

Grade 6 Mathematics Item Specification C1 TA

Task Model 1 Response Type: Multiple Choice, multiple correct response DOK Level 1 6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. <i>For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."</i> Evidence Required: 1. The student uses ratio language to describe a ratio relationship. Tools: None Version 3 Update: Added new example stem 2.	Prompt Features: The student is prompted to identify statements that use ratio language to describe a ratio relationship. Stimulus Guidelines: Context should be familiar to students 11 to 13 years old. TM1 Stimulus: The student is presented with a ratio relationship between two whole-number quantities. Example Stem: A game has green and blue pieces. The ratio of green game pieces to total pieces is 5:12. Select all the statements about the game pieces that are correct. A. The ratio of green pieces to blue pieces is 7:5. B. The ratio of total pieces to blue pieces is 12:7. C. There must be 7 more blue pieces than green pieces. D. The ratio of total pieces to green pieces is 12:5. Answer Choices: Answer choices will be four statements describing the ratio relationship. At least two statements must be correct. Rubric: (1 point) Student selects all the correct statements (e.g., B and D). Response Type: Multiple Choice, multiple correct response Example Stem 2: A punch recipe calls for 3 cups of orange juice for every 2 cups of cranberry juice. Select all of the statements about the recipe that are correct. A. There are 3 cups of orange juice for every 5 cups of punch. B. The ratio of cranberry juice to orange juice is 2 to 3. C. The ratio of orange juice to cranberry juice is 2:1. D. The ratio of cranberry juice to punch is 2:5. Answer Choices: Answer choices will be four statements describing the ratio relationship. At least two statements must be correct. Rubric: (1 point) Student selects all the correct statements (e.g., A, B and D). Response Type: Multiple Choice, multiple correct response
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Grade 6 Mathematics Item Specification C1 TA

Task Model 2 Response Type: Equation/Numeric DOK Level 2 6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. <i>For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar."</i> "We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger." Evidence Required: 2. The student determines the unit rate associated with a real-world ratio. Tools: Calculator	Prompt Features: The student is prompted to identify the unit rate that corresponds to a ratio of real-world quantities. Stimulus Guidelines: - Context should be familiar to students 11 to 13 years old. - Item difficulty can be adjusted via these example methods: - Both numbers and unit rate are whole numbers. - Both numbers are whole numbers and unit rate is a fraction. TM2 Stimulus: The student is presented with a real-world ratio problem. Example Stem: Carl can type 180 words in 2 minutes. How many words per minute can Carl type? Rubric: (1 point) Student enters correct value (e.g., 90). Units should be assumed from the problem. Response Type: Equation/Numeric
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Grade 6 Mathematics Item Specification C1 TA

Task Model 3

Response Type: Fill-in Table

DOK Level 1

6.RP.A.3a

Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

Evidence Required:

3. The student finds missing values in tables of equivalent ratios.

Tools: Calculator

Prompt Features: The student is prompted to find missing values in tables of equivalent ratios.

Stimulus Guidelines:

- If used, context should be familiar to students 11 to 13 years old.
- The values for the table should be whole numbers.
- Tables should be labeled and have two columns and 3–5 rows of data.
- Either one x - or y -value should be missing from the table.
- All table formats in an item should be the same.
- Unit rate should be a whole number or non-complex fraction.
- Item difficulty can be adjusted via these example methods:
 - All numbers and unit rates are whole numbers. Unit rate is given in the table (i.e., 1:3).
 - All numbers and unit rates are whole numbers. Unit rate is not given in the table.
 - All numbers are whole numbers and unit rate is a non-complex fraction.

TM3a

Stimulus: The student is presented with a table that has an equivalent ratio and a single missing value.

Example Stem 1: The table shows the number of tennis balls that fit into a given number of cans. Each can holds the same number of balls.

Cans	Balls
2	6
	15
7	21
9	27

Fill in the missing value in the table.

Example Stem 2: This table contains equivalent ratios between x and y .

x	y
2	6
5	
7	21
9	27

Fill in the missing value in the table.

Rubric: (1 point) Student enters correct missing value (e.g., 5; 15).

Response Type: Fill-in Table

Grade 6 Mathematics Item Specification C1 TA

Task Model 3 Response Type: Fill-in Table DOK Level 2 6.RP.A.3a Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. Evidence Required: 3. The student finds missing values in tables of equivalent ratios. Tools: Calculator	TM3b Stimulus: The student is presented with a table that has an equivalent ratio and two missing values. Example Stem: The table shows the number of tennis balls that fit into a given number of cans. Each can holds the same number of balls. <table border="1" data-bbox="771 436 992 604"> <thead> <tr> <th>Cans</th><th>Balls</th></tr> </thead> <tbody> <tr> <td>1</td><td></td></tr> <tr> <td>4</td><td>12</td></tr> <tr> <td>13</td><td></td></tr> <tr> <td>15</td><td>45</td></tr> </tbody> </table> Fill in the missing values to complete the table. Rubric: (1 point) Student enters the two correct values into the table (e.g., 3 and 39). Response Type: Fill-in Table	Cans	Balls	1		4	12	13		15	45
Cans	Balls										
1											
4	12										
13											
15	45										

Grade 6 Mathematics Item Specification C1 TA

Task Model 4 Response Type: Graphing DOK Level 1 6.RP.A.3a Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. Evidence Required: 4. The student plots coordinate pairs to represent equivalent ratios. Tools: Calculator Accessibility Note: Graphing items are not currently able to be Brailled. Minimize the number of items developed to this TM.	Prompt Features: The student is prompted to plot ordered pairs in the coordinate plane that correspond to ratios in a table. Stimulus Guidelines: • Table should have two columns and 3–5 rows of data. • All table formats in an item should be the same. • The x- and y-values for the table should be whole numbers. • Unit rates should be a whole number or non-complex fraction. • If used, context should be familiar to students 11 to 13 years old. • Graph should have a title and have both axes labeled. • Item difficulty can be adjusted via these example methods: ◦ All numbers are whole numbers. The independent values are all consecutive numbers. ◦ All numbers are whole numbers. Some independent values are consecutive numbers. ◦ All numbers are whole numbers. All independent values are non-consecutive numbers. TM4 Stimulus: The student is presented with a completed table that has an equivalent ratio. Example Stem: The table shows the number of tennis balls that fit into a given number of cans. <table border="1" data-bbox="743 1045 982 1218"> <thead> <tr> <th>Cans</th><th>Balls</th></tr> </thead> <tbody> <tr> <td>2</td><td>6</td></tr> <tr> <td>5</td><td>15</td></tr> <tr> <td>7</td><td>21</td></tr> <tr> <td>8</td><td>24</td></tr> </tbody> </table> Use the Add Point tool to plot the ordered pairs in the coordinate plane. Interaction: Students will be given a graph with axes numbered and labeled appropriately. Students will need the Add Point and Delete tools. Rubric: (1 point) Student correctly plots all coordinate pairs on the graph. Response Type: Graphing	Cans	Balls	2	6	5	15	7	21	8	24
Cans	Balls										
2	6										
5	15										
7	21										
8	24										

Grade 6 Mathematics Item Specification C1 TA

Task Model 5

Response Type:
Fill-in Table

DOK Level 2

6.RP.A.3a

Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

Evidence Required:

5. The student makes tables of equivalent ratios relating quantities with whole-number measurements.

Tools: Calculator

Version 3 Update:

Revised TM5 including prompt features, stimulus guidelines, and example stem.

Prompt Features: The student is prompted to create a table given a ratio.

Stimulus Guidelines:

- Ratios use whole numbers
- Tables should have 3 rows of values

TM5

Stimulus: The student is presented with a partially completed table and information about a specific ratio.

Example Stem: To make popcorn, a movie theater uses 9 tablespoons of oil for each cup of popcorn kernels.

Using this information, complete the table for the missing amounts of oil and popcorn kernels.

Tablespoons of Oil	Cups of Popcorn Kernels
18	
	4
	9

Rubric: (1 point) Student enters the correct missing values in the table (e.g., 2, 36, 81).

Response Type: Fill-in Table

Task Model 6 Response Type: Equation/Numeric DOK Level 2 6.RP.A.3b Solve unit rate problems including those involving unit pricing and constant speed. Evidence Required: 6. The student solves real-world problems involving unit rate. Tools: Calculator	Prompt Features: The student is prompted to identify the solution to problems involving a unit rate. Stimulus Guidelines: • Context should be familiar to students 11 to 13 years old. • Unit rate should be a whole number or non-complex fraction. • Unit of measurement values should be whole numbers appropriate for the given situation. TM6 Stimulus: The student is presented with a real-world problem involving unit rate. Example Stem: Carl types 180 words in 2 minutes. Enter the number of words Carl types in 5 minutes at this rate. Rubric: (1 point) Student enters correct numeric value (e.g., 450). Response Type: Equation/Numeric
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Task Model 7 Response Type: Equation/Numeric DOK Level 2 6.RP.A.3c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. Evidence Required: 7. The student solves mathematical problems involving finding the whole, given a part and the percent. Tools: Calculator	Prompt Features: The student is prompted to solve a mathematical problem involving finding the whole, given a part and the percent. Stimulus Guidelines: • If used, context should be familiar to students 11 to 13 years old. • Percent and total quantities should be whole numbers. • Item difficulty can be adjusted via these example methods: ◦ Benchmark percentages (such as 100% and 50%) are used. ◦ Benchmark percentages (such as 75%, 25%, and 10%) are used. ◦ Non-benchmark percentages are used. TM7 Stimulus: The student is presented with a part and a percent. Enter the unknown value that makes this statement true: 30% of is 60. Rubric: (1 point) Student enters the correct numeric value representing the total amount (e.g., 200). Response Type: Equation/Numeric
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Task Model 8 Response Type: Equation/Numeric DOK Level 2 6.RP.A.3c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. Evidence Required: 8. The student solves real-world and mathematical problems involving finding a percent of a quantity as a rate per 100. Tools: Calculator	Prompt Features: The student is prompted to solve a real-world or mathematical problem involving finding a percent of a quantity as a rate per 100. Stimulus Guidelines: • If used, context should be familiar to students 11 to 13 years old. • Generally percentages and quantities should be whole numbers unless appropriate for the situation. • Item difficulty can be adjusted via these example methods: ◦ Benchmark percentages (such as 100% and 50%) are used. ◦ Benchmark percentages (such as 75%, 25%, and 10%) are used. ◦ Non-benchmark percentages are used. TM8a Stimulus: The student is presented with a part and a whole. Example Stem 1: Janet correctly answers 45 questions on her science test. There are 50 questions on the test. Enter the percent of the questions Janet did not answer correctly. Example Stem 2: Enter the unknown value that makes this statement true: 45 is % of 50. Rubric: (1 point) Student enters the correct numeric value representing the percent (e.g., 10; 90) and 0.90 is not an acceptable answer. Percent symbol (%) is not required for a correct response. Response Type: Equation/Numeric
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Grade 6 Mathematics Item Specification C1 TA

Task Model 8 Response Type: Multiple Choice, multiple correct response DOK Level 1 6.RP.A.3c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. Evidence Required: 8. The student solves real-world and mathematical problems involving finding a percent of a quantity as a rate per 100. Tools: Calculator Version 3 Update: Evidence required statement 9 and TM9 have been retired.	Prompt Features: The student is prompted to identify solution methods for problems involving finding a percent of a quantity as a rate per 100. Stimulus Guidelines: • If used, context should be familiar to students 11 to 13 years old. • Percentages and quantities should be whole numbers. TM8b Stimulus: The student is presented with a real-world or mathematical percent problem. Example Stem 1: In a school with 200 students, 45% are males. Select all expressions that can be used to find the total number of male students. A. $\frac{45}{100} \bullet 200$ B. $\frac{0.45}{100} \bullet 200$ C. $0.45 \bullet 200$ D. $\frac{45}{10} \bullet 200$ Example Stem 2: Select all expressions that can be used to find 45% of 200. A. $\frac{45}{100} \bullet 200$ B. $\frac{0.45}{100} \bullet 200$ C. $0.45 \bullet 200$ D. $\frac{45}{10} \bullet 200$ Answer Choices: At least two expressions must be correct. Rubric: (1 point) Student selects all the correct mathematical expressions (e.g., A and C; A and C). Response Type: Multiple Choice, multiple correct response
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Task Model 10 Response Type: Equation/Numeric DOK Level 2 6.RP.A.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. Evidence Required: 10. The student uses ratio reasoning to manipulate and transform units appropriately when multiplying or dividing quantities. Tools: Calculator Version 3 Update: Revised stimulus guidelines and example stem to eliminate multi-unit conversions.	Prompt Features: The student is prompted to use ratio reasoning to convert measurement units. Stimulus Guidelines: • If used, context should be familiar to students 11 to 13 years old. • Units of measurement should be rational numbers appropriate for the given situation. • Specify measurement relationship when needed (e.g., 1 inch = 2.54 cm). • Item difficulty can be adjusted via these example methods: ◦ All numbers used in conversion are whole numbers. ◦ Some numbers used in conversion are decimals. TM10 Stimulus: The student is presented with a measurement and is asked to convert it to an equivalent measurement. Example Stem: Aaron needs 24 inches of copper wire for an experiment. The wire is sold by the centimeter. Given that 1 inch = 2.54 centimeters, how many centimeters of wire does Aaron need? Rubric: (1 point) Student enters the correct numeric value for the converted unit of measurement [e.g., 60.96 (accept 61 because of the real-word context)]. Response Type: Equation/Numeric
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