



**The New York City
Department of Education**

**Grade 5 Mathematics Benchmark
Assessment**

**Teacher Guide
Spring 2013**

February 11–March 19, 2013



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Test Design and Instructional Purpose

The Mathematics Benchmark Assessment is designed to help you collect *some* information about your students' progress toward meeting the Common Core expectations for fifth grade. This information can provide insights into your students' mathematical proficiency, specifically their fluency with skills, their conceptual understanding, and their ability to apply concepts and skills in novel settings. Consequently, the results from the Benchmark Assessment may influence your plans for targeting instruction to meet your students' needs.

There are two Benchmark Assessments available for the school year. Both assessments are aligned to units from the New York City Department of Education's Curriculum Maps. The first Grade 5 Mathematics Benchmark Assessment, designed to be administered in the fall, focuses on Units 1 and 2; the second Grade 5 Mathematics Benchmark Assessment, designed to be administered in the spring, focuses on Units 3 and 4. The assessments contain various item types: multiple choice, short response, and constructed response/performance tasks. Items may partially align to a single standard, several standards, a cluster, or a domain, or they may require synthesis across clusters and/or domains.

The Benchmark Assessments are meant to provide a lens for identifying some of the skills and concepts that may need to be taught or reinforced if students are to meet the Common Core expectations for fifth grade. The results of this assessment will best support your instruction and your students' learning if you are familiar with the Common Core Learning Standards, including the fluency expectations, key advances, and culminating standards.

Limitations

Neither Benchmark Assessment is an exhaustive test. While each Benchmark Assessment reflects the Common Core Standards in the units that comprise its blueprint, Common Core Standards contain a breadth of skills and concepts that cannot be fully assessed by any single measure.

Additionally, each Benchmark Assessment is limited to a maximum of three units and covers approximately 25–40% of the year's instruction. Accordingly, the Benchmark Assessments do not reflect the work of the entire grade.

As a result, this assessment is best used as part of a comprehensive set of evaluative measures that include teacher observation, classwork, homework, and school- or teacher-made assessments.

Test Content

Unit 3: Addition, Subtraction, Multiplication, and Division of Fractions. Unit 4: Extensions and Applications of Multiplication and Division of Fractions and Decimal Fractions.

Unit	Domain	Cluster	Standard	Items
3	Measurement and Data	Convert like measurement units within a given measurement system.	5.MD.1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems.	8, 27, 30
3	Measurement and Data	Represent and interpret data.	5.MD.2. Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.	12, 35
3	Operations and Algebraic Thinking	Write and interpret numerical expressions.	5.OA.1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.	4, 20
3	Operations and Algebraic Thinking	Write and interpret numerical expressions.	5.OA.2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation “add 8 and 7, then multiply by 2” as $2 \times (8 + 7)$. Recognize that $3 \times (18,932 + 921)$ is three times as large as $18,932 + 921$, without having to calculate the indicated sum or product.	16, 31

3	Number and Operations—Fractions	Use equivalent fractions as a strategy to add and subtract fractions.	5.NF.1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. (In general, $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$.)	1, 9, 17, 21
3	Number and Operations—Fractions	Use equivalent fractions as a strategy to add and subtract fractions.	5.NF.2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$, by observing that $\frac{3}{7} < \frac{1}{2}$.	5, 13, 24, 32
3	Number and Operations—Fractions	Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	5.NF.3. Interpret a fraction as division of the numerator by the denominator ($\frac{a}{b} = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret $\frac{3}{4}$ as the result of dividing 3 by 4, noting that $\frac{3}{4}$ multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size $\frac{3}{4}$. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?	10, 18, 25

4	Number and Operations—Fractions	Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	5.NF.4a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)	2, 6, 14
4	Number and Operations—Fractions	Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	5.NF.4b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.	22, 26, 28
4	Number and Operations—Fractions	Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	5.NF.5a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.	7, 19
4	Number and Operations—Fractions	Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	5.NF.5b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.	33

4	Number and Operations —Fractions	Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	5.NF.6. Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	3, 11, 15, 23, 29, 34
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Rubrics for Scoring Short-Response & Extended-Response/Performance Task

Item # 28

Key Elements	
N/A	
Criteria	
2	Meets Standard (Meets criteria at grade level) 2 correct elements Finds the area of the note card AND Shows work to find the area
1	Near Standard (Mostly meets criteria) 1 correct element Finds the area of the note card OR Shows work to find the area
0	Far Below Standard Incorrect response
Exemplar	
2	$\frac{1}{28}$ square feet AND $\frac{1}{7} \times \frac{1}{4} = \frac{1}{28}$ OR Other valid work

Item # 29

Key Elements	
N/A	
Criteria	
2	Meets Standard (Meets criteria at grade level) 2 correct elements Finds the correct total number of cups AND Shows correct work to find the total number of cups
1	Near Standard (Mostly meets criteria) 1 correct element Finds the correct total number of cups OR

	Shows correct work to find the total number of cups
0	Far Below Standard Incorrect response
Exemplar	
2	$8\frac{3}{4}$ cups AND $\frac{5}{2} \times \frac{4}{3} = \frac{10}{3} = 3\frac{1}{3}$ AND $\frac{5}{2} \times \frac{7}{6} = \frac{35}{12} = 2\frac{11}{12}$ AND $3\frac{1}{3} + 2\frac{11}{12} + 2\frac{1}{2} = 8\frac{3}{4}$ OR Other valid work

Item # 30

Key Elements	
N/A	
Criteria	
2	Meets Standard (Meets criteria at grade level) 2 correct elements Writes the height of the soil in the pot in feet and inches AND Shows the work to find the height of the soil in the pot
1	Near Standard (Mostly meets criteria) 1 correct element Writes the height of the soil in the pot in feet and inches OR Shows the work to find the height of the soil in the pot
0	Far Below Standard Incorrect response
Exemplar	
2	1 foot 3 inches AND

	$\frac{1}{2} \times \frac{1}{4} \times 10 = \frac{10}{8} = 1\frac{1}{4}$ <p>1 foot = 12 inches</p> $\frac{1}{4} \text{ foot} = \frac{1}{4} \times 12 = 3 \text{ inches}$ <p>OR Other valid work</p>
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Item # 31

Key Elements	
N/A	
Criteria	
3	<p>Meets Standard (Meets criteria at grade level)</p> <p>3 correct elements</p> <p>Writes a correct expression</p> <p>AND</p> <p>Writes the correct value of the expression</p> <p>AND</p> <p>Shows valid process</p>
2	<p>Near Standard (Mostly meets criteria)</p> <p>2 correct elements</p> <p>Writes a correct expression and writes the correct value of the expression</p> <p>OR</p> <p>Writes the correct expression and shows the correct process to evaluate it</p> <p>OR</p> <p>Shows valid process and finds the correct value without writing the expression</p>
1	<p>Approaching Standard (Partially meets criteria)</p> <p>1 correct element</p> <p>Writes a correct expression</p> <p>OR</p> <p>Writes the correct value of the expression</p> <p>OR</p> <p>Shows valid process</p>
0	<p>Far Below Standard</p> <p>Incorrect response</p>
Exemplar	
3	<p>Part A</p> $\left(\frac{2}{3} - \frac{1}{2}\right) \times (2 + 4)$ <p>OR</p>

	Other valid expression AND Part B 1 AND $\frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} = \frac{1}{6}$ $2 + 4 = 6$ $\frac{1}{6} \times 6 = 1$ OR Other valid work
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Item # 32

Key Elements	
N/A	
Criteria	
3	Meets Standard (Meets criteria at grade level) 3 correct elements Writes a correct expression AND Writes the correct total amount of water AND Shows the valid steps to simplify the expression
2	Near Standard (Mostly meets criteria) 2 correct elements Writes a correct expression and writes the correct total amount of water OR Writes a correct expression and shows the valid steps to simplify the expression OR Writes the correct total amount of water and shows the valid steps to simplify the expression
1	Approaching Standard (Partially meets criteria) 1 correct element Writes a correct expression OR Writes the correct total amount of water OR Shows the valid steps to simplify the expression

0	Far Below Standard Incorrect response
Exemplar	
3	<p>Part A.</p> $\left(\frac{3}{4} - \frac{2}{3}\right) + \left(\frac{5}{6} - \frac{1}{2}\right)$ <p>OR Other valid expression AND</p> <p>Part B</p> $\frac{5}{12} \text{ pint}$ <p>AND</p> $\left(\frac{3}{4} - \frac{2}{3}\right) + \left(\frac{5}{6} - \frac{1}{2}\right) =$ $\left(\frac{9}{12} - \frac{8}{12}\right) + \left(\frac{5}{6} - \frac{3}{6}\right) =$ $\frac{1}{12} + \frac{2}{6} =$ $\frac{1}{12} + \frac{4}{12} =$ $\frac{5}{12}$ <p>OR Other valid process</p>

Item # 33

Key Elements	
N/A	
Criteria	
3	<p>Meets Standard (Meets criteria at grade level)</p> <p>3 correct elements</p> <p>Writes a fraction that Jim can use to obtain a product greater than 9,481</p> <p>AND</p> <p>Explains, without actual multiplication, why the product is greater than 9,481</p> <p>AND</p> <p>Writes a fraction that Jim can use to obtain a product less than 9,481</p>
2	<p>Near Standard (Mostly meets criteria)</p> <p>2 correct elements</p> <p>Writes a fraction that Jim can use to obtain a product greater than 9,481 AND</p>

	<p>explains, without actual multiplication, why the product is greater than 9,481 OR Writes a fraction that Jim can use to obtain a product greater than 9,481 AND writes a fraction that Jim can use to obtain a product less than 9,481 OR Explains, without actual multiplication, why the product is greater than 9,481 AND writes a fraction that Jim can use to obtain a product less than 9,481</p>
1	<p>Approaching standard (Partially meets criteria) 1 correct element Writes a fraction that Jim can use to obtain a product greater than 9,481 OR Explains, without actual multiplication, why the product is greater than 9,481 OR Writes a fraction that Jim can use to obtain a product less than 9,481</p>
0	<p>Far Below Standard Incorrect response</p>
Exemplar	
3	<p>Part A $\frac{8}{3}$ OR Any other valid improper fraction AND</p> <p>Part B $\frac{8}{3} \times 9,481$ must be greater than 9,481 because $\frac{8}{3}$ is greater than 1 and multiplying a whole number by a number greater than 1 will give a product greater than 1. OR Other valid explanation AND</p> <p>Part C $\frac{2}{5}$ OR Any other proper fraction</p>

Item # 34

Key Elements	
N/A	
Criteria	
6	<p>Meets Standard (Meets criteria at grade level)</p> <p>6 correct elements</p> <p>Explains why it is possible to glue pictures on $\frac{4}{5}$ of the area but not on $1\frac{3}{4}$ of the area</p> <p>AND</p> <p>Calculates the area of the poster and writes it as a mixed number</p> <p>AND</p> <p>Shows correct work to find the area of the poster</p> <p>AND</p> <p>Writes an equation to find t, the area left for a title</p> <p>AND</p> <p>Writes the area left for a title</p> <p>AND</p> <p>Shows the work to calculate the area left for a title</p>
5	5 correct elements
4	4 correct elements
3	3 correct elements
2	2 correct elements
1	1 correct element
0	<p>Far Below Standard</p> <p>Incorrect response</p>
Exemplar	
6	<p>Part A</p> <p>$1\frac{3}{4}$ is greater than 1. A number greater than 1 times the area is greater than the area. You cannot glue something on an area that is greater than what you have. $\frac{4}{5}$ is less than 1. A number less than 1 times the area is less than the area so it is possible to glue pictures on this fraction of the area.</p> <p>OR</p> <p>Other valid explanation</p> <p>AND</p> <p>Part B</p> <p>$3\frac{1}{8}$ square feet</p> <p>AND</p>

	<p>Area = $2\frac{1}{2} \times 1\frac{1}{4} =$ square feet</p> <p>$\frac{5}{2} \times \frac{5}{4} =$</p> <p>$\frac{25}{8} = 3\frac{1}{8}$</p> <p>OR</p> <p>Other valid work</p> <p>AND</p> <p>Part C</p> <p>$t = 3\frac{1}{8} - \left(\frac{4}{5} \times 3\frac{1}{8}\right)$</p> <p>OR</p> <p>$t = \frac{1}{5} \times 3\frac{1}{8}$</p> <p>OR</p> <p>Other valid equation</p> <p>AND</p> <p>Part D</p> <p>Area = $\frac{5}{8}$ square feet</p> <p>AND</p> <p>$3\frac{1}{8} - \left(\frac{4}{5} \times 3\frac{1}{8}\right) = \frac{25}{8} - \left(\frac{4}{5} \times \frac{25}{8}\right) = \frac{25}{8} - \frac{20}{8} = \frac{5}{8}$</p> <p>OR</p> <p>Other valid work</p>
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Item # 35

Key Elements	
N/A	
Criteria	
6	<p>Meets Standard (Meets criteria at grade level)</p> <p>6 correct elements</p> <p>Writes an appropriate title</p> <p>AND</p> <p>Writes an appropriate label</p> <p>AND</p> <p>Plots the 3 given points</p> <p>AND</p> <p>Plots the 4 remaining points</p> <p>AND</p>

	Writes the capacities of the two jars sold AND Shows work to find the two jars sold
5	5 correct elements
4	4 correct elements
3	3 correct elements
2	2 correct elements
1	1 correct element
0	Far Below Standard Incorrect response
Exemplar	
6	<p>Part A</p> <p style="text-align: center;">Jars of Honey</p> <p style="text-align: center;">Amount (in gallons)</p> <p>OR</p> <p>A line plot with an appropriate title and label. Student adds the given fractions and subtracts the sum from 3 to get 1. The student then divides 1 by 4 to get $\frac{1}{4}$ which he/she marks with four X's along with one X at $\frac{1}{2}$ and two X's at $\frac{3}{4}$.</p> <p>AND</p> <p>Part B</p> <p>A $\frac{3}{4}$-gallon jar and a $\frac{1}{2}$-gallon jar.</p> <p>AND</p> $\frac{3}{4} + \frac{1}{2} = \frac{3}{4} + \frac{2}{4} = \frac{5}{4} = 1\frac{1}{4}$ <p>OR</p> <p>Other valid work</p>



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