Linear Equations

### Objective

After completing this section, students will be able to solve single variable, single step and multi-step equations involving rational numbers. (6.EE.5, 6.EE.6, 6.EE.7, 7.EE.3, 7.EE.4a, 7.RP)

### Lessons

1. **Solving one step equations +, -, x, ÷ (650Q)**
   - a) Each lesson needs to include integer, fraction, and decimal examples
   - b) Include discussion of solution verification
   - c) \( ax = c \)
   - d) \( a - x = c \)
   - e) \( a + x = c \)
   - f) \( \frac{a}{b}x = c \)
   - g) \( \frac{x}{a} = c \)

2. **Solving multi-step equations (690Q)**
   - a) Each lesson needs to include integer, fraction, and decimal examples
   - b) 2-step
   - c) Variable on both sides/combining like terms
   - d) Distribution
   - e) Include discussion of solution verification

3. **Applications of linear equations (800Q)**

4. **Percent applications (820Q - 900Q)**

### Sample Problems for College Readiness

- **Pretest**
- **Posttest**
- **Lessons**

*Sample problems represent the highest necessary level of difficulty*

### One variable – 1 step (include fractions, decimals +/-)

- \( x + 3 = 5 \)
- \(-3x = 6\)
- \( \frac{1}{3}x = 5 \)
- \( \frac{x}{7} = -3 \)
- \( \frac{2}{5}y = \frac{4}{15} \)

### Multi-step (include fractions, decimals +/-)

- \( 2x + 3 = 11 \)
- \( 6a - 4 = 8a - 5 \) (var on both sides)
- \( 6x - (3x + 8) = 16 \) (distribution)
- \( 2(6c + 4) = 5c - 10 \)
- \( 4y - 4 + y + 24 = 6y + 20 - 4y \) (combine like terms)

### Applications of Linear Equations

- The ages of Whitney, Wesley, and Wanda are consecutive integers. The sum of their ages is 108. What are their ages?
- A bus leaves Lexington traveling at 45 mph. An hour later, a second bus leaves the same city traveling at 55 mph in the same direction. In how many hours will the second bus overtake the first bus?
### Extensions for College Algebra

<table>
<thead>
<tr>
<th>Additional Examples with no solution or infinite solutions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>6x – 2(x – 3) = 4(x + 1) + 4</td>
</tr>
<tr>
<td>3(x + 5) = 2(x + 7) + (x + 1)</td>
</tr>
</tbody>
</table>


### Resources

<table>
<thead>
<tr>
<th>Video:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video focusing on multistep equation with fractions, parenthesis. Also focuses on properties that are used in solving: <a href="http://www.wcpss.net/success-series/hs-algebra1/video/algebra1-lesson-1.html?size=success">http://www.wcpss.net/success-series/hs-algebra1/video/algebra1-lesson-1.html?size=success</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Web Resources:</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.lessonplanspage.com/MathConstructAlgebraLinearEquationsReviewBoardGame910.htm">http://www.lessonplanspage.com/MathConstructAlgebraLinearEquationsReviewBoardGame910.htm</a></td>
</tr>
</tbody>
</table>

---

- A 72-inch board is cut into 2 pieces. One piece is 2 inches longer than the other. Find the lengths of the pieces.
- A standard rectangular highway billboard sign has a perimeter of 124 feet. The length is 6 feet more than 3 times the width. Find the dimensions.
- The second angle of a triangular field is three times as large as the first angle. The third angle is 40° greater than the first angle. How large are the angles?

### Percent Applications

- After a 34% reduction, a blouse is on sale for $42.24. What was the original price?
- The price of a gallon of gas rose from $3.10 a gallon to $3.94 a gallon in 6 months. What was the percent increase over this time?
- An investment is made at 6% simple interest for 1 year. It grows to $768.50. How much was originally invested?
## Unit 3: One-Variable Linear Equations and Inequalities
### Section 2: Solving One-Variable Linear Inequalities

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to: solve single variable, single-step and multi-step inequalities involving rational numbers, including compound inequalities, and show solution graphically and in interval and set notation. (6.EE.8, 7.EE.4b)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Graphical representation of inequality vs. equation (on the number line) (690Q)  
|           | a. Include explanation of open circle vs. closed circle  
|           | b. Interval notation, set notation to be discussed  
|           | c. Clearly explain infinity symbol (∞)  
|           | d. Introduce idea that this is a solution (solution set) to an equation |
|           | ![Graphical representation of inequality vs. equation](image) |
|           | 2. Solve a linear inequality – express answer in interval and set notation and by graphing (690Q)  
|           | a. (single- and multi-step)  
|           | b. Special emphasis on multiplying/dividing by a negative |
| Sample Problems for College Readiness | • Solve, graph on a number line  
|           | o \(-2x < 10\)  
|           | o \(8y - 5 > 17 - 5y\)  
|           | o \(\frac{y}{5} + 1 < \frac{2}{5}\)  
|           | o \(8(2x + 1) > 4(7x + 7)\)  
|           | o \(2.1x + 45.2 > 3.2 - 8.4x\)  
|           | o \(5(x + 3) + 9 \leq 3(x - 2) + 6\)  
|           | • Applications  
|           | o Your quiz grades are 73, 75, 89, and 91. Determine what scores on the last 2 quizzes will allow you to get an average quiz grade of at least 85.  
|           | o A parking garage offers two payment options: a $20 flat fee for the whole day, or $5 plus $2 per hour for each hour or part thereof that a customer parks. Under what circumstances is the flat fee the better option?  
|           | o A person weighing 200 lb. volunteers for a clinical trial of a new diet pill. If he loses 2.5 lb. per month using the diet pill combined with regular exercise, when will he weigh less than 180 lb.? |
| Extensions for College Algebra | Lesson: Solve compound linear inequalities, graph solutions on a number line, and express in set and interval notation. (690Q)  
|           | • \(2x - 7 > 11\) or \(3x + 1 < 16\)  
|           | • \(5 < 2x + 1 < 13\)  
|           | [http://www.cliffsnotes.com/study_guide/Compound-Inequalities.topicArticleId-38949/articleId-38862.html](http://www.cliffsnotes.com/study_guide/Compound-Inequalities.topicArticleId-38949/articleId-38862.html) |
|--------------------|----------------|------------------------------------------------------------------------------------------------|
|Web Resources:      |                |• Activity: http://illuminations.nctm.org/LessonDetail.aspx?id=L681                           |
|                    |                |• Activity: http://www.microsoft.com/education/lessonplans/lineargraphs.mspx                    |
|                    |                |• Activity: http://alex.state.al.us/lesson_view.php?id=24038                                 |
|                    |                |• Activity: http://shodor.org/succeed-1.0/curriculum/MCN_NEW/lessons/linearInequalities.html |
# Unit 3: One-Variable Linear Equations and Inequalities
## Section 3: Solving Absolute Value Equations

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to solve absolute value equations. (6.NS.7, 7.EE)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Conceptual explanation of absolute value as distance (990Q)  
2. Solve absolute value equations. |
| Sample Problems for College Readiness | Solve.  
• \(|x| = 3\)  
• \(|2x + 3| = 7\)  
• \(|x + 5| - 1 = 15\) |
| *Sample problems represent the highest necessary level of difficulty* | |
| Extensions for College Algebra | Lesson: Solve absolute value inequalities, graph on a number line, and express in interval and set notation (1120Q)  
• \(|x| > 3\)  
• \(|x + 4| - 7 \leq 12\) |
| Resources | Videos  
Web Resources:  
• Lesson: [http://www.purplemath.com/modules/absineq.htm](http://www.purplemath.com/modules/absineq.htm)  
• Examples: [http://whyslopes.com/Analytic-Geometry-Functions/14_absolute_value_equations_and_inequalities.html](http://whyslopes.com/Analytic-Geometry-Functions/14_absolute_value_equations_and_inequalities.html) |
Unit 4: Literal Equations and Lines

In this module, students will solve for a specified variable in a literal equation. Determining the slope/rate of change when given a table of data, a graph or a set of points is also included in this unit. Graphing linear equations when given different scenarios, and finding the equation of a line given the slope and a point, two points, or a point and parallel or perpendicular lines, round out this unit.

4.1 Literal Equations
4.2 Slope and Rate of Change
4.3 Graphing Linear Equations
4.4 Writing Equations of Lines
# Unit 4: Literal Equations and Lines

## Section 1: Literal Equations

### Objective
After completing this section, students will be able to solve for a specified variable, given a literal equation. (A.CED.4, A.REI.1, A.REI.2, A.REI.3)

### Lessons
Given an equation or formula, solve for a specified variable.

### Sample Problems for College Readiness

- **Pretest**
- **Posttest**
- **Lessons**

*Sample problems represent the highest necessary level of difficulty*

- **Solve for C:** \( F = \frac{9}{5}C + 32 \)
- **Solve for b:** \( A = \frac{1}{2} b \cdot h \)
- **Solve for h:** \( P = 2b + 2h \)
- **Solve for y:** \( Ax + By = C \)
- The height of a plant is 5 inches more than twice the number of days since it has been planted. Write an equation that compares the height to the number of days. Then write the equation solving for the number of days.

### Resources

- **Web Resources:**
  - Lesson: [http://alex.state.al.us/lesson_view.php?id=23922](http://alex.state.al.us/lesson_view.php?id=23922)
  - Samples: [http://teachers.henrico.k12.va.us/math/HCPSAlgebra1/module3-2.html](http://teachers.henrico.k12.va.us/math/HCPSAlgebra1/module3-2.html)
### Unit 4: Literal Equations and Lines
#### Section 2: Slope and Rate of Change

**Objective**
After completing this section, students will be able to determine slope/rate of change given any of the following: table (data), graph, a set of points. (7.RP, 8.EE.5, 8.F)

**Lessons**
1. Rate of change – context and data table (810Q)
2. Algebraic description: \( m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x} \) (1140Q)
3. Graphical representation (1080Q)
4. Contextual word problem write slope as a ratio (1140Q)

**Sample Problems for College Readiness**
- Pretest
- Posttest
- Lessons

*Sample problems represent the highest necessary level of difficulty*

- Given the following data in context… determine the rate of change
- Example: (Note: vary x intervals to include numbers that are not patterns. Do not always start at 1)

<table>
<thead>
<tr>
<th>Time</th>
<th>1 sec.</th>
<th>2 sec.</th>
<th>4 sec.</th>
<th>12 sec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>5 ft</td>
<td>10 ft</td>
<td>20 ft</td>
<td>60 ft</td>
</tr>
</tbody>
</table>

Where is “x = 0”?

- Contextual word problem: write slope as ratio
- Given the following graph, find the slope/rate of change, then write the equation of the line.

- Given points on a line (3, -2) and (4, 1), find the slope/rate of change
- Given points on a line (3, -2) and (3, 1), find the slope/rate of change
- Given points on a line (3, -2) and (4, -2), find the slope/rate of change
|--------------|--------------------------------------------------------------------------------------------------|
  - Activity: [Illuminations: Growth Rate](http://standards.nctm.org/document/eexamples/chap6/6.2/index.htm)  
### Unit 4: Literal Equations and Lines
#### Section 3: Graphing Linear Equations

**Objective**
After completing this section, students will be able to graph a line, given points and/or various forms of equations. (7.RP, 8.F.3, 8.F.4)

**Lessons**

1. Given 2 points, graph the line containing the points on a Cartesian coordinate system (930Q)
2. Given an equation, graph the line on a Cartesian coordinate system by generating points (930Q)
3. Given the slope and 1 point on a line, graph the line on a Cartesian coordinate system (include 0 and undefined slopes) (930Q)
4. Given $y = mx + b$, graph the line on a Cartesian coordinate system using slope and y-intercept (930Q).
5. Given $Ax + By = C$, solve in slope-intercept form and graph the line on a Cartesian coordinate system using slope and y-intercept. (930Q)
6. Given $Ax + By = C$, find the x and y-intercepts. (1000Q)
7. Contextual problems with points embedded in wording. Graph, labeling axes appropriately.

**Sample Problems for College Readiness**

- **Pretest**
- **Posttest**
- **Lessons**

*Sample problems represent the highest necessary level of difficulty*

- Graph the line containing points $(2, 1)$ and $(-2, -2)$.
- Generate points and graph the line $y = -3x + 1$.
- Generate points and graph $f(x) = -1/2x + 2$.
- Graph the line with slope $\frac{-2}{3}$ that passes through point $(2, -1)$.
- Graph the line with a slope of 0 that passes through point $(3, 3)$.
- Graph the line with undefined slope that passes through $(1, 1)$.
- Find the slope and y-intercept of the line with equation $y = -2x - 1$.
- Then graph the line.
- Write the line $4x - 2y = 4$ in slope-intercept form and graph the line.
- Given $6x + y = 6$, find the x and y-intercepts.
- What is the x-coordinate of the point where the line $2x + 3y + 7 = 0$ intersects the x-axis?
- Verify each of the above by choosing a 3rd point on the line.
- Also provide contextual problems with points embedded in wording. Graph, labeling axes appropriately.

**Examples of lines to graph:**
- $y = 3x + 4$
- $2x - 3y = 6$
- $x = -4$
- $y = 3$
- Line through $(-1, 2)$ with slope $-1/3$
- $y = \frac{1}{4}x + 2$
- $f(x) = 3x - 5$
### Extensions for College Algebra

<table>
<thead>
<tr>
<th>Lesson: Graphing linear inequalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Graph: $2x - 3y &gt; 6$</td>
</tr>
<tr>
<td>• $x \geq -2$</td>
</tr>
</tbody>
</table>


http://www.math.com/school/subject2/lessons/S2U4L3GL.html#sm1

### Resources

<table>
<thead>
<tr>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanatory video:</td>
</tr>
<tr>
<td><a href="http://khanexercises.appspot.com/video?v=rgvysb9emcQ">http://khanexercises.appspot.com/video?v=rgvysb9emcQ</a></td>
</tr>
</tbody>
</table>

**Web Resources**

- Activity: http://www.intime.uni.edu/lessons/015mohs/default.htm
- Activity: http://www.microsoft.com/education/lessonplans/linearequations.mspx
- Activity: http://teachers.net/lessons/posts/4193.html
## Unit 4: Literal Equations and Lines
### Section 4: Writing Equations of Lines

**Objective**

After completing this section, students will be able to find the equation of a line given the slope and 1 point, 2 points, or a point and parallel or perpendicular line, and write a linear equation in function notation. 

(F.LE.2, 8.EE.6, 8.F.4, G.GPE.5, F.IF.1, F.IF.2)

**Lessons**

1. Find the slope and a point on the line
   a. Given a graph (1140Q)
   b. Given a data table (1140Q)
   c. Given 2 points (1140Q)
   d. Given the x- and y-intercepts (1140Q)
   e. Given a parallel linear equation and a point (1140Q)
   f. Given a perpendicular linear equation and a point (1140Q)
   g. Given 2 points (a, c) and (a, d) (undefined slope) (1140Q)
   h. Given 2 points (a, b) and (d, b) (1140Q)
2. Do all of the above, asking to find the equation of a line using 
   \( y = mx + b \) or \( y - y_1 = m(x - x_1) \) (1140Q)
3. Write a linear equation using function notation.

**Sample Problems for College Readiness**

- Pretest
- Posttest
- Lessons

*Sample problems represent the highest necessary level of difficulty*

Find the equation of a line
- That contains (4, 2) and has slope -3
- That passes through (-1, 2) and (1, 6)
- That passes through (2, -3) with slope 0
- That passes through (0, 7) and is parallel to \( y = -2x + 5 \)
- That passes through (2, 3) and (2, 5)
- That passes through (5, -1) and is perpendicular to \( y = -3x + 1 \)

Determine whether the graphs of the equations are parallel, perpendicular, or neither.
- \( y = 2x + 7 \)
  \( 5y + 10x = 20 \)
- \( 2x - 5y = -3 \)
  \( 10x + 4y = 21 \)
- \( 2x - y = -9 \)
  \( 2x - 6y = -2 \)

Given \( f(x) = 4x + 2 \), evaluate
- \( f(2) \)
- \( f(-8) \)

**Application**

1. When the brakes on a train are applied, the speed of the train decreases by the same amount every second. Two seconds after applying the brakes, the train's speed is 88 mph. After 4
seconds, its speed is 60 mph.

a. Write an equation relating the speed $s$ of the train and the time elapsed $t$ seconds after applying the brakes.

b. Graph the equation found in part a.

c. What was the speed of the train when the brakes were first applied?

d. At what rate is the train slowing down?

4. Application example:
For cable television, a homeowner pays $30 per month plus $5 for each pay-per-view movie ordered.

a. Express as an equation the relationship between the monthly bill $B$ and the number $n$ of pay-per-view movies.

b. Draw the graph of this equation in Quadrant I of a coordinate plane

c. Compute the slope of this graph. In terms of the cable TV bill, explain the significance of the slope.

d. In terms of the cable TV bill, explain the significance of the $B$-intercept of the graph.

e. From the graph in part b, estimate what the cable bill would be if the homeowner had ordered 15 pay-per-view movies that month.

<table>
<thead>
<tr>
<th>Extensions for College Algebra</th>
<th>Given $f(x) = 2x - 3$, evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$f(a)$</td>
</tr>
<tr>
<td></td>
<td>$f(a + 1)$</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Resources</th>
<th>Videos:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>g. Algebra I classroom videos from Cary HS in NC. She does a great job of explaining writing an equation from a real world problem situation: <a href="http://www.wcpss.net/success-series/hs-algebra1/video/algebra1-lesson-8.html?size=succes">http://www.wcpss.net/success-series/hs-algebra1/video/algebra1-lesson-8.html?size=succes</a></td>
</tr>
<tr>
<td></td>
<td>h. Lesson: <a href="http://enlvm.usu.edu/ma/classes/__shared/emready@eqns_lines/info/lessonplan.html">http://enlvm.usu.edu/ma/classes/__shared/emready@eqns_lines/info/lessonplan.html</a></td>
</tr>
</tbody>
</table>
Unit 5: Quadratic Equations

The concepts contained in this unit require students to identify the parts of a parabola from a graph and to solve quadratics by factoring, using the quadratic formula and by graphing.

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this unit, students will be able to identify the parts of a parabola from a graph (ax² + bx + c = 0), solve quadratic equations, write and evaluate quadratic equations using function notation, and find the domain and range of a quadratic graph. (F.IF, A.REI.4, A.SSE.3)</th>
</tr>
</thead>
</table>
| Lessons | 1. Identify the parts of a parabola from a graph (ax² + bx + c = 0) (vertex, axis of symmetry, intercepts, domain, and range) (1150Q)  
2. Solve quadratics by factoring (1200Q)  
3. Solve quadratics using the quadratic formula (1200Q)  
4. Solve quadratics by graphing (1150Q)  
5. Evaluate quadratic equations using function notation (1180Q)  
6. Finding the domain and range of a quadratic graph (1150Q) |
| Sample Problems for College Readiness |  
- From a graph, identify vertex, axis of symmetry, intercepts, domain, and range  
- Solve x² – 2x – 8 = 0 by graphing (calculator)  
- Solve x² – 2x – 8 = 0 by factoring  
- Solve (x + 1)(x + 3) = 15 by factoring [note: may have to write in standard form first.]  
- Solve 3x² – 2x – 8 = 0 by quadratic formula  
- Solve x² – 20 = 0  
- Given f(x) = 3x² – x – 2, find f(-1)  
- Identify the intercepts of the equation f(x) = x² – 4x – 5. |
| Extensions for College Algebra | Lesson: Applications of quadratics  
- In ping-pong, the length of the top of the ping-pong table is 1 ft less than twice the width. The area of the ping-pong table is 36 ft². Find the length and width of the top of the table.  
- An object is thrown upward from the top of a 200-foot cliff with a velocity of 12 feet per second. The height h of the object after t seconds is \( h = -16t^2 + 12t + 200 \). How long after the object is thrown will it strike the ground? Round to the nearest tenth of a second. |

Web Resources:  
- Lessons: [http://www.hippocampus.org/?select-browse-topics-sequential](http://www.hippocampus.org/?select-browse-topics-sequential)  
Unit 6: Systems of Equations

Solving systems of equations, including word problems and applications, by three different methods are contained in this unit. The three methods are graphing, elimination and substitution with matrices as an option for teachers.

Unit 6: Systems of Equations

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this unit, students will be able to solve systems of equations by graphing, elimination, and substitution. (8.EE.8, A.REI.5, A.REI.6) (A.REI.7 and A.REI.8 are optional)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Solving systems by graphing (900Q)  
2. Solving systems by elimination (990Q)  
3. Solving systems by substitution (990Q)  
4. Include word problems and applications (990Q)  
5. Matrices are optional (1100Q) |
| Sample Problems for College Readiness | • Solve by graphing:  
y = x + 1  
x + y = -3  
• Solve using substitution:  
5x – 3y = 5  
2x – y = 1  
• Solve by elimination:  
3x + 2y = 9  
-2x + 3y = -19  
• Solve using any convenient method:  
4x + y = -3  
-4x + 6y = 11  
8x + 2y = -6  
6x – 9y = 5  
• *matrices – optional for teacher |
| *Sample problems represent the highest necessary level of difficulty | Application examples: (many can be 1 or 2 variables)  
• An appliance store sells a washer-dryer combination for $1500. If the washer costs $200 more than the dryer, find the cost of each appliance.  
• A particular computer takes 43 nanoseconds to carry out 5 sums and 7 products. It takes 36 nanoseconds to carry out 4 sums and 6 products. How long does the computer take to carry out one sum? To carry out one product?  
• To enter a zoo, adult visitors must pay $5, whereas children and seniors pay only half price. On one day, the zoo collected a total of $765. If the zoo had 223 visitors that day, how many half-price admissions and how many full-price admissions did the zoo collect?  
• Two angles are supplementary if the sum of their measures is 180°. If one angle’s measure is 90° more than twice the measure of the other angle, what are the measures of the angles?  
• A hospital needs 30 L of a 10% solution of disinfectant. How many liters of a 20% solution and a 4% solution should be mixed to
obtain this 10% solution?

- A student took out two loans totaling $5000. She borrowed the maximum amount she could at 6% and the remainder at 7% interest per year. At the end of the first year, she owed $310 in interest. How much was loaned at each rate?

### Resources

**Videos:**
- Optional Matrix concepts: Great explanation of matrix concepts. While it does not focus on using matrices to solve systems of equations, it provides a basic knowledgebase about matrices in general that can set up an understanding of what a matrix is: [http://www.wcpss.net/success-series/hs-algebra1/video/algebra1-lesson-32.html?size=success](http://www.wcpss.net/success-series/hs-algebra1/video/algebra1-lesson-32.html?size=success)

**Web Resources:**
- Activity: [http://alex.state.al.us/lesson_view.php?id=24046](http://alex.state.al.us/lesson_view.php?id=24046)
Unit 7: Geometry

Geometry concepts contained in this unit are area and perimeter of regular, irregular and composite figures and solving for unknowns in right triangles by using the Pythagorean Theorem.

Unit 7: Geometry

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this unit, students will be able to find area and perimeter of regular and irregular figures with applications attending to units, use similar triangles, solve for missing sides of a right triangle using the Pythagorean Theorem, and apply the Pythagorean Theorem to solve contextual problems. (7.G.6, 8.G.7, 8.G.8)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Find the area of a regular, irregular, or composite geometric figure (1040Q)  
2. Find the perimeter of a regular, irregular, or composite geometric figure (400Q – 1000Q)  
3. Units are important (m vs. m²)  
4. Applications (400Q – 1000Q)  
5. Multi-step application problems  
6. Apply a scale factor to the dimensions of standard geometric figures and determine how it will impact the area and perimeter (1000Q)  
7. Find missing side of rt. Triangle (1050Q)  
8. Apply theorem to contextual problems (1050Q) |
| Sample Problems for College Readiness | Use the figure on the right to find each of the following.  
1. Find the perimeter of the figure on the right.  
2. Find the area.  
3. If we double the lengths of the sides of a square, how is the area changed?  
4. Find the value of c in the figure below.  
5. Find the distance across the pond in the figure to the right.  
6. The radius of a circular target is 10 inches. The bull's eye in the center of the target has a radius of 2 inches. If a dart is thrown randomly and hits the target, what is the probability that the dart will hit the bull's eye? |

*Sample problems represent the highest necessary level of difficulty

May 18, 2011 Final
7. Given that $\angle P \cong \angle S$ and $\angle R \cong \angle V$ and $\angle Q \cong \angle T$, find the values of $x$ and $y$.

![Diagram](image)

<table>
<thead>
<tr>
<th>Resources</th>
<th>Videos:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teachertube videos on Pythagorean Theorem: <a href="http://www.teachertube.com/googleSearch.php?q=pythagorean+theorem&amp;cx=012339422634307447803%3Ah-vlw-wg9yy&amp;cof=FORID%3A11&amp;ie=UTF-8#0">link</a></td>
</tr>
<tr>
<td></td>
<td>Video about finding area using algebraic equations: <a href="http://www.wcpss.net/success-series/hs-algebra1/video/algebra1-lesson-33.1.mov">link</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Web Resources:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lessons: <a href="http://www.mathsisfun.com/geometry/index.html">link</a></td>
</tr>
<tr>
<td>Games and Activities: <a href="http://www.pbs.org/search/search_results.html?q=geometry">link</a></td>
</tr>
<tr>
<td>Lessons: <a href="http://www.insidemathematics.org/index.php/tools-for-teachers/algebraic-properties-a-representations">link</a> Expressions Task</td>
</tr>
<tr>
<td>Right triangle proportional lengths: <a href="http://www.wcpss.net/success-series/hs-geometry/video/geometry-lesson-14.html?size=success">link</a></td>
</tr>
<tr>
<td>Manipulatives: <a href="http://nlvm.usu.edu/en/nav/category_g_4_t_3.html">link</a></td>
</tr>
</tbody>
</table>
Unit 8: Supplementary Materials for College Algebra

This unit contains sections that should be included in the College Algebra Preparation Course, but not necessarily the course for College Readiness.

8.1 Rational Functions and Equations
8.2 Radical Functions and Equations
### Unit 8: Supplementary Materials for College Algebra

#### Section 1: Rational Functions and Equations

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to evaluate rational functions, find the domain, and solve rational equations, checking for extraneous solutions. (A.REI.2)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Find the domain for rational functions (1380Q)  
2. Evaluate rational functions (1180Q)  
3. Solve rational equations, checking for extraneous solutions. (1330Q) |
| Sample Problems for College Algebra |  
| Pretest |  
| Posttest |  
| Lessons |  
| *Sample problems represent the highest necessary level of difficulty* |
| Sample Problems |  
- Given $f(x) = \frac{x^2-1}{x+1}$,  
  - Find the domain of $f(x)$  
  - Evaluate $f(-3)$  
- Given $f(x) = \frac{x^2-2x-3}{x+1}$  
  - Find the domain of $f(x)$  
  - Evaluate $f(1)$  
- Solve, checking for extraneous solutions.  
  - $\frac{1}{x-3} = \frac{5}{7}$  
  - $\frac{2x}{2x-1} + \frac{1}{x} = \frac{1}{2x-1}$  
  - $\frac{6}{p} = \frac{1}{p-5} - \frac{p+4}{p^2-5p}$ |
| Resources | Videos  
- [http://www.youtube.com/watch?v=ItA_hhRtUuw](http://www.youtube.com/watch?v=ItA_hhRtUuw)  
- [http://virtualnerd.com/embed/vid.php?id=Alg1_8_2_1&size=medium](http://virtualnerd.com/embed/vid.php?id=Alg1_8_2_1&size=medium)  
- [http://www.youtube.com/watch?v=Y6x06SBbEcA](http://www.youtube.com/watch?v=Y6x06SBbEcA)  
Resources  
- [http://www.purplemath.com/modules/rtnldefs.htm](http://www.purplemath.com/modules/rtnldefs.htm)  
- [http://www.kutasoftware.com/freeia2.html](http://www.kutasoftware.com/freeia2.html)  
- [http://www.purplemath.com/modules/solvrtnl.htm](http://www.purplemath.com/modules/solvrtnl.htm)  
# Unit 8: Supplementary Materials for College Algebra

## Section 2: Radical Functions and Equations

<table>
<thead>
<tr>
<th>Objective</th>
<th>After completing this section, students will be able to evaluate radical functions, find the domain, and solve radical equations. (A.REI.2)</th>
</tr>
</thead>
</table>
| Lessons   | 1. Find the domain for radical functions (1250Q)  
2. Evaluate radical functions (1250Q)  
3. Solve radical equations. (1380Q) |
| Sample Problems for College Readiness | - Given $f(x) = \sqrt{x - 4}$  
  - Find the domain  
  - Evaluate $f(29)$  
- Solve  
  - $\sqrt{2x - 3} - 2 = 1$ |
| Resources | Lessons/Practice  
- [http://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut39_simrad.htm](http://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut39_simrad.htm)  
Video  
College and Career Readiness in Kentucky

Kentucky believes that, as the nature of work and the types of careers change, all students will need higher-level skills to meet their career goals. The expected outcome of addressing the readiness issues in this manner is that more students will reach higher levels of proficiency and more students will be college and career ready.

What is Kentucky’s definition of college readiness?
College readiness is the level of preparation a first-time student needs in order to succeed in a credit-bearing course at a postsecondary institution. “Succeed” is defined as completing entry-level courses at a level of understanding and proficiency that prepares the student for subsequent courses. Kentucky’s systemwide standards of readiness guarantee students access to credit-bearing coursework without the need for developmental education or supplemental courses. Developmental education courses do not award credit for a degree.

What is Kentucky’s definition of career readiness?
Career readiness is the level of preparation a high school graduate needs in order to proceed to the next step in a chosen career, whether that is postsecondary coursework, industry certification, or entry into the workforce. According to the Association of Career and Technical Education (ACTE), career readiness includes core academic skills and the ability to apply those skills to concrete situations in order to function in the workplace and in routine daily activities; employability skills that are essential in any career area such as critical thinking and responsibility; and technical, job-specific skills related to a specific career pathway.

What are the standards of readiness?
Most definitions of college readiness include some predictive statement about how well students will do in relevant college courses based on national assessments, such as the ACT or SAT. For example, ACT sets benchmark scores for college readiness based on success in college courses that would count toward a degree. “Success” is defined by ACT as 50% or higher probability of earning a B or higher in the corresponding college course or courses and 75% or higher probability of earning a C or higher in the corresponding college course or courses.

What ACT scores determine college readiness for Kentucky students?
The Kentucky systemwide standards of college readiness are ACT scores of 18 for English, a score of 20 for reading, and a mathematics score of 19 for some introductory courses in mathematics (often statistics or an applied mathematics course), a 22 for college algebra, and a 27 for calculus. The Kentucky systemwide standards of readiness guarantee students access to credit-bearing coursework without the need for developmental education or supplemental courses. SAT equivalent scores may also be used.
Why does Kentucky have three college readiness standards for mathematics?
A three-tiered approach to mathematics was used to establish mathematics readiness levels for various fields of study. For example, a survey of Kentucky institutions found that most majors in the liberal arts and social sciences fields do not require college algebra. A readiness score for mathematics courses for these majors was investigated and subsequently established based on student performance in the liberal arts mathematics courses required for these students. Typically, one-half of all graduates were in liberal arts or social sciences fields. The ACT score of 22 for college algebra reflects both Kentucky and national success data. The third tier for calculus readiness is typically listed as a course prerequisite. Prior to establishing a calculus readiness level, each Kentucky institution established its own ACT prerequisite. The calculus readiness score reflects a level of readiness that would guarantee placement in an entry level calculus course at any Kentucky institution.

What happens if a student does not meet the college readiness standards in any area?
Kentucky students not meeting readiness benchmarks can demonstrate needed competency levels through placement testing recognized by all Kentucky public colleges and universities.