HOW DO MATH MATERIALS RECEIVE QUANTILE® MEASURES
How Do Math Materials Receive Quantile Measures?

Mathematics materials receive Quantile measures by being calibrated to the Quantile Framework. The math demand of the material, such as textbook lessons, games and other resources, is analyzed by MetaMetrics. In the analysis, both subject matter experts review the material as well as automated software that uses an algorithm to evaluate the material’s mathematics demand. The automated software and subject matter reviews are done independently. These results are then compared to determine which mathematics skills and concepts are represented. Oftentimes, there are several skills/concepts assigned with a specific lesson or activity. A Quantile measure is assigned that describes the overall difficulty of the skills/concepts represented in the material.

In this way, mathematics materials are placed on the Quantile scale, a scale that ranges from beginning math skills below 0Q to advanced mathematics materials above 1600Q.

The following are two mathematics activities: one at 90Q and one at 790Q. Although they are on the same topic of addition, the higher Quantile measured material involves more complex mathematics skills and concepts.

### 90Q

**Sample Activity: Video on Addition With Regrouping Measures**

\[
\begin{array}{c}
32 \\
+ 29 \\
\hline
61
\end{array}
\]

### 790Q

**Sample Activity: Video on Adding Fractions With Unlike Denominators Measures**

\[
\begin{align*}
\frac{2}{3} + \frac{1}{3} &= \frac{3}{3} \\
\frac{10}{15} + \frac{3}{15} &= \frac{13}{15}
\end{align*}
\]
MetaMetrics’ Research on Mathematics

MetaMetrics studied the difficulty of lessons in mathematics textbooks commonly used in the United States to help understand the mathematics demand that students will likely encounter in their elementary through high school mathematics courses. Results are shown in the table below. In a related study, MetaMetrics found that the mathematics ability needed for college and career readiness ranged from approximately 1220Q to 1440Q, and the median mathematics demand for college and career readiness was 1350Q.

Research indicates that the materials students will first encounter in college and careers are around 1350Q.

Our mathematics demand research and how Quantile measures can be used to determine and encourage college and career readiness is detailed in the FAQs section of this Toolkit, which is accessible on the Toolkit homepage: metametricsinc.com/quantile-toolkit-edtech.
Math Demand for College and Career Readiness

Read our research briefs describing this work: A Quantitative Task Continuum for K-12 Mathematics and The Quantile Framework for Mathematics Quantifies the Mathematics Ability Needed for College and Career Readiness.

QUANTILE MEASURES TO GUIDE MATHEMATICS INSTRUCTION FOR COLLEGE AND CAREER READINESS

<table>
<thead>
<tr>
<th>Grade</th>
<th>Lessons Complexity Measures Beginning of Year</th>
<th>Lessons Complexity Measures End of Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EM50Q*</td>
<td>80Q</td>
</tr>
<tr>
<td>2</td>
<td>40Q</td>
<td>300Q</td>
</tr>
<tr>
<td>3</td>
<td>240Q</td>
<td>490Q</td>
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<td>4</td>
<td>390Q</td>
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<td>560Q</td>
<td>810Q</td>
</tr>
<tr>
<td>6</td>
<td>680Q</td>
<td>890Q</td>
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<tr>
<td>7</td>
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<tr>
<td>8</td>
<td>840Q</td>
<td>1050Q</td>
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<td>900Q</td>
<td>1150Q</td>
</tr>
<tr>
<td>10</td>
<td>1070Q</td>
<td>1230Q</td>
</tr>
<tr>
<td>11</td>
<td>1100Q</td>
<td>1350Q</td>
</tr>
</tbody>
</table>

*When a Quantile measure is below 0Q, an EM (Emerging Mathematician) code is reported with the measure.