

Tennessee Comprehensive Assessment Program / Mathematics

TCAP/CRA PILOT 2012



Task 1 : Basketball Scores Scoring Guide

Task 1. Basketball Scores Task

In the table below, Roberto recorded his team's basketball score every 4 minutes for the first half of the game.

Time in Minutes	4	8	12	16
Score	8	16	24	38

His friend Tom says that the numbers in Roberto's table represent a proportional relationship. Roberto disagrees.

Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.



1. Basketball Scores Task Scoring Guide

The CCSS for Mathematical Content (1 point)

- 7.RP.2a Student explains how to use values in the table to test for proportionality in any of the following ways: _____
- Drawing a diagram iterating the 4-minute, 8-point combination or breaking apart the 16-minute, 38-point combination.
 - Dividing, e.g., 8 points by 4 minutes, 16 points by 8 minutes, 24 points by 12 minutes, and 38 points by 16 minutes; or 4 minutes by 8 points, etc.
 - Scaling up the 4:8 ratio in tabular form.
 - Scaling up the 4:8 ratio in fraction form.
 - Multiplying 8 points and 4 minutes by 2, 3, and 4, since $8 \text{ points} \times 2 = 16 \text{ points}$, etc.; noting $8 \text{ points} \times 4 \neq 38 \text{ points}$.
 - Using a proportion or proportional reasoning (e.g., $\frac{4 \text{ minutes}}{8 \text{ points}} = \frac{8 \text{ minutes}}{x \text{ points}}$ or $\frac{16 \text{ points}}{x \text{ minutes}} = \frac{8 \text{ points}}{16 \text{ minutes}}$); finding the value for 16 minutes is not 32 points.
 - Testing in fraction form.
 - Graphing the scores vs. time in minutes, and noting that no line both contains all four points and passes through (0, 0) or the origin.

Total Content Points _____

The CCSS for Mathematical Practices (4 points)

- MP1 Student tests for proportionality; recognizes need to analyze all the data from the table. _____
(MP1: Make sense of problems and persevere in solving them.)
- MP2 Student correctly abstracts the data from the context and forms ratios, equations, a table or a graph to test the data. Student correctly notes the meaning of the results in the context of the problem. _____
(MP2: Reason abstractly and quantitatively.)
- MP3 Student provides a logical argument that one of the entries in the table, 16 minutes, 38 points, does not meet the conditions of a proportional relationship using ratios, table, equations, or graph. _____
(MP3: Construct viable arguments and critique the reasoning of others.)

MP7 Student's work specifically indicates that the student understands the multiplicative relationship that underlies proportional relationships for all values associated with the relationship. _____

(MP7: Look for and make use of structure.)

Total Practice Points _____

Total Awarded Points _____

The CCSS for Mathematical Content Addressed in This Task

Analyze proportional relationships and use them to solve real-world and mathematical problems.

Recognize and represent proportional relationships between quantities.

7.RP.2a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

The CCSS for Mathematical Practices*

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*Gray text indicates Mathematical Practices not addressed in this task.

Students' responses to a mathematical task provide evidence of what they understand and are able to do in relation to the standards and practices. Across tasks, this cumulative evidence shows students' understanding and abilities within a domain. When students do not respond completely to all parts of a task, they provide insufficient evidence of their mathematical understanding and abilities and therefore do not fully demonstrate the expectations of the standards and practices aligned with that task.


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His friend Tom says that the numbers in Roberto's table represent a proportional relationship. Roberto disagrees.

Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 It doesn't represent a proportional relationship.

$$\frac{4}{8} = 1:2$$

$$\frac{8}{16} = 1:2 \quad \text{but} \quad \frac{16}{38} \neq 1:2$$

$$\frac{12}{24} = 1:2 \quad \frac{16}{38} = 8:19$$

$$8:19 \neq 1:2$$

Guide 1

Litho 70007

Total Content Points: 1 (7.RP.2a)

Total Practice Points: 4 (MP1, MP2, MP3, MP7)

The student uses proportional reasoning to test for a proportional relationship between scores and minutes played (7.RP.2a). The student takes all of the data from the table and creates a series of ratios to test for proportionality (MP2), and she is able to show that the values do not represent a proportional relationship (MP1). The student's work shows that one ratio (16:38) does not equal 1:2 and that the table therefore does not represent a proportional relationship (MP3). The work shown indicates a clear understanding of multiplicative relationships by dividing the score by the time to test for proportionality (MP7).

Total Awarded Points: 5 out of 5


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Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 $\frac{8}{4} = 2$ $\frac{16}{8} = 2$ $\frac{24}{12} = 2$ $\frac{38}{16} = 2\frac{3}{8}$

Roberto is right. The first three scores are proportional with the times, but the last one is not. In order to find out whether something is proportional, divide the bottom number by the top number or the top number by the bottom number as long as you do the same for all of them. If the numbers of the result are the same, it is proportional.

Guide 2

Litho 70324

Total Content Points: 1 (7.RP.2a)

Total Practice Points: 4 (MP1, MP2, MP3, MP7)

The student uses division to test for the proportionality of the relationship between the time and the recorded score every 4 minutes (7.RP.2a). The student correctly analyzes all of the data from the table, and is able to show that the data does not represent a proportional relationship (MP1). The student takes all of the available data from the table, and is able to use division equations to test for proportionality (MP2). Proportionality is contextualized by describing the use of a unit rate to check all the data in the table (MP3). The student uses fractions to show multiplicative relationships (MP7) and provides a clear explanation to address how proportionality was tested.

Total Awarded Points: 5 out of 5

Task 1. Basketball Scores Task


Guide 3

In the table below, Roberto recorded his team's basketball score every 4 minutes for the first half of the game.

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Score	8	16	24	38

His friend Tom says that the numbers in Roberto's table represent a proportional relationship. Roberto disagrees.

Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 You have to see if all the numbers have the same ratio. In this case Roberto is right.

$$\frac{4}{8} \quad \frac{8}{16} \quad \frac{12}{24} \quad \frac{16}{38}$$
$$\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{8}{19}$$

Guide 3

Litho 70193

Total Content Points: 1 (7.RP.2a)

Total Practice Points: 3 (MP1, MP7)

This student shows an understanding of proportionality by simplifying the data from the table to test for common ratios (7 RP.2a). All of the data are analyzed, and the student correctly states that “Roberto is right” (MP1). The student uses fractions to show the relationship between the time and scores, but does not explain why the fractions show that Roberto is correct (no credit for MP3). The work shown is correct and indicates that the student understands the multiplicative relationship for all the values (MP7), but fails to state that the result of $\frac{16}{38}$ simplified to $\frac{8}{19}$ is not proportional to the other scores and times (no credit for MP2).

Total Awarded Points: 3 out of 5


Task 1. Basketball Scores Task**Guide 4**

In the table below, Roberto recorded his team's basketball score every 4 minutes for the first half of the game.

Time in Minutes	4	8	12	16
Score	8	16	24	38

His friend Tom says that the numbers in Roberto's table represent a proportional relationship. Roberto disagrees.

Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 First off, let the time in minutes be x ; and the score be y . Take any two values of the y , + find the difference of them. Then take the same two x 's that correspond with the y 's, + find the difference of them as well. Then put the difference of the y 's over the difference of the x 's and simplify. Keep doing this on different sets of numbers. If the answer stays consistent, then the set is proportional. If not, the set is not proportional. In the case of this set, it is not proportional because the last ordered pair is not proportional.

Guide 4

Litho 70337

Total Content Points: 1 (7.RP.2a)

Total Practice Points: 3 (MP1, MP3, MP7)

This student gives a clear explanation for a process to test proportionality by looking for consistent ratios in the differences between numbers from the table (7.RP.2a). The student recognizes the need to analyze all of the data in the table, and points out that the last entry shows that the relationship is not proportional (MP1). The student provides a logical argument that the relationship is not proportional (MP3). The explanation is precise and demonstrates an understanding of proportionality and how it relates to the slope of a line (MP7), but lacks specific data from the table (no credit for MP2).

Total Awarded Points: 4 out of 5


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His friend Tom says that the numbers in Roberto's table represent a proportional relationship. Roberto disagrees.

Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 Tom is Right, because the numbers go up equal $\frac{1}{2}$.

$\frac{16}{38} = \frac{1}{2}$ $\frac{12}{24} = \frac{1}{2}$ $\frac{8}{16} = \frac{1}{2}$ $\frac{4}{8} = \frac{1}{2}$

Guide 5

Litho 70372

Total Content Points: 1 (7.RP.2a)

Total Practice Points: 2 (MP1, MP7)

The student demonstrates understanding of common ratios by simplifying the data from the table to test for proportionality by checking for equivalent ratios (7.RP.2a). The work shown analyzes all the data from the table (MP1) and demonstrates the multiplicative relationship of all values by simplifying fractions to identify a proportional relationship as one with a common unit rate (MP7). However, incorrectly simplifying $\frac{16}{38}$ to $\frac{1}{2}$ results in an incorrect answer and an argument that the data is proportional (no credit for MP3) which is incorrect in the context of this task (no credit for MP2).

Total Awarded Points: 3 out of 5

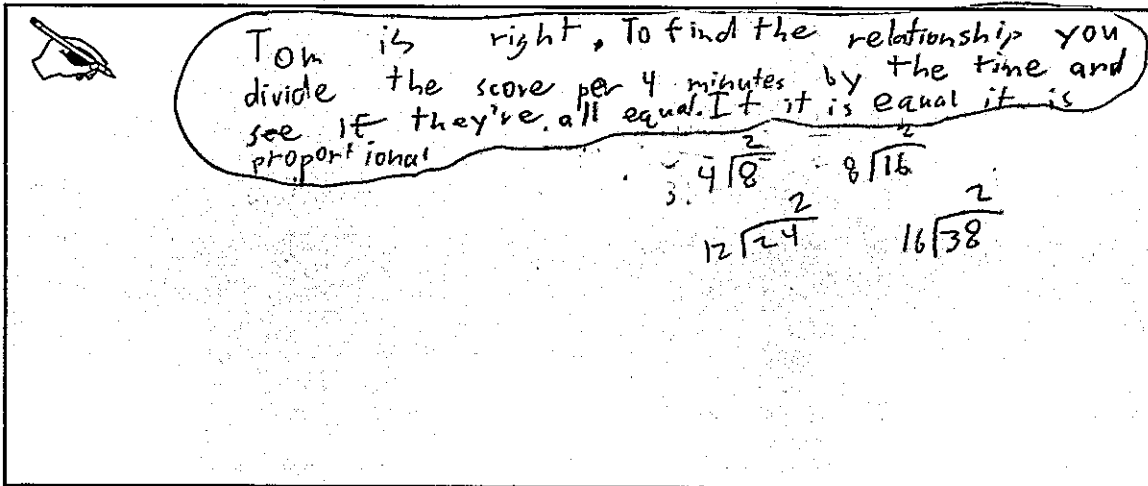
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Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.



Tom is right. To find the relationship you divide the score per 4 minutes by the time and see if they're all equal. If it is equal it is proportional.

$$\begin{array}{r} 2 \\ 4 \overline{) 8} \\ \underline{8} \\ 0 \end{array} \quad \begin{array}{r} 2 \\ 8 \overline{) 16} \\ \underline{16} \\ 0 \end{array}$$

$$\begin{array}{r} 2 \\ 12 \overline{) 24} \\ \underline{24} \\ 0 \end{array} \quad \begin{array}{r} 2 \\ 16 \overline{) 38} \\ \underline{32} \\ 6 \end{array}$$

Guide 6

Litho 70139

Total Content Points: 1 (7.RP.2a)

Total Practice Points: 2 (MP1, MP7)

The student uses division to test the proportionality of the relationship between basketball scores and time played (7.RP.2a). The work shown analyzes all the data from the table (MP1) and provides calculations for obtaining proportions (MP7). The student incorrectly divided $\frac{38}{16}$, which resulted in an incorrect answer of 2. The student fails to provide a logical argument that the data do not meet the conditions of a proportional relationship (no credit for MP3), which is incorrect in the context of this task (no credit for MP2).

Total Awarded Points: 3 out of 5


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Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.



They are not proportional.
4 - 8 - 12 - 16
8 → 16 → 24 → 32

Guide 7

Litho 70142

Total Content Points: 1 (7.RP.2a)

Total Practice Points: 1 (MP1)

The student uses a diagram to scale up the values in the table, showing that 16 minutes multiplied by 2 equals 32 (7.RP.2a), and this approach shows that the numbers in the table have a non-proportional relationship (MP1). The student fails to clearly explain either how the data was analyzed (no credit for MP2) or the results, and there is no argument presented that Roberto is correct (no credit for MP3). Given the failure to provide additional work or explanation, the response does not demonstrate understanding of the multiplicative nature of proportional relationships clearly enough for credit (no credit for MP7).

Total Awarded Points: 2 out of 5


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Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 Time goes up by 4's.
Score goes up by 8 first 3 then
Changes pattern.
This is non-proportional.

Total Content Points: 0

Total Practice Points: 1 (MP1)

The student does not explain how to accurately test for proportionality utilizing values from the table (no credit for 7.RP.2a), although the student does correctly recognize that the numbers from the table do not represent a proportional relationship. The student's explanation that the time and scores go up but change pattern at the last entry on the table indicates that data from the table was analyzed (MP1), but no specific data (no credit for MP2), results, or logical argument of a non-proportional relationship are provided (no credit for MP3). No indication is provided that the student understands the multiplicative relationship that underlies proportional relationships (no credit for MP7).

Total Awarded Points: 1 out of 5


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His friend Tom says that the numbers in Roberto's table represent a proportional relationship. Roberto disagrees.

Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 Roberto is right, because when you double 4, 8, and 12 the product ended up +4 every 4 time. When I tried to double 16 it was only 32 and not 38.

8	16	24	38
-4	-8	-12	-16
4	8	12	22

Total Content Points: 0

Total Practice Points: 1 (MP1)

The student does not provide a clear explanation or work showing how to use the data in the table to test for proportionality (no credit for 7.RP.2a). The explanation to double the time shows that the student has analyzed the data, and the last entry in the table was seen as evidence that the relationship shown is non-proportional (MP1), but the student fails to provide accurate results (no credit for MP2) and a logical argument that the relationship is not proportional (no credit for MP3). Although work showing subtraction is provided, the results are not clear and the explanation of the student's process does not clearly indicate understanding of multiplicative and proportional relationships (no credit for MP7).

Total Awarded Points: 1 out of 5


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Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 Tom is right because every 4 minutes it goes up 8 points.

Total Content Points: 0

Total Practice Points: 0

The student does not demonstrate an ability to use the data from the table to test for proportionality (no credit for 7.RP.2a). The student provides an inaccurate answer (no credit for MP3) and the data from the table is not correctly analyzed (no credit for MP1). Although a brief explanation is provided, it includes only part of the data from the table (no credit for MP2), and no results are given. The failure to provide work and a detailed explanation demonstrates a lack of understanding of how to determine proportional relationships (no credit for MP7).

Total Awarded Points: 0 out of 5


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Who is right? Explain to Roberto and Tom how to test the data in the table to see whether or not the relationship is proportional.

 Roberto, it is not proportional. You find out if the x plus another x equals the y .

Total Content Points: 0

Total Practice Points: 0

This response does not demonstrate knowledge of how to use data in a table to test for proportionality (no credit for 7.RP.2a). The student does not show any analysis of specific data from the table (no credit for MP1, no credit for MP2) and, although the student claims that the relationship shown is not proportional, the explanation for determining this is incorrect and unclear (no credit for MP3). Although a vague explanation utilizing x and y variables is given, the student does not provide results based on using these variables. Failure to provide work and a detailed explanation including specific data demonstrates a lack of understanding of multiplicative and proportional relationships (no credit for MP7).

Total Awarded Points: 0 out of 5