Tennessee Comprehensive Assessment Program / Mathematics

TCAP/CRA 2012-2013

4

Task 2: Portion of a Whole Task

NOTE: This is the universally scored task for Grade 4. Please visit www.tncore.org for more information on Phase II updates and changes.

Full Scoring Guide

Task 2. Portion of a Whole Task

a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 =$ _____ ○ ○ ○ ○ ○ ○

$\frac{3}{4} \times 8 =$ _____ □ □ □ □ □ □ □ □

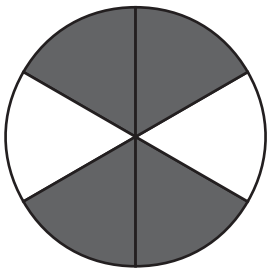
$\frac{1}{5} \times 10 =$ _____ △ △ △ △ △ △ △ △ △ △

b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

$2 \times \frac{2}{6}$

$4 \times \frac{1}{6}$

$2 \times \frac{1}{3}$



2. Portion of a Whole Task Scoring Guide

The CCSS for Mathematical Content (2 points)

4.NF.4b(a) The student calculates the products of fractions and whole numbers, and writes correct answers in the boxes in Part A. _____

4.NF.4b(b) The student demonstrates that the same fraction model can be represented by multiple expressions by providing a valid explanation for how $2\times\frac{2}{6}$, $4\times\frac{1}{6}$, and $2\times\frac{1}{3}$ are evident in the model in part b, through equations or an explanation, or showing work indicating that $2\times\frac{2}{6}$, $4\times\frac{1}{6}$, and $2\times\frac{1}{3}$ are equivalent. _____

Total Content Points _____

The CCSS for Mathematical Practice (2 points)

MP3 The student constructs an argument in Part B that supports through words and references to the model that multiplying a whole number by a fraction can be represented by multiple equivalent expressions. _____

(MP3: Construct viable arguments and critique the reasoning of others.)

MP4 The student shades the accurate portion of the models in Part A. _____

(MP4: Model with mathematics.)

Total Practice Points _____

Total Awarded Points _____

The CCSS for Mathematical Content Addressed in This Task

Build fractions from unit fractions by applying and extending previous understanding of operations on whole numbers.

4.NF.4b Understand a multiple of *a*/*b* as a multiple of 1/*b*, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 x (2/5) as 6 x (1/5), recognizing this product as 6/5. (In general, n x (a/b) = (n x a)/b.)*

The CCSS for Mathematical Practice*

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 that are 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.

Task 2. Portion of a Whole Task

a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 =$ 4

$\frac{3}{4} \times 8 =$ 6

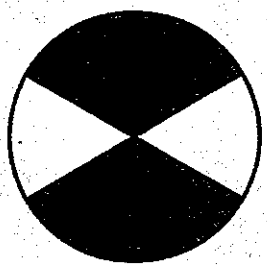
$\frac{1}{5} \times 10 =$ 2

b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

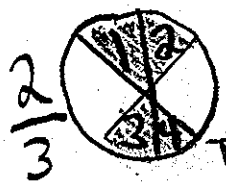
$2 \times \frac{2}{6}$

$4 \times \frac{1}{6}$

$2 \times \frac{1}{3}$



It represents $2 \times \frac{2}{6}$ because it equals 2,3.



4 reduces down to 2. There are 6 total pieces. It is reduced to 3.

4 goes down to 2. 6 total pieces. It's reduced into 3

It represents $2 \times \frac{1}{3}$, because it equals 2/3 too.

It represents $4 \times \frac{1}{6}$, because it equals 2,3.

4 is shaded in. 4 reduces into 2. 6 total pieces it's brought down to 3.

They all represent the model because they all equal 2,3.

Guide 1 Litho 3185

Total Content Points: 2 (4.NF.4b(a), 4.NF.4b(b))

Total Practice Points: 2 (MP3, MP4)

The student calculates the product of fractions and whole numbers. The student writes correct answers in the boxes in Part A and calculates correct products in Part B, showing that the given expressions in Part B all equal $\frac{2}{3}$ (4.NF.4b(a), 4.NF.4b(b)). The student constructs a viable argument that provides a valid explanation, using words and referring to the fraction model, for how $2\times\frac{2}{6}$, $4\times\frac{1}{6}$, and $2\times\frac{1}{3}$ are evident in the model in Part B, demonstrating that the same fraction model can be represented by multiple expressions (MP3). The student models with mathematics by shading the accurate portion of the models in Part A (MP4).

Total Awarded Points: 4 out of 4

Task 2. Portion of a Whole Task

a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 = \frac{12}{3} = 4$

$\frac{3}{4} \times 8 = \frac{24}{4} = 6$

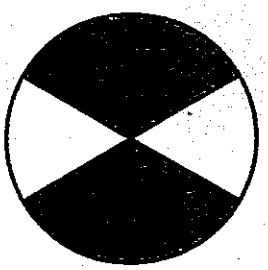
$\frac{1}{5} \times 10 = \frac{10}{5} > 2$

b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

1) $2 \times \frac{2}{6}$

2) $4 \times \frac{1}{6}$

3) $2 \times \frac{1}{3}$



$\frac{2}{1} \times \frac{2}{6} = \frac{4}{6} > \frac{1}{2}$

$\frac{4}{1} \times \frac{1}{6} = \frac{4}{6}$

$\frac{2}{1} \times \frac{1}{3} = \frac{2}{3}$

1) $2 \times \frac{2}{6} = \frac{4}{6}$ - so does the drawing

2) $4 \times \frac{1}{6} = \frac{4}{6}$ so does "number 1" & the circle

3) $2 \times \frac{1}{3} = \frac{2}{3}$ > wich is the reduced fraction of $\frac{4}{6}$

Litho#: 3223

Guide 2 Litho 3223

Total Content Points: 2 (4.NF.4b(a), 4.NF.4b(b))

Total Practice Points: 2 (MP3, MP4)

The student calculates the product of fractions and whole numbers. The student writes correct answers in the boxes in Part A and calculates the correct products for the expressions in Part B (4.NF.4b(a), 4.NF.4b(b)). The student constructs a viable argument that provides a valid explanation using words and equations for how $2\times\frac{2}{6}$, $4\times\frac{1}{6}$, and $2\times\frac{1}{3}$ are evident in the model in Part B, demonstrating that the same fraction model can be represented by multiple expressions (MP3). The student models with mathematics by shading the accurate portion of the models in Part A (MP4).

Total Awarded Points: 4 out of 4

Task 2. Portion of a Whole Task

a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 =$ 4

$\frac{3}{4} \times 8 =$ 6

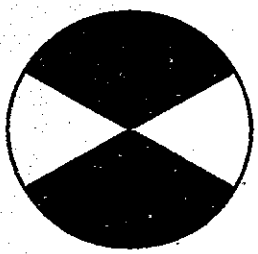
$\frac{1}{5} \times 10 =$ 2

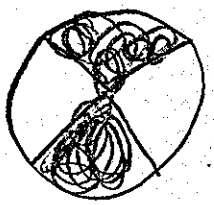
b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

$2 \times \frac{2}{6} = \frac{4}{6}$

$4 \times \frac{1}{6} = \frac{4}{6}$

$2 \times \frac{1}{3} = \frac{2}{3}$





$= \frac{2}{4}$ - numerator because two piece are shaded in so the numerater is two and the demonater is four. - divide - denominator

Guide 3 Litho 3271

Total Content Points: 2 (4.NF.4b(a), 4.NF.4b(b))

Total Practice Points: 1 (MP4)

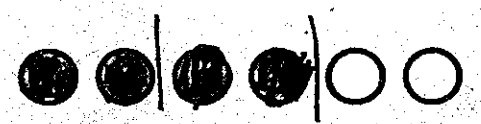
The student calculates the product of fractions and whole numbers. The student writes the correct answers in the boxes in Part A and calculates correct products for the expressions in Part B (4.NF.4b(a), 4.NF.4b(b)). The student models with mathematics by shading the accurate portions (4, 6, 2) of the models in Part A (MP4). The student shows that the expressions in Part B equal $\frac{4}{6}$ or $\frac{2}{3}$. The student does not understand the fraction model in Part B, and therefore does not provide a valid explanation that the same fraction model can be represented by multiple expressions (no credit for MP3).

Total Awarded Points: 3 out of 4

Task 2. Portion of a Whole Task

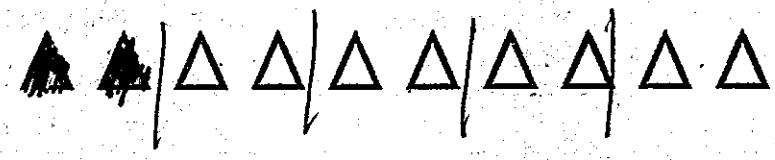
a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 = 4$



$\frac{3}{4} \times 8 = 6$

$\frac{1}{5} \times 10 = 2$

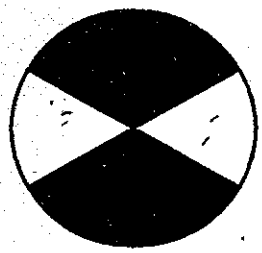


b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

$2 \times \frac{2}{6}$

$4 \times \frac{1}{6}$

$2 \times \frac{1}{3}$



$2 \times \frac{1}{3} = \frac{2}{3}$

$2 \times \frac{2}{6} = \frac{4}{6} = \frac{2}{3}$

$4 \times \frac{1}{6} = \frac{2}{3}$

Guide 4 Litho 3261

Total Content Points: 2 (4.NF.4b(a), 4.NF.4b(b))

Total Practice Points: 1 (MP4)

The student calculates the product of fractions and whole numbers. The student writes the correct answers in the boxes in Part A and calculates the correct products for the expressions in Part B (4.NF.4b(a), 4.NF.4b(b)). The student models with mathematics by shading the accurate portions of the whole in Part A (MP4). Although the student indicates that the expressions in Part B equal $\frac{2}{3}$, the answer to the expressions is not connected to the fraction model, and therefore does not provide a valid explanation demonstrating that the same fraction model can be represented by multiple expressions (no credit for MP3).

Total Awarded Points: 3 out of 4

Task 2. Portion of a Whole Task

a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 =$ 4

1 2 3 4 5 6

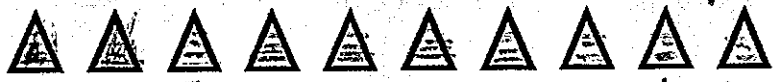
I divide them all into 3, and for every 1, I add 2.

$\frac{3}{4} \times 8 =$ 6

1 2 3 4 5 6 7 8

• divide into 4, and for every 1, I add 3.

$\frac{1}{5} \times 10 =$ 2



• I divide them into 5, and for every 1, I add 1

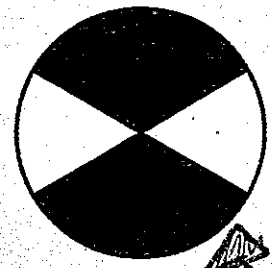
1 2 3 4 5 6 7 8 9 10

b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

$2 \times \frac{2}{6}$

$4 \times \frac{1}{6}$

$2 \times \frac{1}{3}$



When multiplying fractions, I just add a 1 to the whole number.

Ex.

$\frac{2}{1} \times \frac{2}{6} = \frac{4}{6}$

$\frac{2}{1} \times \frac{2}{6} = \frac{4}{6}$

$\frac{4}{1} \times \frac{1}{6} = \frac{4}{6}$

$\frac{2}{1} \times \frac{1}{3} = \frac{2}{3}$ - which is a simplified version of $\frac{4}{6}$

They all come out as $\frac{4}{6}$.

Guide 5 Litho 3207

Total Content Points: 2 (4.NF.4b(a), 4.NF.4b(b))

Total Practice Points: 1 (MP4)

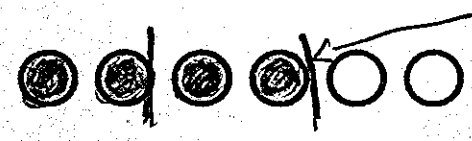
The student calculates the product of fractions and whole numbers. The student writes correct answers in the boxes in Part A and calculates correct products in Part B (4.NF.4b(a), 4.NF.4b(b)). The student models with mathematics by shading the accurate portions of the whole in Part A (MP4). The student does not refer to the fraction model in the explanation in Part B, and the explanation of how to multiply a fraction by a whole number is unclear (no credit for MP3).

Total Awarded Points: 3 out of 4

Task 2. Portion of a Whole Task

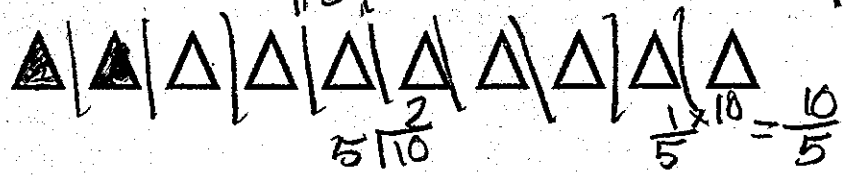
a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 =$ 4



$\frac{3}{4} \times 8 =$ 6

$\frac{1}{5} \times 10 =$ 2

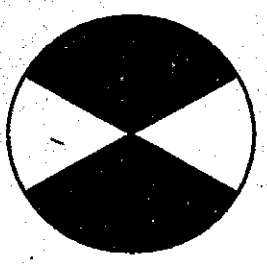


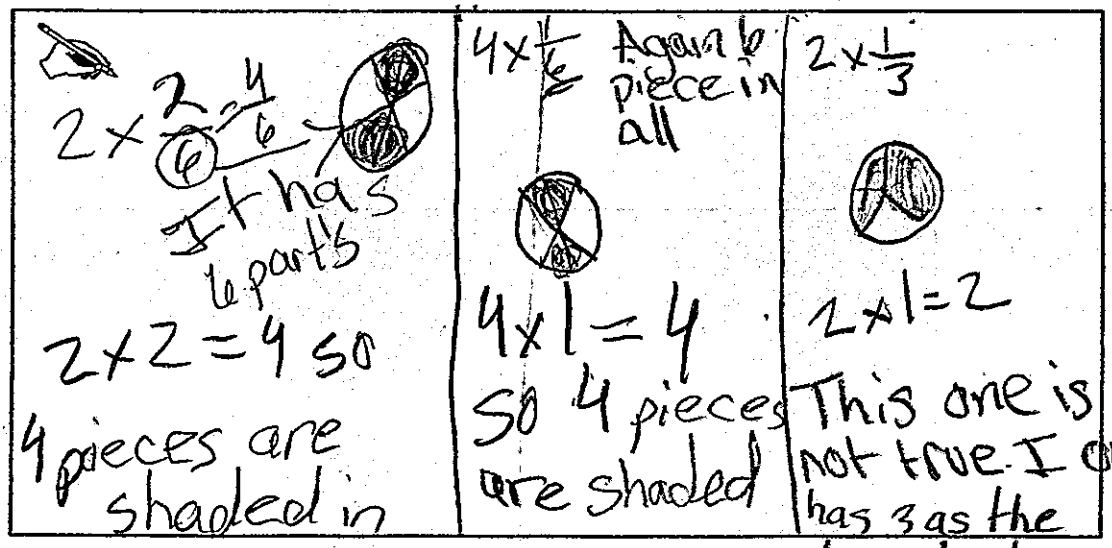
b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

$2 \times \frac{2}{6}$

$4 \times \frac{1}{6}$

$2 \times \frac{1}{3}$





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Guide 6 Litho 3265

Total Content Points: 1 (4.NF.4b(a))

Total Practice Points: 1 (MP4)

The student calculates the product of fractions and whole numbers. The student writes the correct answers in Part A (4.NF.4b(a)). The student models with mathematics by shading the accurate portion of the whole in Part A (MP4). The student has not constructed a viable argument for how $2\times\frac{2}{6}$, $4\times\frac{1}{6}$, and $2\times\frac{1}{3}$ are evident in the model in Part B, as the explanation for $2\times\frac{1}{3}$ is incorrect, and shows the student does not recognize the equivalence between $\frac{2}{3}$ and $\frac{4}{6}$ (no credit for MP3, no credit for 4.NF.4b(b)).

Total Awarded Points: 2 out of 4

Task 2. Portion of a Whole Task

a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$2 \times \frac{2}{3} = \frac{4}{6}$ $2 \times 2 = 4$, $3 \times 2 = 6$

$4 \times \frac{2}{8} = \frac{6}{8}$ $3 \times 2 = 6$, $4 \times 2 = 8$

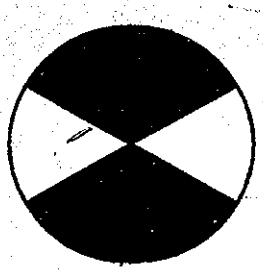
$5 \times \frac{1}{10} = \frac{5}{10}$ $1 \times 5 = 5$, $5 \times 5 = 10$

b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

$2 \times \frac{2}{6} = \frac{4}{6}$

$4 \times \frac{1}{6}$ $\frac{4}{6}$

$2 \times \frac{1}{3}$ $\frac{2}{3}$



Because the numerater has to add two to it.

Guide 7 Litho 3277

Total Content Points: 1 (4.NF.4b(b))

Total Practice Points: 1 (MP4)

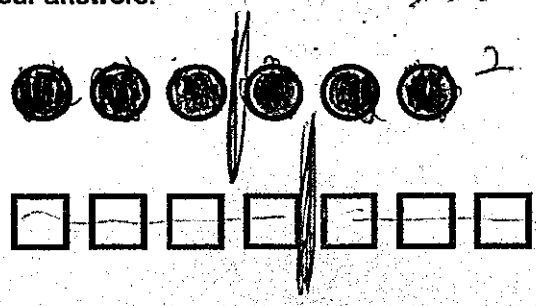
The student calculates the products of fractions and whole numbers. The student calculates correct products in Part B (4.NF.4b(b)), but the answers in Part A are incorrect (no credit for 4.NF.4b(a)). The student accurately shades in the models based on the multiplication equations 2 x 2 = 4, 3 x 2 = 6, and 1 x 5 = 5 in Part A (MP4). The explanation in Part B is incorrect, and does not demonstrate how multiplying a whole number by a fraction can be represented by multiple equivalent expressions (no credit for MP3).

Total Awarded Points: 2 out of 4

Task 2. Portion of a Whole Task

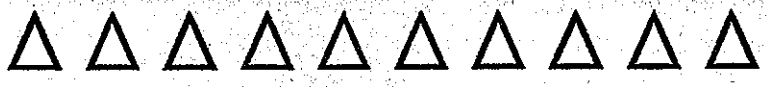
a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 =$ 4



$\frac{3}{4} \times 8 =$ _____

$\frac{1}{5} \times 10 =$ _____

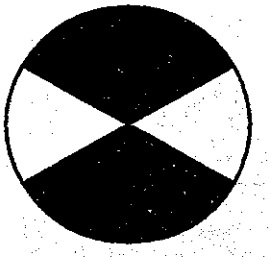


b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

$2 \times \frac{2}{6}$ $\frac{4}{6}$

$4 \times \frac{1}{6}$ $\frac{4}{6}$

$2 \times \frac{1}{3}$ $\frac{2}{3}$



Guide 8 Litho 3253

Total Content Points: 1 (4.NF.4b(b))

Total Practice Points: 0

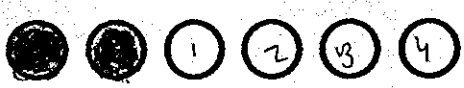
The student calculates the product of fractions and whole numbers. The student calculates correct products in Part B (4.NF.4b(b)). The student only calculates the product of one of the expressions in Part A, which is insufficient for credit (no credit for 4.NF.4b(a)). The student does not attempt an explanation for how $2\times\frac{2}{6}$, $4\times\frac{1}{6}$, and $2\times\frac{1}{3}$ are evident in the model in Part B (no credit for MP3). The student does not shade the accurate portion of the whole in Part A (no credit for MP4).

Total Awarded Points: 1 out of 4

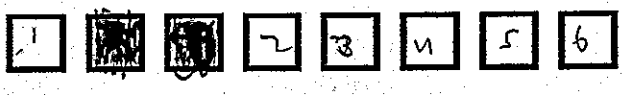
Task 2. Portion of a Whole Task

a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 =$ 4

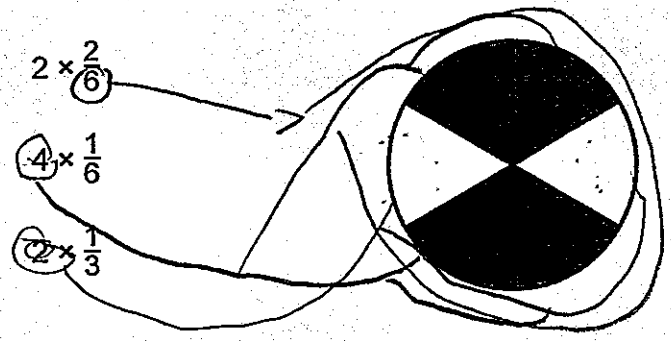


$\frac{3}{4} \times 8 =$ 6



$\frac{1}{5} \times 10 =$ 2

b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.



Litho#: 3215

Guide 9 Litho 3215

Total Content Points: 1 (4.NF.4b(a))

Total Practice Points: 0

The student calculates the product of fractions and whole numbers. The student writes correct answers in the boxes in Part A (4.NF.4b(a)). The student leaves the correct number of shapes unshaded in the first two models in Part A, but does not shade in any part of the third model (no credit for MP4). Although the student has attempted to indicate how the model in Part B represents the expressions shown, the student's work is too unclear to serve as a valid explanation, and the student does not clearly show understanding that the expressions in Part B are equivalent (no credit for MP3, no credit for 4.NF.4b(b)).

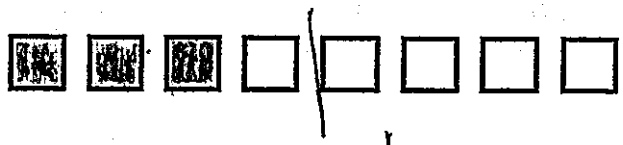
Total Awarded Points: 1 out of 4

Task 2. Portion of a Whole Task

a. Find the products. Write the answers in the spaces provided. Shade the models to show your thinking or prove your answers.

$\frac{2}{3} \times 6 =$ _____

$\frac{3}{4} \times 8 =$ _____



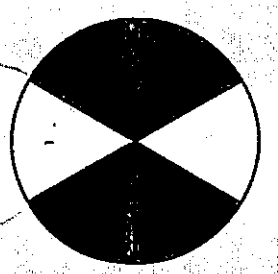
$\frac{1}{5} \times 10 =$ _____

b. The fraction model below represents each of the expressions beside it. Explain how you know the model represents each of the expressions.

$2 \times \frac{2}{6}$

$4 \times \frac{1}{6}$

$2 \times \frac{1}{3}$



I know that the model represents $2 \times \frac{2}{6}$ because if you divide the circle into two parts then see how there are two parts shaded out of six parts. I know that the model represents $4 \times \frac{1}{6}$ because if you seprerate the circle into four parts then you see how there is one part shaded out of six. I know that the model is $2 \times \frac{1}{3}$ because if you divide the circle into two parts and then theres 3 on each side then you see how 2 is colored in and 1 of the isn't.

GO ON TO THE NEXT PAGE.

Litho#: 13045

Guide 10 Litho 13045

Total Content Points: 0

Total Practice Points: 0

The student has not found the products of fractions and whole numbers. The student does not write correct answers in the boxes in Part A and does not calculate the correct products for the expressions in Part B (no credit for 4.NF.4b(a), no credit for 4.NF.4(b)). The student shades in the models in Part A to indicate the fractions in the expressions shown, but there is no recognition that the models need to represent the products of the expressions given (no credit for MP4). The student attempts an explanation in Part B, but the explanation given is incorrect (no credit for MP3).

Total Awarded Points: 0 out of 4