

# Quantiles 101

## An Introduction to the Quantile Framework for Mathematics

Presented by:  
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# Good news!

## The power and advantages of the Lexile Framework for Reading have been harnessed for mathematics...

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North Carolina End-of-Grade Test  
Regular Test Administration Spring 2009  
Individual Student Report  
Public Schools of North Carolina

<p><b>Reading</b></p> <p>Scale Score: 351 Percentile Rank (2008): 53 Lexile Measure: 900L Met State Gateway: VEC</p> <p>Reading Developmental Scale Score 300 330 340 350 360 370</p> <p>Achievement Levels: I II III IV</p> <p>Student: [diamond at III]</p> <p>School: [diamond at III]</p> <p>System: [diamond at III]</p> <p>State 2008: [diamond at III]</p>	<p><b>Mathematics</b></p> <p>Scale Score: 365 Percentile Rank (2006): 88 Quantile Measure: 1040Q Met State Gateway: VEC</p> <p>Mathematics Developmental Scale Score 330 340 350 360 370 380</p> <p>Achievement Levels: I II III IV</p> <p>Student: [diamond at IV]</p> <p>School: [diamond at IV]</p> <p>System: [diamond at IV]</p> <p>State 2006: [diamond at IV]</p>
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### Lexiles and Quantiles: Both are vertical, developmental scales

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### Lexiles and Quantiles: Each measure one construct.

The Lexile scale provides a *single metric* for reporting reading achievement.

**In other words, students will receive BOTH a Lexile and a Quantile score.**

Example:  
Student score report:  
Emma Jane  
900L 910Q

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### Instructional Implications

Student Quantile Measure →

#### Resources:

- Math skills/topics targeted to student's math achievement level
- Knowledge clusters
- Textbooks
- Websites
- Games
- Math at Home
- Trade books
- Worksheets

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## Other FAQ...

- Is there a connection between the Lexile scale and the Quantile scale?
  - No
- Should students have similar Lexile and Quantile measures?
  - No
- Is reading considered when measuring math items?
  - Yes...



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## Goals for the Session...

- What is the Quantile Framework?
- What does a Quantile measure mean?
- How can it be used in the classroom?
  - Free suite of online tools at [Quantiles.com](http://Quantiles.com)
  - **And**, Quantile measures for students are available....
    - Now for some (block)
    - Soon for all students in NC



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## Question 1: What is the Quantile Framework?



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## Think of a classroom...

Which skill is most difficult for the student?

- Create equivalent amounts with different coins and bills. **460Q**
- Analyze patterns and translate the pattern into another pattern (e.g., from letters to numbers). **460Q**
- Divide using single-digit divisors with and without remainders. **460Q**



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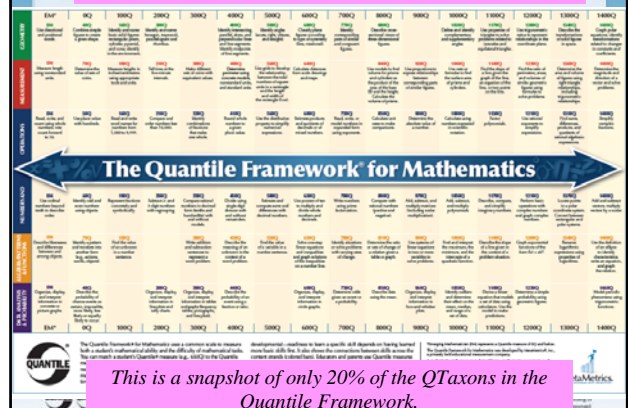
## Quantile Framework Taxonomy

- What is a QTaxon?
  - Mathematical skill or concept.
  - Over 450 QTaxons in the Framework
  - Ranges from Kindergarten to PreCalculus
- Where does the list of QTaxons come from?
  - National Council of Teachers of Mathematics (NCTM)
  - TIMSS
  - State curriculums
- How are the strands determined?
  - Content Strands from NCTM and other states



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## Map of the Quantile Framework



## How do we get a Quantile measure for a QTaxon?

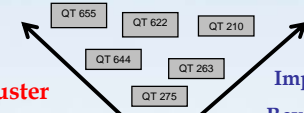
- Field Study February 2004
  - Tests for Grades 2 through Algebra II
  - Ancillary Materials: rulers, protractors, calculators, and reference sheets
  - Sample:  $N = 9,847$  students in 34 schools and 6 states
- And then....
  - Identify items that meet psychometric criteria
  - Identify items that are representative of the QTaxon and match what is typically taught during the first lesson
  - Relationship with prerequisite and impending QTaxons (i.e., the knowledge clusters)



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Knowledge Cluster for

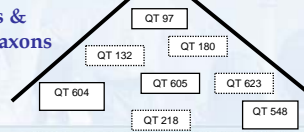
Impending/Reverse search



QT A 208:

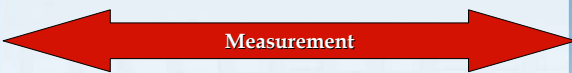
Solve one-step linear equations and inequalities and graph the solutions of the inequalities on a number line.

Prerequisites & Supporting QTaxons



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## The Quantile Scale is a developmental scale. (within a strand)

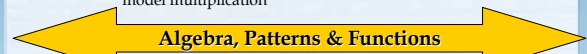


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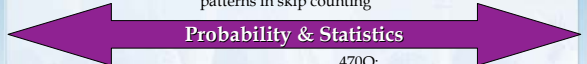
## The Quantile Scale is a developmental scale. (across the strands)



240Q:  
Use Skip counting to model multiplication



360Q:  
Describe & demonstrate patterns in skip counting



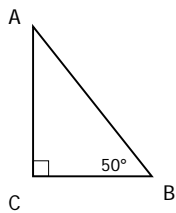
470Q:  
Display, read, or interpret data on a line graph



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## Example of How Strands Relate

What is the measure of  $\angle A$ ?



### Measurement Item

Step	Strand
Recognize it's a triangle & right triangle	Geometry
Sum of the interior angles sum to $180^\circ$ .	Geometry
A right angle is $90^\circ$ .	Measurement
Set up "equation" & solve	Algebra
Calculations	Numbers & Operations



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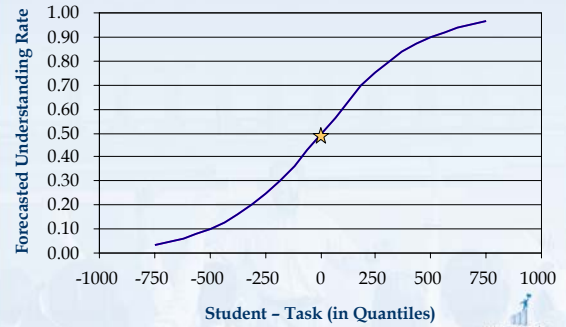
## Interaction of the Content Strands



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## Question 2: What does a Quantile Measure mean?

## What Does the Measure Mean?

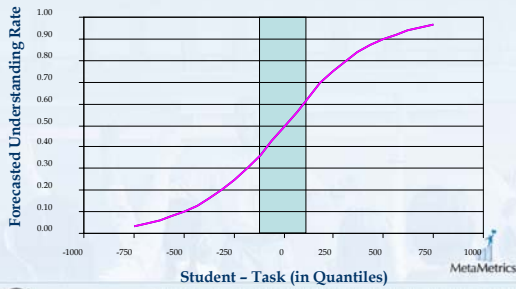


## Learning Frontier ( $\pm 50Q$ )

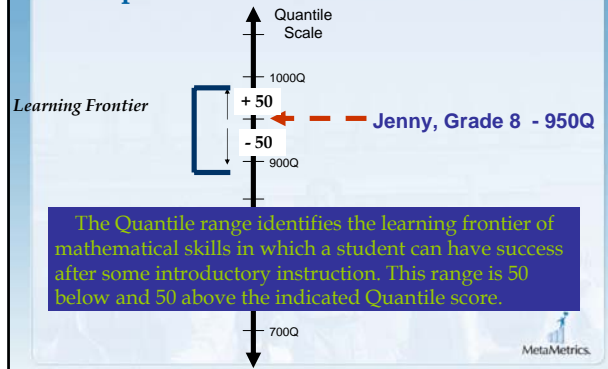
Example:

Student's Quantile Measure 600Q

Quantile learning frontier is 550Q - 650Q



## Implications for Instruction

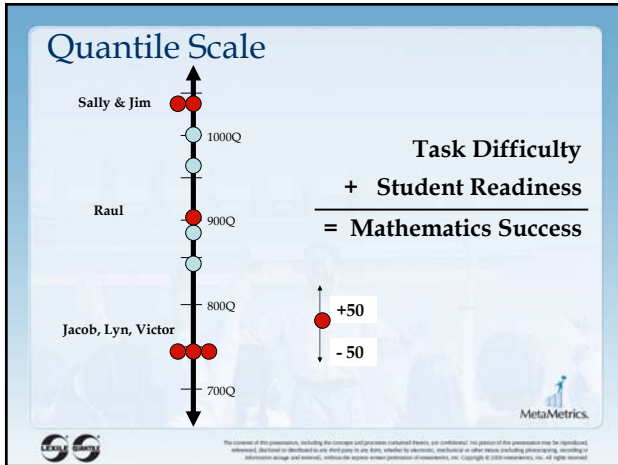


## Question 3: How can I use it in my classroom?

### Instructional Applications

## Differentiated Instruction

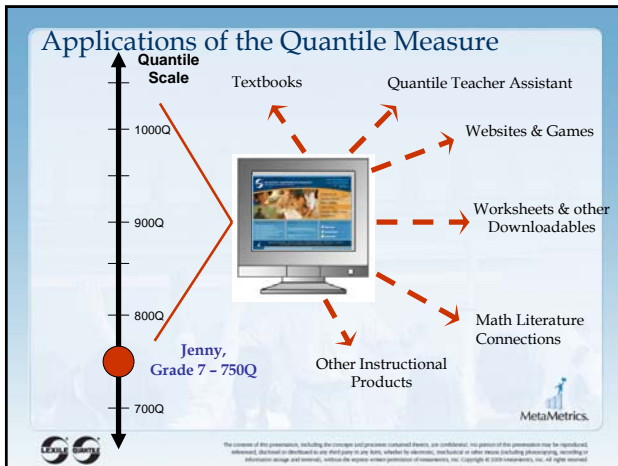
- Understand content progression
- Determine student readiness
- Differentiate instruction by linking students with appropriate instruction at their level



## The Quantile Website:

[www.Quantiles.com](http://www.Quantiles.com)

MetaMetrics



## www.Quantiles.com

**THE QUANTILE FRAMEWORK FOR MATHEMATICS**  
LINKING ASSESSMENT WITH MATHEMATICS INSTRUCTION

INFORMATION FOR:  
 Departments of Education  
 Principals & Educators  
 Families & Students  
 Assessment & Instruction Companies  
 Textbook Publishers

RECENTLY ASKED QUESTIONS:  
 • How do I get a Quantile measure?  
 • What does my Quantile measure mean?  
 • How can I use Quantile measures in the classroom?  
 • How can I use Quantile measures at home?  
 • How can I share my student's results to the Quantile Framework?

NEWS & EVENTS:  
 META-METRICS SEEKING CONTRACT ITEM WRITERS  
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DOWNLOAD THE PRESENTATIONS NOW!  
 MetaMetrics' 2008 Inside National Conference & Quantile Symposium June 16-19

RESEARCH:  
 Search the Math Skill Database  
 Math at Home  
 Find your Math Textbook

MetaMetrics

## QTaxon Search

**THE QUANTILE FRAMEWORK FOR MATHEMATICS**  
LINKING ASSESSMENT WITH MATHEMATICS INSTRUCTION

Home  
 Where to get Quantiles  
 Professional Development  
 Tools  
 Resources

### QTaxon Search

Keyword(s):

State:

Grade:

State Goal:

Min QMeasure:

Max QMeasure:

Strand:

Do you know the QTaxon ID? Jump straight to the details by entering the ID here.

QTaxon ID: QT-A

1 If you are in a state that has been aligned to the Quantile Framework, you can select your state and see the state goals for the QTaxons.

## QTaxon Details

QTaxon ID: QT-N-118  
 QMeasure: 240Q  
 Strand: Numbers and Operations  
 Description: Model and explain multiplication in a variety of ways including repeat addition, rectangular arrays, and skip counting.

### Knowledge Cluster

#### Precursor Taxons

QTaxon ID	QMeasure	Description
QT-N-617	EM	Use counting strategies for total up to 100 that include counting forward, counting backwards, grouping, tens frame, and hundreds chart.
QT-N-601	90Q	Rate count by 3s, 4s, 6s, 7s, 8s, and 9s.

#### Supportive Taxons

QTaxon ID	QMeasure	Description
QT-P-136	480Q	Construct graphs where symbols or scales represent multiple units.
QT-M-105	70Q	Determine the value of sets of coins (pennies, nickels, dimes, quarters, and half dollars) identify coins that have a specified value; record using appropriate notation.
QT-N-119	220Q	Model and use the identity and commutative properties for addition (0) and multiplication (1).
QT-M-541	210Q	Tell time at the five-minute intervals.

**Related Math Terms**

- multiply
- array
- skip counting

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**State Standards**

Mississippi

Goal	Description	Grade
6h	Model and multiply numbers 0 to 5 using repeated addition.	2
6i	Model multiplication problems by drawing and writing explanations.	2
7e	Model, explore, and state multiplication facts 6 to 12, and division facts 1 to 12.	3

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**Textbook Lessons**

Textbook	Publisher	Grade/Course	Chapter	Lesson
1- <i>math</i> Multiplying by 1-Digit Numbers 4-C	Voyager Expanded Learning, LP	4	1 - Multiplying by 1-Digit Numbers	7 - Choosing an Operation
1- <i>math</i> Multiplying by 1-Digit Numbers 4-E	Voyager Expanded Learning, LP	4	1 - Multiplying by 1-Digit Numbers	1 - Meaning and Multiplication

**Resources**

**Web Resources**

Web Resource	Link	Additional Resources
Student Tutorial at Coolmath.com	<a href="http://www.coolmath4kids.com/imes-Tables/imes-tables-lesson-lattice-multiplic-600-1.htm">http://www.coolmath4kids.com/imes-Tables/imes-tables-lesson-lattice-multiplic-600-1.htm</a>	

**Download Resources**

Downloadable Resource	Link
Worksheet QT-N-118 Buzz-Buzz-Bazooka Game	<a href="#">QuantileResource16125.pdf</a> <a href="#">QuantileResource16891.pdf</a>

**Book, Article or Periodical in Print**

Book, Article or Periodical in Print	Author	ISBN	Additional Resources
Multiplying This Grapes of Math Mind-Stretching Math Riddles	Mortague-Smith, Ann	9781845381943	
Tiny Toes	Tang, Greg	043921033x	
One Hundred Shoes	Jakob, Donna	9780786800131	<a href="#">Download</a>
Math Potatoes	Olghin, Charles	9780375821183	<a href="#">Download</a>
Each Orange Had 8 Slices	Tang, Greg	9780439443906	
	igiganti, Paul	9780688139858	<a href="#">Download</a>

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## Aligning to State Standards

ID	QMeasure	Description	Strand	State Goal
QT-M-099	100Q	Measure lengths in inches/centimeters using appropriate tools and units.	Measurement	Grade: 4b Goal: 4b
QT-M-099	100Q	Measure lengths in inches/centimeters using appropriate tools and units.	Measurement	Grade: 6 Goal: 4c
QT-M-099	100Q	Measure lengths in inches/centimeters using appropriate tools and units.	Measurement	Grade: 6 Goal: 4a
QT-P-097	250Q	Locate points on the number line.	Probability and Statistics	Grade: 6 Goal: 9d
QT-M-151	380Q	Read Celsius and Fahrenheit thermometers; relate temperatures to everyday situations.	Measurement	Grade: 6 Goal: 4b
QT-M-151	380Q	Read Celsius and Fahrenheit thermometers; relate temperatures to everyday situations.	Measurement	Grade: 6 Goal: 4c
QT-P-137	390Q	Read and interpret tables and graphs (pictographs, line plots, and frequency tables) as sources of information. Identify the main idea and draw conclusions.	Probability and Statistics	Grade: 6 Goal: 5a

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## Quantile Teacher Assistant

THE QUANTILE FRAMEWORK™ FOR MATHEMATICS  
LINKING ASSESSMENT WITH MATHEMATICS INSTRUCTION

INFORMATION FOR:  
 Departments of Education  
 Principals & Educators  
 Families & Students  
 Assessment & Instruction Companies  
 Textbook Publishers

RECENTLY ASKED QUESTIONS

- How do I get a Quantile measure?
- What does my Quantile measure mean?
- How can I use Quantile measures in the classroom?
- How can I use Quantile measures at home?
- How can I apply my product/service to the Quantile Framework?

NEWS & EVENTS

October 29, 2010 - Greenboro, NC  
 North Carolina Council of Teachers of Mathematics (NCTM)  
 2009 State Mathematics Conference

Quantile Framework  
 Training Webinars  
 Tuesday, December 13, 2009 at 3:00 PM EST

RESOURCES

- Search the Math Skill Database
- Math at Home
- Quantile Teacher Assistant

## Quantile Teacher Assistant:

Time is short and math instruction needs to be focused. This easy tool helps educators locate resources that can help with instruction and identify those skills that are most relevant to the topic of the daily instruction. This tool has been aligned with state mathematics curriculum standards to make it directly applicable to use in the classroom.

Please follow the three steps below:

- Select State
- Select Grade
- Select Objective

## Select your state:

Time is short and math instruction needs to be focused. This easy tool helps educators locate resources that can help with instruction and identify those skills that are most relevant to the topic of the daily instruction. This tool has been aligned with state mathematics curriculum standards to make it directly applicable to use in the classroom.

Please follow the three steps below:

- Select State
- Select Grade
- Select Objective

Select a state

- Alabama
- California
- D.C.E.A.
- Florida
- Georgia
- Illinois
- Mississippi
- North Carolina
- New York
- SDA
- Texas
- West Virginia
- Wyoming

## Select the grade level:

**QUANTILE Teacher Assistant**

Time is short and math instruction needs to be focused. This easy tool helps educators locate resources that can help with instruction and identify those skills that are most relevant to the topic of the daily instruction. This tool has been aligned with state mathematics curriculum standards to make it directly applicable to use in the classroom.

Please follow the three steps below:

- 1. Select State**  
North Carolina
- 2. Select Grade**  
5th grade
- 3. Select Objective**

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## Select the objective:

3.02.1 Sum of the measures of interior angles. Make and test conjectures about polygons.

**Select the objective**

- 1.01.1 Connect model, number word, and number using a variety of...
- 1.01.2 Build understanding of place value (thousandths through hundred thousandths). Develop...
- 1.01.3 Compare and order rational numbers. Develop number sense for rational...
- 1.01.4 Make estimates of rational numbers in appropriate situations. Develop number...
- 1.02.1 Develop and analyze strategies for adding and subtracting numbers. Develop...
- 1.02.2 Estimate sums and differences. Develop fluency in adding and subtracting...
- 1.02.3 Judge the reasonableness of solutions. Develop fluency in adding and...
- 1.02.4 Develop flexibility in solving problems by selecting strategies and using...
- 2.01 Estimate the measure of an object in one system given...
- 2.02 Identify, estimate, and measure the angles of plane figures using...
- 3.01 Identify, define, describe, and accurately represent triangles, quadrilaterals, and other...
- 3.02.1 Sum of the measures of interior angles. Make and test...
- 3.02.2 Lengths of sides and diagonals. Make and test conjectures about...
- 3.02.3 **Sum of the measures of interior angles. Make and test conjectures about polygons.**
- 3.04.1 Sum of the measures of interior angles. Solve problems involving...
- 3.04.2 Lengths of sides and diagonals. Solve problems involving the properties...
- 3.04.3 Parallelism and perpendicularity of sides and diagonals. Solve problems involving...
- 4.01 Collect, organize, analyze, and display data (including stem-and-leaf plots) to...
- 4.02 Compare and contrast different representations of the same data; discuss...
- 4.03 Solve problems with data from a single set or multiple...
- 5.01 Describe, extend, and generalize numeric and geometric patterns using tables...
- 5.02 Use algebraic expressions, patterns, and one-step equations and inequalities to...
- 5.03 Identify, describe, and analyze situations with constant or varying rates.

Select an objective.

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## QTaxons and Activities displayed:

3.02.1 Sum of the measures of interior angles. Make and test conjectures about polygons. North Carolina 5th grade objectives (Class)

Select Quantile Range of Your Class

650Q 930Q

**3.02.1: Sum of the measures of interior angles. Make and test conjectures about polygons.**

Below Quantile Range of Class | Within Quantile Range of Class | Above Quantile Range

**Prerequisite QTaxons**

- Predict results of tessellating, subdividing, and changing shapes by paper folding or dissecting and rearranging pieces of plane figures and solids. (530Q)
- Identify diagonals of a polygon. Determine when a diagonal is a line of symmetry. (610Q)
- Identify and classify triangles according to the measures of the interior angles and the lengths of the sides. (610Q)
- Name polygons by the number of sides.

**QTaxons**

- Define and identify alternate interior, alternate exterior, corresponding, adjacent and vertical angles. (1010Q)
- Define and identify complementary and supplementary angles. (1020Q)
- Use a variety of triangles, quadrilaterals, and other polygons to draw conclusions about the sum of the measures of the interior angles. (1070Q)
- Use a variety of regular polygons to draw conclusions about the sum of the measures of the interior angles. (1150Q)

**No Impending QTaxons**

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## Sliding bar adjust to your class range:

Select Quantile Range of Your Class

550Q 1040Q

**3.02.1: Sum of the measures of interior angles. Make and test conjectures about polygons.**

Below Quantile Range of Class | Within Quantile Range of Class | Above Quantile Range

**Prerequisite QTaxons**

- Predict results of tessellating, subdividing, and changing shapes by paper folding or dissecting and rearranging pieces of plane figures and solids. (530Q)
- Identify diagonals of a polygon. Determine when a diagonal is a line of symmetry. (610Q)
- Identify and classify triangles according to the measures of the interior angles and the lengths of the sides. (610Q)
- Name polygons by the number of sides. Distinguish quadrilaterals based on properties of their sides or angles. (680Q)

**QTaxons**

- Define and identify alternate interior, alternate exterior, corresponding, adjacent and vertical angles. (1010Q)
- Define and identify complementary and supplementary angles. (1020Q)
- Use a variety of triangles, quadrilaterals, and other polygons to draw conclusions about the sum of the measures of the interior angles. (1070Q)
- Use a variety of regular polygons to draw conclusions about the sum of the measures of the interior angles. (1150Q)

**Supplemental QTaxons**

- Identify intersecting, parallel, skew, and perpendicular lines and line segments. Identify...

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Resources can be: Downloadable lessons, books, and web sites

Click on the word to reveal meaning!

Identify and classify triangles according to the measures of the interior angles and the lengths of the sides. (610Q)

**Downloadable Resources**

- Classifying Triangles
- Name That Triangle!
- More Downloaded Triangles (Grade 5)
- Classifying Triangles
- More Downloaded Triangles (Grade 5)
- Class & Contact Triangles

**Vocabulary**

- triangle
- side
- equilateral triangle or polygon
- acute triangle
- isosceles triangle
- obtuse triangle
- right triangle
- equiangular triangle
- interior angles

Identify and classify triangles according to the measures of the interior angles and the lengths of the sides. (610Q)

Use a variety of regular polygons to draw conclusions about the sum of the measures of the interior angles. (1150Q)

**Supplemental QTaxons**

- Identify intersecting, parallel, skew, and perpendicular lines and line segments. Identify multiplicity of line segments. (600Q)
- Use properties of parallelism and perpendicularity to draw conclusions about the sides and diagonals of triangles, quadrilaterals, and other polygons. (1080Q)

**Downloadable Resources**

- Classifying Triangles
- Name That Triangle!
- More Downloaded Triangles (Grade 5)
- Classifying Triangles
- More Downloaded Triangles (Grade 5)
- Class & Contact Triangles

**Vocabulary**

- triangle
- A three-sided polygon
- side
- A line segment that connects two corners of a polygon
- equilateral triangle or polygon
- A triangle or other polygon whose sides are all of the same length
- acute triangle
- isosceles triangle
- obtuse triangle

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## The Quantile Framework is NOT:

- An indicator of mastery of specific skills.
- A list of mathematics skills.
- A curriculum for mathematics.
- A mathematics program.
- A grade equivalent.
- A measure for a worksheet or test.

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## The Quantile Framework for Mathematics

- Predict student readiness
- Monitor student math progress
- Adapt instructional methods
- Understand pre-requisite skills for advanced concepts
- Match students to appropriate materials at their level
- Link big mathematics concepts to state curricula



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## Summary

The Quantile Framework locates....

- the mathematics curriculum,
- the materials to teach mathematics, and
- the students themselves on the same scale.

The results of the Quantile Framework....

- targeted instruction,
- forecasted understanding and
- improved mathematics instruction and student achievement.



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## Questions?

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