



South Carolina
Department of Education

Good Morning! Please sign-in and get 1 of each handout off the table by the door.

*Digging Deep into the Major
Work of 8th Grade Math*

Janel Johnson

April 2, 2014

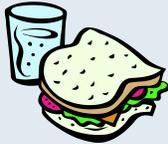


Logistics



Questions

- Raise your hand and ask questions during the session.
- Parking Lot – questions not directly related to the session



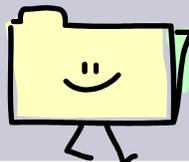
Breaks

- Morning Break and Afternoon Break (10 min each)
- Lunch (30 min)



Technology

- Feel free to take notes on your computer or tablet
- Cell phones on silent



Session Materials

- Located in center of table
- Will be posted on SCDE website and Edmodo Group

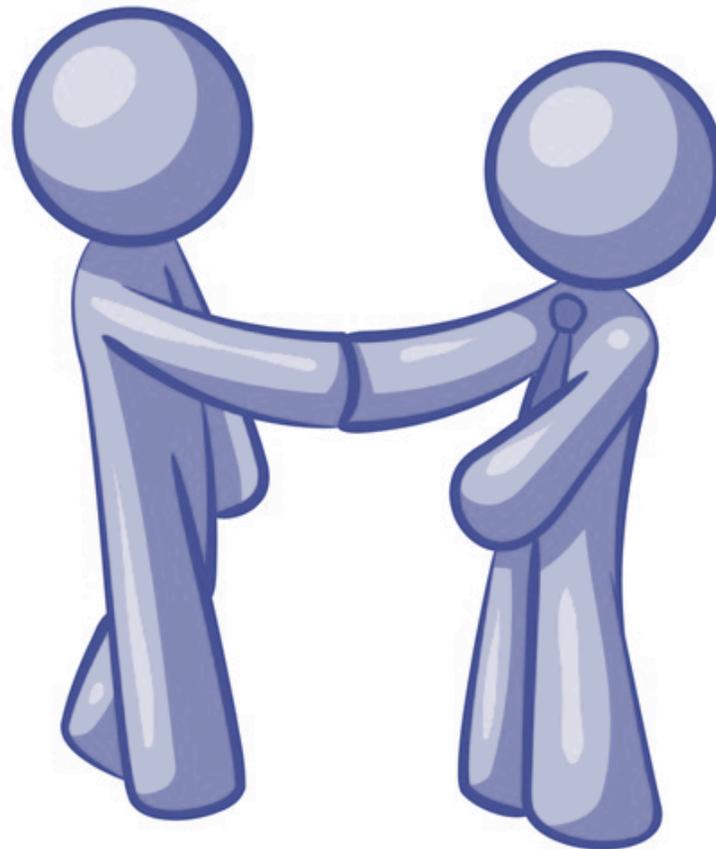


Introductions

Good Morning!
My name is...

My favorite math
concept is...

I teach (grade
level) at (school)
in (district).



Today I hope to...



Norms

- Listen as an Ally
- Value Differences
- Maintain Professionalism
- Actively Participate



Agenda

- **Overview of CCSS for Math**
- **Critical Areas**
 - Functions
 - The Number System
 - Expression and Equations
 - Statistics and Probability
 - Geometry

Critical Areas

- Learning Expectations
- Prior Knowledge
- Connections to Future Learning
- Task/Activity



Agenda (continued)

- Student Misconceptions and Teaching Strategies
- Reflection
- Closing



Objectives

- **IDENTIFY** the critical areas
- **DESCRIBE** the connections concepts have to prior and future courses
- **PRACTICE** tasks and activities aligned to each domain
- **ANALYZE** standards to determine student misconceptions and generate teaching strategies to address them



Mathematical Shifts

Focus

Focus strongly where the standards focus

Coherence

Think across grades, and link to major topics

Rigor

In major topics, pursue conceptual understanding,
procedural skill and fluency, and application



Types of Standards

Standards for Mathematical Content

- Skills and understandings students will learn
- Identified by grade level or course

Standards for Mathematical Practice

- Processes and proficiencies that students show when engaged in mathematics
- Identified for students across all grade levels (K–12)

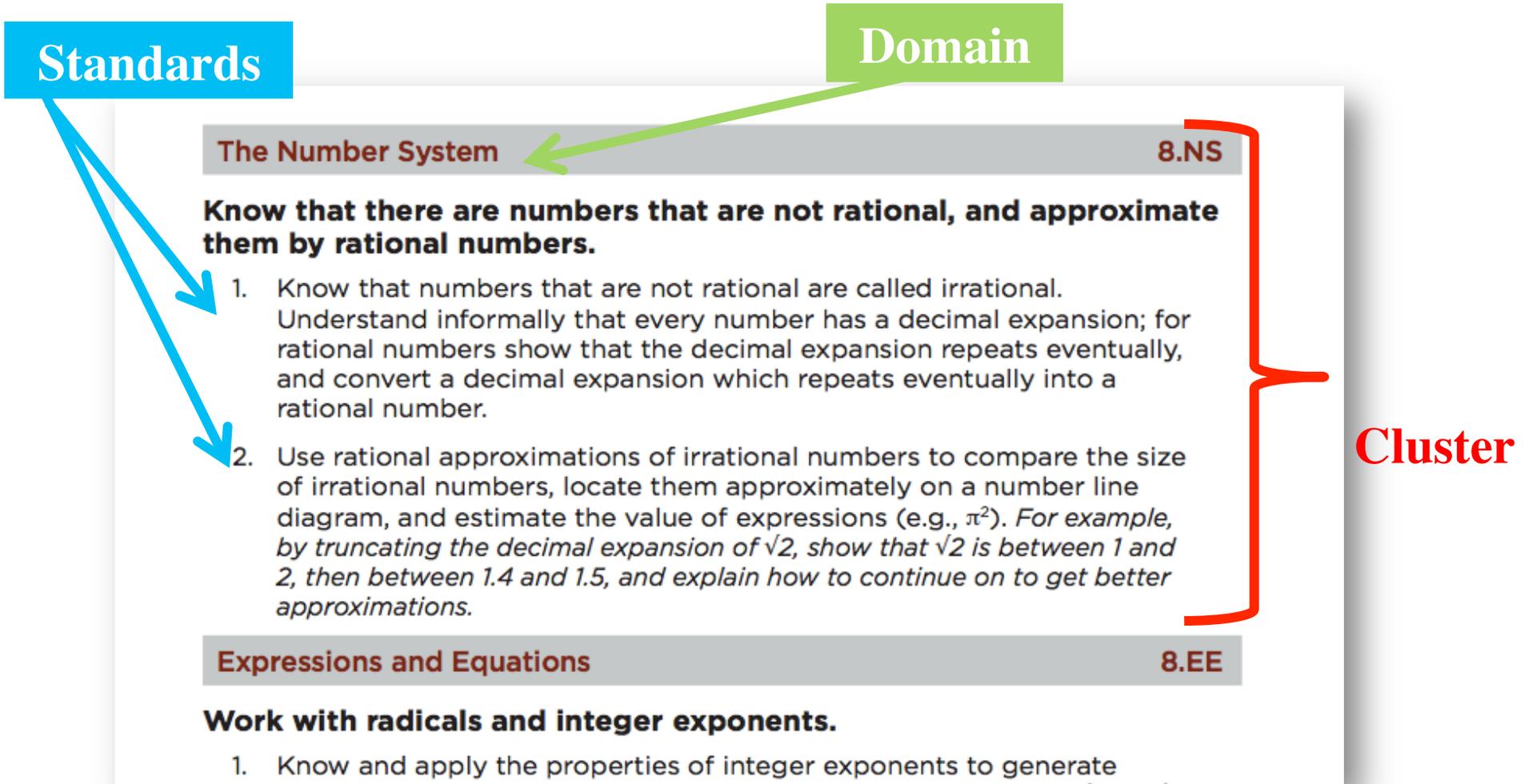


What? vs. How?

While the Content Standards describe what mathematics students should be able to **understand** and **do**, the Mathematical Practices describe **how** students should **engage** with these mathematical concepts and skills.



Structure of the Standards





Critical Areas

COMMON CORE STATE STANDARDS for MATHEMATICS

Mathematics | Grade 8

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

(1) Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y = mx + b$),

Critical
Areas



Critical Areas

In Grade 8, instructional time should focus on three critical areas:

- (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations;
- (2) grasping the concept of a function and using functions to describe quantitative relationships; and
- (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.



Grades 6-8 Domains

6 th Grade	7 th Grade	8 th Grade
Ratios and Proportional Relationships		Functions
Expressions and Equations		
The Number System		
Statistics and Probability		
Geometry		



Expressions and Equations

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations	8.EE.5 8.EE.6	Equation Proportional relationship Slope Unit rate Rate of change Linear relationship Y-intercept	<ul style="list-style-type: none">• Represent linear relationship as an equation and as a graph.• Compare two equations or graphs.• Determine what the slope tells about a linear relationship.• Analyze how changing the slope in the equation changes the graph of that equation, and vice-versa.



Expressions and Equations

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations	8.EE.7 8.EE.8	Equation Proportional relationship Unit rate Rate of change Slope Linear relationship Y-intercept System of equations <ul style="list-style-type: none"> • Substitution method • Elimination method • Graphing method All real solutions Intersection point	<ul style="list-style-type: none"> • Solve linear equations for one variable, numerically or in terms of another variable. • Solve systems of linear equations using graphing, elimination, and/or substitution. • Identify the solution to a system of linear equations as the intersection point of the graphs of those equations. • Recognize when a linear equation has one solution, no solutions, or infinite solutions. • Derive the equation of a line given either 2 points or a point and the slope.



Expressions and Equations

What do students need to learn prior to these concepts?

- Identify and calculate slope
- Identify y-intercept
- Create graphs given data
- Analyze graphs
- Make predictions given a graph
- Understand proportional relationships and reasoning
- Perform operations with rational numbers

How do these concepts support learning in later grades?



Cell Phone Plans Task

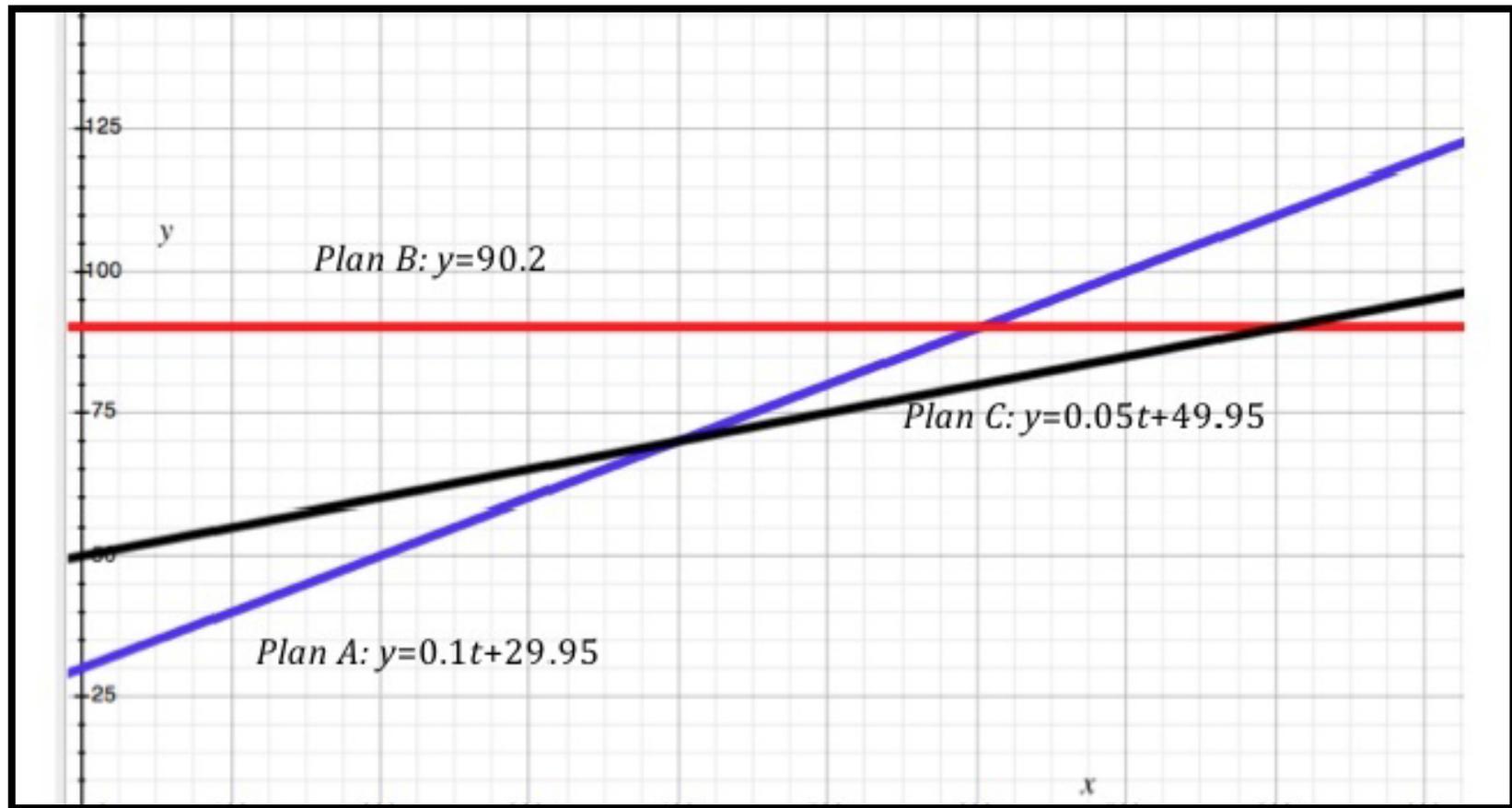
1. Read the task independently.
2. Talk with your partner about a strategy to solve the task.
3. Solve the task with your partner.
4. Compare your strategy and answer with another pair.



Photo: microsoft.com



Cell Phone Plans Task





Functions

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Grasping the concept of a function and using functions to describe quantitative relationships	8.F.1 8.F.2 8.F.3	Function <ul style="list-style-type: none">• Input/output Slope Y-intercept Linear/nonlinear Ordered pair	<ul style="list-style-type: none">• Work with graphs and formulae representing real-world situations.• Determine the equation of a linear function given one point on its graph and the initial value or y-intercept.• Determine if a function is linear or nonlinear based on its equation, graph, table of values, or verbal description.



Functions

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Grasping the concept of a function and using functions to describe quantitative relationships	8.F.4 8.F.5	Function <ul style="list-style-type: none">• Input/output Slope Y-intercept Linear/nonlinear Ordered pair	<ul style="list-style-type: none">• Represent a function as an equation, graph, table of values, or a verbal description.• Move fluently from one representation to another.• Determine the equation of a linear function given two points on its graph.• Determine the equation of a linear function given one point on its graph and the initial value or y-intercept.• Determine if a function is linear or nonlinear based on its equation, graph, table of values, or verbal description.



Functions

What do students need to learn prior to these concepts?

- Write an algebraic expression, equation, and/or inequality using two variables
- Graph points on a Cartesian plane
- Evaluate algebraic expressions
- Simplify algebraic expressions
- Understand unit rate, or slope, as the rate of change in a linear relationship

How do these concepts support learning in later grades?



Distance-Time Graphs Activity

1. In your group, match each graph and story.
2. Take turns at matching pairs of cards.
 - Each time you do this, explain your thinking clearly and carefully. If you think there is no suitable card that matches, write one of your own.
3. Match each graph and story with the correct table. Record your answers.



Distance-Time Graphs Activity

Graph	Story	Table
A	5	W
B	10	S
C	4	V
D	2	Q
E	6	T
F	3	
G	1	P
H	8	R
I	7	U
J	9	X



BREAK – 10 minutes



Photo: java-demos.blogspot.com



The Number System

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
	8.NS.1 8.NS.2	Rational numbers Irrational numbers Approximation/estimation Absolute value Number line Decimal expansion	<ul style="list-style-type: none">• Identify and define rational and irrational numbers.• Express every number in decimal expression and understand that for rational numbers the decimal expression eventually repeats.• Convert a decimal expression that eventually repeats into a rational number.• Estimate the size of irrational numbers and locate the estimate on a number line diagram.



The Number System

What do students need to learn prior to these concepts?

- Understand a rational number as a point on the number line
- Understand ordering and absolute value of rational numbers
- Convert a rational number to a decimal
- Know that the decimal form of a rational number terminates in 0s or eventually repeats.

How do these concepts support learning in later grades?



Rational and Irrational Numbers Activity

1. In your group, decide whether the number is rational or irrational and where it fits on your chart.
2. Be sure you are able to justify your answer.



Lunch – 30 minutes



Photo: 123rf.com



Statistics and Probability

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations	8.SP.1 8.SP.2 8.SP.3 8.SP.4	Bivariate data Two-way table Scatter plot Slope Association (positive, negative, linear, nonlinear) Line of best fit Clustering Outlier Frequencies Intercept	<ul style="list-style-type: none"> • Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. • Find line of best fit for scatter plots that suggest linear association. • Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. • Display frequencies and relative frequencies in a two-way table. Use relative frequencies calculated for rows or columns to describe possible association between two variables.



Statistics and Probability

What do students need to learn prior to these concepts?

- Identify and calculate slope
- Identify the y-intercept
- Create graphs using given data
- Analyze graphs
- Make predictions from a graph

How do these concepts support learning in later grades?



Using and Interpreting Linear Models

- Read the lesson “8.SP.A.3 Lesson Using and Interpreting Linear Models”.
- Note any questions that you have as you read through the lesson.
- Determine what modifications, if any, that you would make to the lesson.



BREAK – 10 minutes

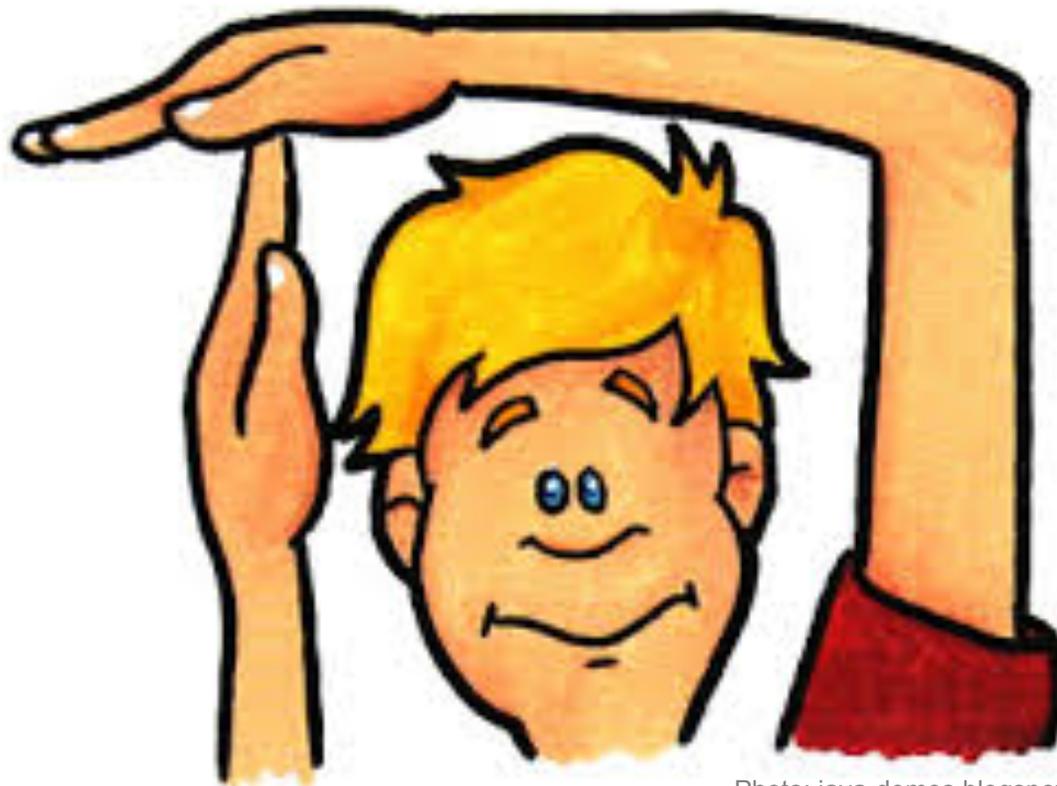


Photo: java-demos.blogspot.com



Geometry

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean theorem	8.G.1 8.G.2 8.G.3 8.G.4 8.G.5	Supplementary Complementary Congruent Vertical Angles Adjacent Angles Similar Reflections Rotations Translations Dilations Transversal	<ul style="list-style-type: none"> • Demonstrate the properties of rotations, reflections and translations. • Demonstrate the congruence of figures through the use of rotations, reflections and translations. • Use coordinates to describe the effects of translations, rotations, and reflections of two-dimensional figures. • Demonstrate the similarity of two figures through the use of rotations, reflections, and translations. • Determine the similarity of triangles using angle-angle criteria.



Geometry

Critical Area	Standards	Concepts (What do students need to know?)	Skills and Procedures (What do students need to be able to do?)
Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean theorem	8.G.6 8.G.7 8.G.8	Right Triangle Hypotenuse Pythagorean Theorem	<ul style="list-style-type: none">• Demonstrate a proof using the Pythagorean Theorem.• Apply the Pythagorean Theorem to real-world problems.• Use the Pythagorean Theorem to find the distance between two points in a coordinate system.



Geometry

What do students need to learn prior to these concepts?

- Plot points on the coordinate plane
- Supplementary, complementary, vertical and adjacent angles
- Angle sum and exterior angles of triangles
- Identify angles formed when parallel lines are cut by transversals
- Characteristics of 2-D and 3-D shapes
- Perform operations with rational numbers
- Find square roots of numbers
- Proportional reasoning

How do these concepts support learning in later grades?



Curb Appeal Task

1. Design two identical, right triangular flowerbeds to flank the edge of the driveway, as shown in the diagram.
2. The driveway measures 35 feet by 10 feet.
3. You are being supplied with 50 feet of edging material for two right triangular beds.
4. The total area of the flowerbeds should not be more than 50 square feet of yard space.
5. Design a blueprint for this project and provide an explanation for the reason for your choice of design.



Student Misconceptions and Teaching Strategies

Numbered Heads

- We are going to make 5 groups

Groups

- 1 – Functions
- 2 – The Number System
- 3 – Expressions and Equations
- 4 – Geometry
- 5 – Statistics and Probability



Student Misconceptions and Teaching Strategies

Analyze the standards in your assigned domain.
Create the chart below for your group's assigned domain.
Post on the wall when finished.

Student Misconceptions

- What are some common misconceptions students have?
- What areas do students struggle?

Teaching Strategies

- List teaching strategies and a brief summary of how to address this misconception.
- List teaching strategies used to address the domain.



Student Misconceptions and Teaching Strategies

1. Grab a few stick notes.
2. Review each chart posted around the room.
3. On your sticky note, record and post any additional student misconceptions and teaching strategies.



Reflection

**How will your knowledge of the
Critical Areas help to inform and
guide your instruction?**





Putting It All Together

The critical areas highlight standards that play an important role in the content at a grade level. They frame important considerations such as time devoted to the standard, amount of student practice, assessment questions, etc.



Suggestions

- Develop long range plans for course content
 - Give focus to the critical areas
- Determine if current instructional materials (unit/lesson plans, books, etc.) meet the demands of CCSS



Objectives

- **IDENTIFY** the critical areas
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Resources

- [Illustrative Mathematics](#)
- [Utah State Office of Education](#)
- [National Council for Teachers of Mathematics](#)
- [SCDE Common Core Support](#)



Questions



Photo: microsoft.com



Certificates of Attendance



- The session evaluation will be sent to you via e-mail.
- Once complete, your certificate will be sent to you via e-mail.



Exit Ticket

List **3** things you learned today.

List **2** things you will take back and use in your school or district.

List **1** thing you need more information about.



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