



Quantile Teacher Assistant

Mathematical achievement is an exciting, yet complex, venture for many students and their teachers. Students come from many different backgrounds, learn in different ways, and progress along their mathematical development at different paces. In theory, the teacher's goal is more singular—to enable students to succeed in their mathematical endeavors. However, providing meaningful instruction to address the developmental needs of all students while covering the entire curriculum during a school year is extremely challenging. To help address these challenges, The Quantile Framework[®] for Mathematics and the Quantile[®] Teacher Assistant were developed to aid teachers and provide free resources to support instruction.

The Quantile Framework for Mathematics

The Quantile Framework for Mathematics is a scientific approach to measuring mathematical achievement and concept/application solvability. The Quantile Framework consists of a Quantile measure and the Quantile scale. A Quantile measure represents the difficulty of a mathematical skill, concept or application (called a "QTaxon") and a developing mathematician's understanding of the QTaxons in the areas of Geometry, Measurement, Numbers and Operations, Algebra, and Data Analysis and Probability. Quantile measures are expressed as numeric measures followed by a "Q" (e.g., 850Q), and are placed on the Quantile scale. The Quantile Framework spans the developmental continuum from kindergarten mathematics through the content typically taught in Algebra II, Geometry, Trigonometry and Pre-Calculus—from below 0Q (Emerging Mathematician) to above 1700Q. Quantile measures take the guesswork out of determining which mathematical skills a developing mathematician has learned and which ones require additional instruction. All Quantile products and services rely on the Quantile measure and Quantile scale to match students with mathematics resources.

This alone has enormous instructional impact for differentiating instruction and forecasting student success with new topics. In addition, the Quantile Framework contains a taxonomy of over 450 QTaxons, ranging from kindergarten to Pre-Calculus. Every QTaxon has a Quantile measure that identifies the difficulty of that QTaxon. The hierarchical nature of mathematics (i.e., the relationships between skills and topics) is captured in a resource available to teachers called a "knowledge cluster."

Anatomy of a Knowledge Cluster

Knowledge clusters contain information regarding three types of relationships—prerequisite, supplemental and impending—between the QTaxon of interest and other QTaxons. An example of a knowledge cluster is shown in Figure 1 (on the next page). It illustrates the knowledge cluster for "solving one-step linear equations and inequalities." The QTaxon of interest or the "main" QTaxon is shown in the center. Below this QTaxon are two other QTaxons: one is a prerequisite QTaxon and the other is a supporting QTaxon. A prerequisite QTaxon describes a skill or concept that provides the foundation necessary for another QTaxon. In this example, students should have mastered "finding the value of a variable in a number sentence" before they can work successfully on "solving one-step linear equalities and inequalities."

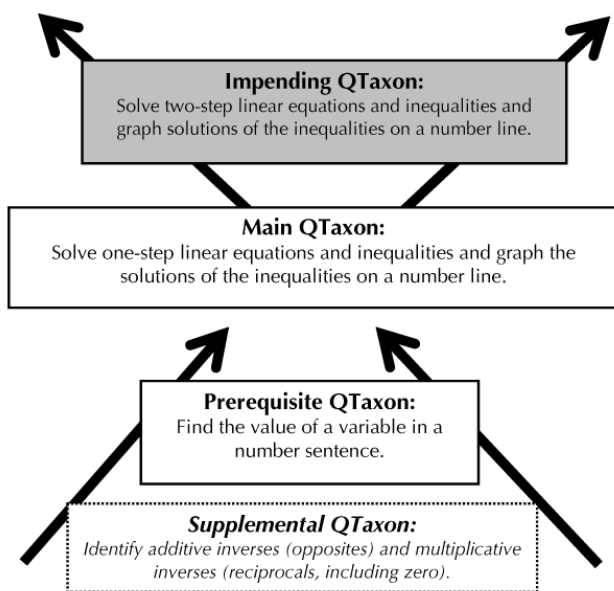
Also below the main QTaxon is a supplemental QTaxon. A supplemental QTaxon describes supplementary skills or knowledge that assists and enriches the understanding of another QTaxon. Supplemental QTaxons could be useful to enrich a lesson, make connections across topics and strands, and help students integrate different mathematical concepts. In this example, "identifying

additive inverses (opposites) and multiplicative inverses (reciprocals, including zero)” are considered to be supplemental or supporting the main QTaxon.

Above the main QTaxon is an impending QTaxon. An impending QTaxon describes the skills and concepts that will be built from a primary QTaxon and helps the teacher or parent to see a trajectory of knowledge across grades and content strands. For example, knowing how to successfully “solve one-step linear equations and inequalities” leads to another skill, “solving two-step linear equations and inequalities and graph solutions of the inequalities on a number line.”

Through the knowledge clusters, the Quantile Framework provides a knowledge base for every topic, concept or skill in the K–12 curriculum. A QTaxon that is classified as “foundational” means it describes a skill or concept that only requires readiness to learn. Readiness is based upon the learner’s cognitive experiences, rather than knowledge of specific mathematical concepts. It is the base upon which other QTaxons are built. In addition, state curriculums have been aligned with the QTaxons in the Quantile Framework. This allows educators to view their state goals and objectives in relation to the QTaxons (and, therefore, the associated Quantile measure and resources).

Figure 1. Sample of a Modified Knowledge Cluster



Note: This is a modified knowledge cluster. Visit www.Quantiles.com for the complete knowledge cluster.

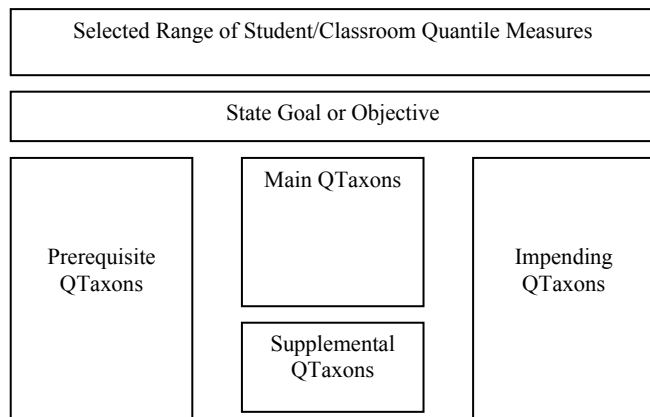
Quantile Teacher Assistant

In order to support instruction with the many resources connected with the Quantile Framework, the Quantile Teacher Assistant (qta.quantiles.com) was developed to simplify and gather all relevant information. When using the Quantile Teacher Assistant, teachers can identify a specific state objective and determine its knowledge base. Teachers can indicate the range of students’ Quantile measures in their classrooms.

Generally, the Quantile Teacher Assistant displays the knowledge cluster in three columns as shown in Figure 2 (on the next page). The column on the far left lists the prerequisite QTaxons. The center column contains two pieces of the knowledge base. The top portion displays the QTaxon(s) that is aligned with the specified state goal or objective. Many state curricula are written in broad terms and typically are aligned with several QTaxons. The lower portion

describes the supplemental QTaxons. The column on the right shows the impending QTaxons. The displayed QTaxons are either on grade, one grade above or one grade below the grade of the main QTaxon(s). Note that the Quantile measure of the QTaxon is in parentheses (e.g., 650Q) and calibrated resources associated with the QTaxon are available by clicking on the hyperlink "More."

Figure 2. Layout of Quantile Teacher Assistant Results



Two examples of using the Quantile Teacher Assistant are presented below. The first example, shown in Figure 3, describes information regarding a goal stated as "Draw objects to scale and use scale drawings to solve problems." Note that there are three QTaxons listed in the center column, indicating that three QTaxons are aligned with one state objective. The color of the QTaxon box denotes how the QTaxon's Quantile measure relates to the range of students' Quantile measures in the classroom. QTaxons with Quantile measures within the classroom range are shown in tan. QTaxons in green are below the lowest classroom Quantile measure. Pink boxes depict QTaxons with Quantile measures higher than the highest classroom Quantile measure (see Figure 4 on the next page).

Figure 3. Quantile Teacher Assistant: Example About Scale Drawings

2.01: Draw objects to scale and use scale drawings to solve problems.

Select Quantile Range of Your Class

750Q 1070Q

2.01: Draw objects to scale and use scale drawings to solve problems.

Below Quantile Range
 Within Quantile Range
 Above Quantile Range

Prerequisite QTaxons (What's this?)

- Multiply or divide two decimals or a decimal and a whole number. (700Q). (More)
- Identify corresponding parts of similar and congruent figures. (770Q). (More)
- Multiply two fractions or a fraction and a whole number. (820Q). (More)
- Calculate unit rates to make comparisons. (830Q). (More)
- Locate points in all quadrants of the coordinate plane using ordered pairs. (850Q). (More)

QTaxons (What's this?)

- Calculate distances from scale drawings and maps. (640Q). (More)
- Use proportions to express relationships between corresponding parts of similar figures. (920Q). (More)
- Use scale factors to reduce and enlarge drawings on grids. (990Q). (More)

Supplemental QTaxons (What's this?)

- Write a proportion to model a word problem; solve proportions. (720Q). (More)

Impending QTaxons (What's this?)

- Use proportional reasoning to solve problems related to similar and congruent polygons. (950Q). (More)
- Identify proportional parts of similar figures using rulers and protractors. (990Q). (More)
- Estimate and calculate areas with scale drawings and maps. (1000Q). (More)
- Graph plane figures which are similar to a given figure (dilation). (1000Q).

Figure 4. Quantile Teacher Assistant: Example with QTaxons Above Range.

The screenshot shows the Quantile Teacher Assistant interface. At the top, there is a navigation bar with the Quantile logo and the text "Teacher Assistant". To the right, there are links for "Help", "Contact Us", and "Print". Below the navigation bar, the objective "5.01.b: Identify relations and functions as linear or nonlinear. Develop an understanding of function." is displayed, with a "(Change)" link. The main content area features a "Select Quantile Range of Your Class" tool with a horizontal scale from 570Q to 890Q. Below this, the objective is repeated: "5.01.b: Identify relations and functions as linear or nonlinear. Develop an understanding of function." A legend indicates three categories: "Below Quantile Range" (green), "Within Quantile Range" (orange), and "Above Quantile Range" (red). The resources are organized into three columns: "Prerequisite QTaxons" (orange), "QTaxons" (orange), and "Impending QTaxons" (red). The "QTaxons" column includes "Supplemental QTaxons" (orange) and "Downloadable Resources" (red). The "Impending QTaxons" column includes "Downloadable Resources" (red) and "Vocabulary" (red).

Select Quantile Range of Your Class

570Q 890Q

5.01.b: Identify relations and functions as linear or nonlinear. Develop an understanding of function.

Below Quantile Range Within Quantile Range Above Quantile Range

Prerequisite QTaxons
(What's this?)

Given a list of ordered pairs, identify either verbally or algebraically the rule used to generate the list and record results. (800Q). (More)

QTaxons
(What's this?)

Identify relations as linear or nonlinear. (850Q). (More)

Supplemental QTaxons
(What's this?)

Identify linear and nonlinear data. (810Q). (More)

Use ordered pairs derived from tables, algebraic rules, or verbal descriptions to graph linear functions. (930Q). (More)

Impending QTaxons
(What's this?)

Interpret and compare properties of linear functions, graphs, and equations. (1150Q).

Downloadable Resources
(What's this?)

[Worksheet QT-A-568](#)

Vocabulary
(What's this?)

equation
linear function
graph

(Close)

Summary

The Quantile Framework for Mathematics places student and mathematical skills on a common scale. By comparing a student's Quantile measure with the Quantile measure of a skill or topic, teachers can differentiate instruction and target classroom activities appropriately. The Quantile Teacher Assistant employs the power of the Quantile Framework, the taxonomy and hierarchy of mathematical skills, and calibrated resources to aid teachers in creating effective instruction and learning opportunities for all students.



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