

# Preparing Students for Success in Algebra and Beyond

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ERNEST MORIAL CONVENTION CENTER

NEW ORLEANS, LA



# Mathematical Practice Standards

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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.

## Content before 2013-14



6th  
Grade



7th  
Grade



8th  
Grade



Algebra 1



Geometry



Algebra 2



6th  
Grade



7th  
Grade



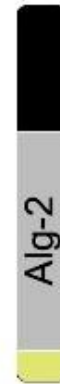
8th  
Grade



Algebra 1



Geometry



Algebra 2

## Current content

Note: The majority of the new content comes from College Algebra (Dual) and Statistics.

# Where are we and how did we get here?

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## Progressions Jigsaw Activity

1. Read your section of the document.
  - What is the focus of your section?
  - What does this mean for students?
  - What does this mean for teachers?
2. Share your section with the rest of your group and discuss its focus and implications.
3. Create a visual that represents the main focus and implications for your grade level.

# Human Graph Activity:

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## Objectives:

TLW graph unit rates.

TLW graph and recognize proportional relationships.

TLW calculate the slope of a line.

TLW graph a linear relationship.

TLW find the solution of a system of equations by graphing.

# Human Graph Activity:

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This activity was created for a 7<sup>th</sup> grade classroom discovering proportional reasoning. It can be adjusted to a 6<sup>th</sup> grade level, as well as extended into linear functions and discovering solutions to systems of equations.

Each group will receive a situation and a chart to complete.

Each group will write the coordinates of each point on an index card. They will need to be able to explain what their point means in relation to the situation.

Each group will need to identify the constant in the situation and be able to discuss if the situation is proportional or not.

The group members will stand in the place on the number line.

# Content Standards

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6.RP.3 - Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

7.RP.2 - Recognize and represent proportional relationships between quantities.

7.RP.3 - Use proportional relationships to solve multi-step ratio and percent problems of simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, and percent error.

8.F.4 - Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two  $(x, y)$  values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

# Modeling Proportional Relationships

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A mixture of concrete is made up of sand and cement in a ratio of 5 : 3. How many cubic feet of each are needed to make 160 cubic feet of concrete mix?

Illustrative math

Solve. Model with a tape diagram and a double number line.



# Modeling Proportional Relationships

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Selina bought a shirt on sale that was 20% less than the original price. The original price was \$5 more than the sale price. What was the original price? Explain or show work.

Illustrative math

Solve. Model with a tape diagram and a double number line.

# Differentiated Application

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3 tiered assignments based upon the students' level of understanding

- Level 1 – basic level of understanding.
- Level 2 – A more in-depth approach to the standard with more problem solving.
- Level 3 – A higher approach of understanding of the material through modeling and reasoning.

Students are placed in a particular level based upon the teacher's informal assessment through teaching the material. They can move up or down through the levels depending on their success in their current level.

# Developing mathematical reasoning

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It is through reasoning that students learn how math makes sense!

What exactly is reasoning?

Mathematical reasoning happens through making conjectures, investigating and representing findings, and explaining and justifying conclusions.

## THE PROCESS:

**Conjecturing** involves reasoning about mathematical relationships to develop statements that are tentatively thought to be true but are not known to be true.

**Generalizing** involves identifying commonalities across cases or extending the reasoning beyond the range in which it originated.

**Justification:** A mathematical justification is a logical argument based on already-understood ideas.

A successful justification does more than just show that one statement is true—it explains *why* by describing how it is true in every instance.

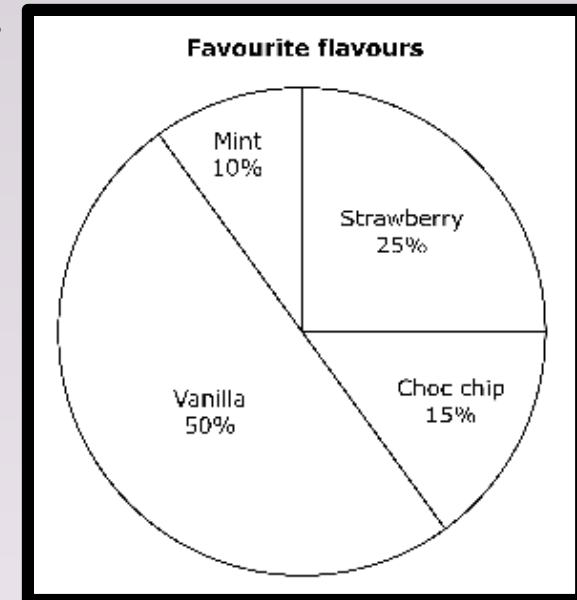
# Ice Cream, You Scream

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You are planning to make and sell ice cream at a school sports event. You expect to make and sell 300 ice cream cones. You buy ice cream in 1 liter tubs. Each tub costs \$2. You can fill ten cones from each tub. Each empty cone costs 5¢. You plan to sell each filled cone for 80¢. Before buying the ice cream, you survey 60 people to find out what flavors they like. Below are the results of the survey.

1. Work out the quantities you need to buy and their costs.
2. How much profit do you expect to make on the day? Show all your reasoning clearly.

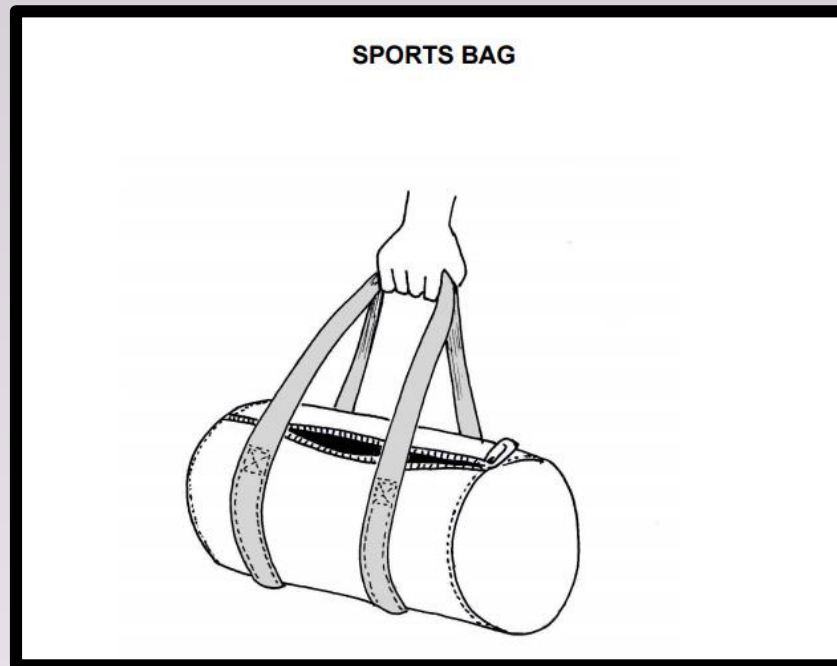
<http://map.mathshell.org/download.php?fileid=1157>



# Supporting Standards with Supporting Standards

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How can the supporting standards be integrated to best facilitate student understanding? (e.g., exploring proportional relationships through similar figures and percents.)



# Welcome to the afternoon.....

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Read the article "Constructive Struggling: the Value of Challenging our Students"

- What issues or challenges does this message raise for you? In what ways do you agree with or disagree with the main points of the message?
- How long do you allow your students to wrestle with a complex problem before you offer increasingly guided assistance? How frequently do you provide such an opportunity?
- How can you determine the right amount of frustration and struggle for any given student on any given task?

# Angles activity

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Look at your group's vocabulary cards.

Create an image that incorporates all of your group's words. Label your image to show the location of each word.

# Task: Angles in Field Hockey

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<https://hcpss.instructure.com/courses/127/files/folder/Unit%203%20Expressions%20and%20Equations?preview=683547>



# Content Standards

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6.EE.2 - Write, read, and evaluate expressions in which letters stand for numbers.

7.EE.4 - Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

8.EE.7 - Solve linear equations in one variable.

8.EE.8 - Analyze and solve pairs of simultaneous linear equations.

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# Modeling with Expressions and Equations

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Solve. Model using an equation, ratio table, graph, tape diagram, double number line.

Task

A water well drilling rig has dug to a height of  $-60$  feet after one full day of continuous use.

1. Assuming the rig drilled at a constant rate, what was the height of the drill after 15 hours?
2. If the rig has been running constantly and is currently at a height of  $-143.6$  feet, for how long has the rig been running?

<https://www.illustrativemathematics.org/content-standards/7/EE/B/4/tasks/1602>

# Differentiated Application: Building the Pyramid

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**Conjecturing** involves reasoning about mathematical relationships to develop statements that are tentatively thought to be true but are not known to be true.

**Generalizing** involves identifying commonalities across cases or extending the reasoning beyond the range in which it originated.

**Justification:** A mathematical justification is a logical argument based on already-understood ideas.

- Level 1 – basic level of understanding.
- Level 2 – A more in depth approach to the standard with more problem solving.
- Level 3 – A higher approach of understanding of the material through modeling and reasoning.

Using your knowledge of the standards, develop level 1, 2, and 3 tasks that develop reasoning skills while building conceptual understanding.

# Developing mathematical reasoning

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**What are some questions, investigations or lesson structures that you have used that support the process of reasoning and sense making?**

Share with your group ways that you promote student reasoning in your classroom.

# Practice Standards Sort

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Work with your group to sort each descriptor into the **BEST** practice standard group.

# Resources

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Louisiana Rigor Documents and Focus Documents -

<http://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning>

Great Minds Teach Eureka -

[https://greatminds.org/video\\_gallery?taxon\\_ids%5B%5D=79&opened\\_product\\_id=100](https://greatminds.org/video_gallery?taxon_ids%5B%5D=79&opened_product_id=100)

Eagle 2.0 - <https://www.drcedirect.com/all/eca-portal-ui/welcome/LA>

Illustrative Math - <https://www.illustrativemathematics.org/content-standards>

Math Assessment Project - <http://map.mathshell.org/>

HCPSS Math Wiki -

6th grade - <https://hcpss.instructure.com/courses/125>

7th grade - <https://hcpss.instructure.com/courses/127>

8th grade - <https://hcpss.instructure.com/courses/161>