

Tennessee Comprehensive Assessment Program

TCAP/CRA 2013



5

Anchor Set

Grade 5 – Multiplying Fractions Task

SECURE MATERIAL - Reader Name: _____

Tennessee Comprehensive Assessment Program

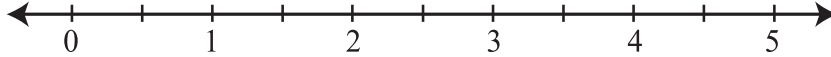
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Part 2: Constructed Response Task Section

Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

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



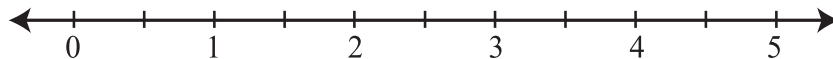
Without calculating, explain how you decided where to place the estimated product on the number line.

A large empty rectangular box for writing an explanation. In the top-left corner of the box, there is a small icon of a hand holding a pencil, indicating where to start writing.



Part 2: Constructed Response Task Section

b. $\frac{4}{6} \times \frac{1}{2}$





Without calculating, explain how you decided where to place the estimated product on the number line.

A large rectangular box for writing an explanation. In the top-left corner of the box, there is a small icon of a hand holding a pencil, indicating where to start writing.



Part 2: Constructed Response Task Section

- c. Calculate each expression.


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

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


Scoring Guide

The CCSS for Mathematical Content (3 points)

5.NF.B.5bx Explains that when multiplying $\frac{4}{6} \times 2$ the product will be: _____

- larger than $\frac{4}{6}$ because there are two groups of $\frac{4}{6}$
- smaller than 2 because there is a portion of two wholes **(1 Point)**

5.NF.B.5bz Explains that when multiplying $\frac{4}{6} \times \frac{1}{2}$ the product will be: _____

- smaller than $\frac{4}{6}$ because the product is half the size of $\frac{4}{6}$,

OR

- smaller than $\frac{1}{2}$ because $\frac{4}{6}$ is a portion of $\frac{1}{2}$. **(1 Point)**

5.NF.B4 Finds the product for each of the expressions $\frac{4}{6} \times 2$ and $\frac{4}{6} \times \frac{1}{2}$. **(1 Point)** _____

The CCSS for Mathematical Practice (2 points)

MP3 Justifies his/her placement of the product for each of the two expressions with mathematical reasoning, even if the product is not accurately calculated. **(1 Point)** _____
(MP3: Construct viable arguments and critique the reasoning of others.)

MP4 Accurately estimates the products on the number line. In Part A the estimate is at least 1 and _____
is less than 2. In Part B the estimate is greater than 0 and less than $\frac{1}{2}$. **(1 Point)**
(MP4: Model with mathematics.)

TOTAL POINTS: 5

The CCSS for Mathematical Content Addressed In This Task

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

5.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

5.NF.B.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.

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 type indicates Mathematical Practices not addressed in this assessment.

1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

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



Without calculating, explain how you decided where to place the estimated product on the number line.



The product will be less than 2 because $\frac{4}{6}$ is less than 1. $\frac{4}{6} \times 2$ is two parts and not two wholes. I know $\frac{4}{6}$ is more than $\frac{1}{2}$ and $\frac{1}{2} \times 2 = 1$, so $\frac{4}{6} \times 2$ is more than 1.

A-1b

b. $\frac{4}{6} \times \frac{1}{2}$



Without calculating, explain how you decided where to place the estimated product on the number line.



I know that $\frac{4}{6}$ is less than 1 so

$\frac{4}{6} \times \frac{1}{2}$ is less than $1 \times \frac{1}{2}$ because

$\frac{4}{6} \times \frac{1}{2}$ is a part of $\frac{1}{2}$.

A-1c

c. Calculate each expression.



$$\frac{4}{6} \times 2 = \frac{8}{6} \text{ or } 1\frac{2}{6}$$

$$\frac{4}{6} \times 2 = \frac{4}{6} \times \frac{2}{1} = \frac{8}{6}$$



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

$$\frac{4}{6} \times \frac{1}{2} = \frac{4}{12} = \frac{1}{3}$$

Anchor 1

Litho 0083

Total Content Points: 3 (5.NF.B.5bx, 5.NF.B.5bz, 5.NF.B.4)

Total Practice Points: 2 (MP3, MP4)

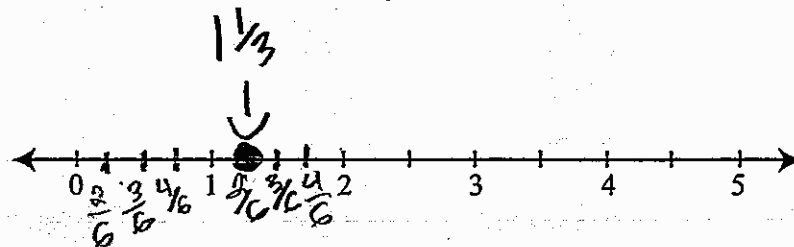
In Part A, the student explains that the product of $2 \times \frac{4}{6}$ will be less than 2 because multiplying 2 by $\frac{4}{6}$ is taking parts of two wholes, and that the product will also be larger than 1 (5.NF.B.5bx). In Part B, the student uses the fact that $\frac{4}{6}$ is less than 1 to successfully explain why the product of $\frac{1}{2} \times \frac{4}{6}$ will be less than $\frac{1}{2}$ (5.NF.B.5bz). The student correctly calculates the products for the given expressions in Part C (5.NF.B.4). The explanations provided in Parts A and B comparing $\frac{4}{6}$ to 1 successfully use mathematical reasoning to explain the placement of the points (MP3). The student models with mathematics in Parts A and B by accurately placing the products on the given number lines (MP4).

Total Awarded Points: 5

1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

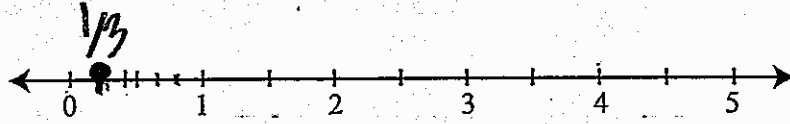
a. $\frac{4}{6} \times 2$



Without calculating, explain how you decided where to place the estimated product on the number line.

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


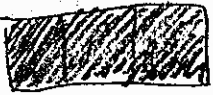

b. $\frac{4}{6} \times \frac{1}{2}$

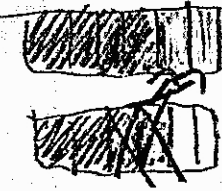




Without calculating, explain how you decided where to place the estimated product on the number line.

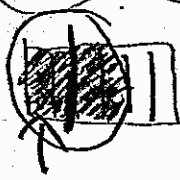
Hand-drawn diagram illustrating the multiplication of $\frac{1}{3}$ by $\frac{2}{3}$. On the left, a rectangular bar is divided into 3 equal parts, with the first part shaded. An arrow points to this bar. In the middle, there is a multiplication sign \times followed by another rectangular bar divided into 3 equal parts, with the first two parts shaded. To the right of this is an equals sign $=$ followed by a rectangular bar divided into 6 equal parts, with the first two parts shaded. Below this bar is a wavy line and another rectangular bar divided into 6 equal parts, with the first two parts shaded. Handwritten text below the first bar reads: "half of this is $\frac{2}{6}$ of $\frac{1}{3}$ ".

c. Calculate each expression.

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



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



half of it

Anchor 2

Litho 0088

Total Content Points: 3 (5.NF.B.5b, 5.NF.B.5b, 5.NF.B.4)

Total Practice Points: 1 (MP4)

In Part A, the student uses a diagram to explain why multiplying a given number (2) by a fraction less than $1\left(\frac{4}{6}\right)$ always results in a product smaller than the given number. The diagram depicts portions of two wholes being combined for a result that is smaller than 2 (5.NF.B.5b). In Part B, the student uses a diagram to explain why multiplying another given number $\left(\frac{4}{6}\right)$ by a fraction less than $1\left(\frac{1}{2}\right)$ results in a product smaller than the given number. The diagram depicts 6 blocks, 4 of which are shaded. The shaded portion is divided in half, producing a result that is visually smaller in size than the original $\left(\frac{4}{6}\right)$

(5.NF.B.5b). The student multiplies a fraction by a whole number $\left(\frac{4}{6} \times 2\right)$ and by a

fraction $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and finds correct products $\left(1\frac{1}{3}\right)$ —given in Part A, $\frac{1}{3}$ —given in

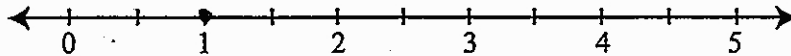
Part B) for each expression (5.NF.B.4). In Parts A and B, the student does not provide any justification, beyond the calculation of the exact numerical values of the products, for where the dots were placed on the number line. There is no evidence that the student attempted to estimate the products (no credit for MP3). The student models with mathematics in Parts A and B by accurately placing the products on the given number lines (MP4).

Total Awarded Points: 4 out of 5

1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

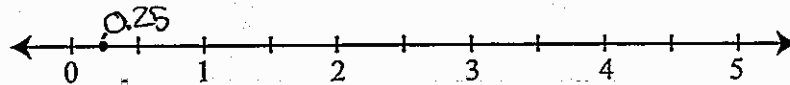
a. $\frac{4}{6} \times 2$ -----




Without calculating, explain how you decided where to place the estimated product on the number line.

Well, $\frac{4}{6}$ is really close to $\frac{3}{6}$ so if you round it to $\frac{3}{6}$, $\frac{3}{6} \cong \frac{1}{2}$. And $\frac{1}{2} \times 2 = 1$.

b. $\frac{4}{6} \times \frac{1}{2}$



Without calculating, explain how you decided where to place the estimated product on the number line.

 $\frac{4}{6}$ is again, very close to $\frac{3}{6}$ which is = to $\frac{1}{2}$ so basically we are doing $\frac{1}{2} \times \frac{1}{2}$ and if you multiply across it is $\frac{1}{4}$. $\frac{1}{4}$ is less than 1 so we can think of it as quarters and say that $\frac{1}{4}$ of 1 is 0.25 which is what I put on the number line.

c. Calculate each expression.



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



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

Anchor 3

Litho 0038

Total Content Points: 1 (5.NF.B.4)

Total Practice Points: 1 (MP3, MP4)

In Parts A and B, the student fails to explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. Simply providing estimates that are less than the given numbers is not enough to explain why this will always be the case (no credit for 5.NF.B.5bx, no credit for 5.NF.B.5bz). In Part C, the

student multiplies a fraction by a whole number $\left(\frac{4}{6} \times 2\right)$ and by a fraction $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and

finds correct products $\left(1\frac{2}{6}, \frac{1}{3}\right)$ for each expression (5.NF.B.4). In Parts A and B, the

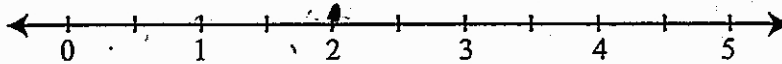
student constructs viable arguments by explaining the use of benchmark fractions to estimate the products and decide where to place the dots on the number lines (MP3). The student models with mathematics in Parts A and B by placing the estimated products on the given number lines at points within the acceptable ranges (MP4).

Total Awarded Points: 3 out of 5


1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

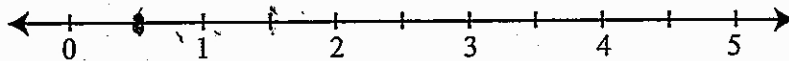
a. $\frac{4}{6} \times 2$



Without calculating, explain how you decided where to place the estimated product on the number line.

 I decided 2 b/c $\frac{4}{6}$ is close to 1 and $1 \times 2 = 2$.

b. $\frac{4}{6} \times \frac{1}{2}$




Without calculating, explain how you decided where to place the estimated product on the number line.

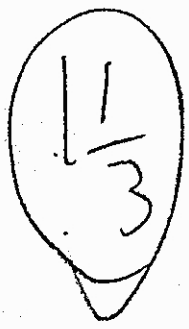



Once again, I rounded $\frac{4}{6}$ to 1,
 $1 \times \frac{1}{2} = \frac{1}{2} = 0.5$, so, since I kept
 $\frac{1}{2}$ how it was, that's how I got
my answer.

c. Calculate each expression.



$$\frac{4}{6} \times 2 = \frac{4}{3} \times \frac{2}{1} = \frac{8}{6}$$

$$6 \sqrt{\frac{8}{6}} = \frac{12}{6} = 2$$




$$\frac{4}{6} \times \frac{1}{2} = \frac{4}{12} = \frac{1}{3}$$

Anchor 4

Litho 0008

Total Content Points: 1 (5.NF.B.4)

Total Practice Points: 1 (MP3)

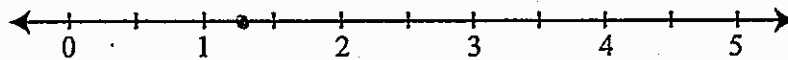
In Part A, the student fails to explain why multiplying a given number (2) by a fraction less than $1 \left(\frac{4}{6}\right)$ results in a product smaller than the given number (no credit for 5.NF.B.5bx). In Part B, the student does not explain why multiplying a given number $\left(\frac{4}{6}\right)$ by a fraction less than $1 \left(\frac{1}{2}\right)$ results in a product smaller than the given number. Simply providing an estimate that is less than the given number is not enough to explain why this will always be the case (no credit for 5.NF.B.5bz). In Part C, the student multiplies a fraction by a whole number $\left(\frac{4}{6} \times 2\right)$ and by a fraction $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and finds correct products $\left(1\frac{1}{3}, \frac{1}{3}\right)$ for each expression (5.NF.B.4). The student constructs viable arguments in Parts A and B by explaining the use of rounding to estimate the products and decide where to place the dots on the number lines (MP3). In Part B, the student places the estimated product within the acceptable range on the given number line. However, the student's placement of the product in Part A falls outside of the acceptable range (no credit for MP4).

Total Awarded Points: 2 out of 5

1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

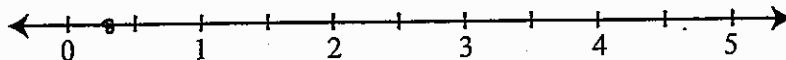
a. $\frac{4}{6} \times 2$




Without calculating, explain how you decided where to place the estimated product on the number line.

~~I know~~ $\frac{4}{6} \times 2$ equals to bigger than 1, but smaller than 2. So, answer would be between 1 and 2. $\frac{9}{6}$ is $1\frac{1}{2}$, and I thought answer would be between $\frac{6}{6}$ and $\frac{9}{6}$, and I guess


b. $\frac{4}{6} \times \frac{1}{2}$




Without calculating, explain how you decided where to place the estimated product on the number line.

 $\frac{4}{6} \times \frac{1}{2}$ means to find $\frac{1}{2}$ of $\frac{4}{6}$. Half of the $\frac{4}{6}$ is $\frac{1}{3}$. So I put $\frac{1}{3}$ in between the 0 and 1.

c. Calculate each expression.


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


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

Anchor 5

Litho 0001

Total Content Points: 1 (5.NF.B.4)

Total Practice Points: 1 (MP4)

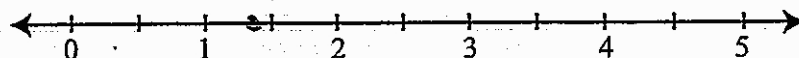
In Part A, the student states that $\left(\frac{4}{6} \times 2\right)$ is smaller than 2, but fails to explain why multiplying a given number by a fraction less than 1 always results in a product smaller than the given number (no credit for 5.NF.B.5bx). The student attempts in Part B to explain why multiplying a given number $\left(\frac{4}{6}\right)$ by a fraction less than 1 $\left(\frac{1}{2}\right)$ results in a product smaller than the given number, but the explanation merely restates the meaning of the specific equation $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and does not sufficiently explain why this will always be the case (no credit for 5.NF.B.5bz). In Part C, the student multiplies a fraction by a whole number $\left(\frac{4}{6} \times 2\right)$ and by a fraction $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and finds correct products $\left(1\frac{1}{3}, \frac{1}{3}\right)$ for each expression (5.NF.B.4). In Part A, the student describes estimating the product, but does not sufficiently explain how it was estimated. The student does not provide any justification in Part B, beyond the calculation of the exact numerical value of the product, for where the dot was placed on the number line (no credit for MP3). The student models with mathematics in Parts A and B by placing the estimated products on the given number lines at points within the acceptable ranges (MP4).

Total Awarded Points: 2 out of 5

1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

a. $\frac{4}{6} \times 2$ $1\frac{2}{6}$

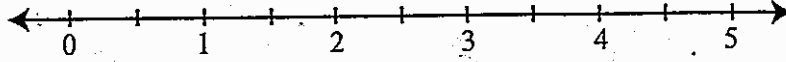


Without calculating, explain how you decided where to place the estimated product on the number line.

$1\frac{2}{6} > 1$ $1\frac{2}{6} < 2$ $\frac{1}{2} = \frac{3}{6}$ $\frac{3}{6} \frac{2}{6}$
 $1\frac{2}{6}$ goes right before $1\frac{1}{2}$.

The student has drawn a number line from 0 to 2 with tick marks every 1/6 units. The number 1 is labeled at the 6th tick mark, and 1 1/2 is labeled at the 12th tick mark. A dot is placed at the 12th tick mark, representing the product 1 2/6.

b. $\frac{4}{6} \times \frac{1}{2} = \frac{4}{12}$




Without calculating, explain how you decided where to place the estimated product on the number line.


~~$\frac{4}{12} = \frac{1}{3}$~~ ~~$\frac{1}{3} \times 0$~~ ~~0~~ $\frac{1}{3}$ $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{3}$

It is between 0 and 1


$\frac{1}{3} < 1$


c. Calculate each expression.


 $\frac{4}{6} \times 2 = 1\frac{2}{6}$ $1\frac{2}{6} = 1\frac{1}{3}$ $1\frac{2}{6} \div 2 = \frac{8}{12}$ $\frac{8}{12} = \frac{4}{6}$



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

 $\frac{4}{6} \times \frac{1}{2} = \frac{4}{12} = \frac{1}{3}$ $\frac{4}{12} \div \frac{1}{2} = \frac{4}{6}$



\times  $= \frac{4}{12}$

Anchor 6

Litho 0030

Total Content Points: 1 (5.NF.B.4)

Total Practice Points: 1 (MP4)

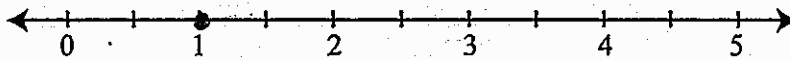
In Parts A and B, the student fails to explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. Simply providing values that are less than the given numbers is not enough to explain why this will always be the case. The diagram in Part C falls short of explaining this, as it simply depicts the final result of $\left(1\frac{2}{6}\right)$, not portions of two wholes being combined for a result that is smaller than 2 (no credit for 5.NF.B.5bx, no credit for 5.NF.B.5bz). In Part C, the student multiplies a fraction by a whole number $\left(\frac{4}{6} \times 2\right)$ and by a fraction $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and finds correct products $\left(1\frac{2}{6}, \frac{4}{12}\right)$ for each expression (5.NF.B.4). In Parts A and B, the student explains how the exact numerical values of the products were determined. There is no evidence that the student attempted to estimate the products (no credit for MP3). The student models with mathematics in Part A by accurately placing the product on the given number line. The student models with mathematics in Part B by drawing a number line and accurately placing the products on it. (MP4).

Total Awarded Points: 2 out of 5


1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

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



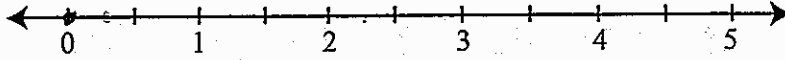
Without calculating, explain how you decided where to place the estimated product on the number line.

 We know that $\frac{4}{6} \times 2 = \frac{4 \times 2}{6} = \frac{8}{6} = 1\frac{1}{3}$


So $1\frac{1}{3}$ is rounded to 1 so

the answer is 2

b. $\frac{4}{6} \times \frac{1}{2}$




Without calculating, explain how you decided where to place the estimated product on the number line.


 We know that $\frac{4}{6} \times \frac{1}{2} = \frac{1}{3}$ and

$\frac{1}{3}$ is ~~smaller~~ rounded to 0 so

the answer is zero

c. Calculate each expression.


$$\frac{4}{6} \times 2 =$$
$$\frac{4}{6} \times \frac{2}{1} = \frac{8}{6}$$
$$\frac{8}{6} = \frac{4}{3}$$
$$1\frac{2}{3} = 1\frac{2}{3}$$


$$\frac{4 \times 1}{6 \times 2} = \frac{4}{12} = \frac{1}{3}$$

Anchor 7

Litho 0006

Total Content Points: 1 (5.NF.B.4)

Total Practice Points: 0

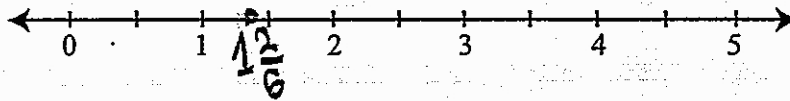
In Parts A and B, the student fails to explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. Simply providing values that are less than the given numbers is not enough to explain why this will always be the case (no credit for 5.NF.B.5bx, no credit for 5.NF.B.5bz). In Part C, the student multiplies a fraction by a whole number $\left(\frac{4}{6} \times 2\right)$ and by a fraction $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and finds correct products $\left(1\frac{1}{3}, \frac{1}{3}\right)$ for each expression (5.NF.B.4). The student explains in Parts A and B how the exact values of the products were first calculated, and then rounded to the nearest whole number to decide where to place the dots on the number line. While the student does make use of rounding, it is not an appropriate estimation strategy in this context, since the exact values have already been determined (no credit for MP3). In Part A, the student places the estimated product within the acceptable range on the given number line. However, the student's placement of the product in Part B falls outside of the acceptable range (no credit for MP4).

Total Awarded Points: 1 out of 5


1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

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

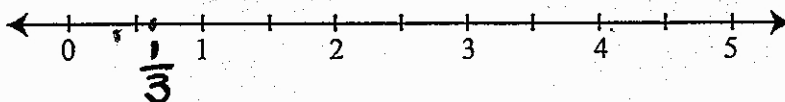


Without calculating, explain how you decided where to place the estimated product on the number line.


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

$\frac{4 \times 2}{6} = \frac{8}{6} = 1\frac{2}{6}$

b. $\frac{4}{6} \times \frac{1}{2}$





Without calculating, explain how you decided where to place the estimated product on the number line.


$$\frac{4}{6} \times \frac{1}{2} = \frac{4}{12} = \frac{1}{3}$$

you would multiply $\frac{4}{6} \times \frac{1}{2}$ then you will get $\frac{4}{12}$ but it would simplify to $\frac{1}{3}$.

c. Calculate each expression.


$$\frac{4}{6} \times 2 =$$
$$\frac{4}{6} \times 2 = \frac{8}{6} = 1\frac{2}{6}$$


$$\frac{4}{6} \times \frac{1}{2} =$$
$$\frac{4}{6} \times \frac{1}{2} = \frac{4}{12} = \frac{1}{3}$$

Anchor 8

Litho 0005

Total Content Points: 1 (5.NF.B.4)

Total Practice Points: 0

In Parts A and B, the student fails to explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. Simply providing values that are less than the given numbers is not enough to explain why this will always be the case (no credit for 5.NF.B.5bx, no credit for 5.NF.B.5bz). In Part C, the student

multiplies a fraction by a whole number $\left(\frac{4}{6} \times 2\right)$ and by a fraction $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and finds

correct products $\left(1\frac{2}{6}, \frac{1}{3}\right)$ for each expression (5.NF.B.4). The student explains in Part A

how the exact numerical value of the product was placed on the given number lines. The student explains in Part B how the exact value of the product was calculated. There is no evidence that the student attempted to estimate the products (no credit for MP3). In Part A, the student places the estimated product within the acceptable range on the given number line. In Part B, the student marks two different points on the given number line.

The point labeled $\frac{1}{3}$ is actually between $\frac{1}{2}$ and 1—outside the acceptable range

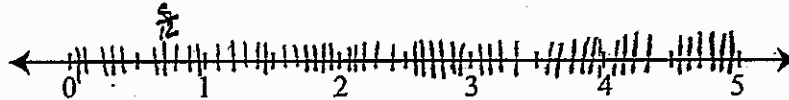
(no credit for MP4).

Total Awarded Points: 1 out of 5


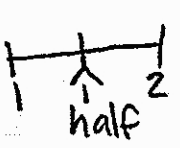
1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

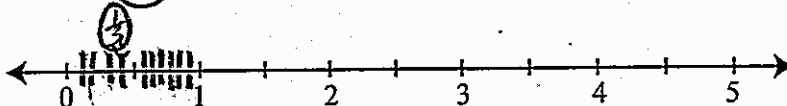
a. $\frac{4}{6} \times 2 = \frac{8}{12}$




Without calculating, explain how you decided where to place the estimated product on the number line.

 $\frac{8}{12}$ is not a whole #, so you can't place it on 1 or any # higher. Then the half mark ex =  acts as a 6 because 6 is half of 12. Then you count from 0 to 8 & you get your answer.

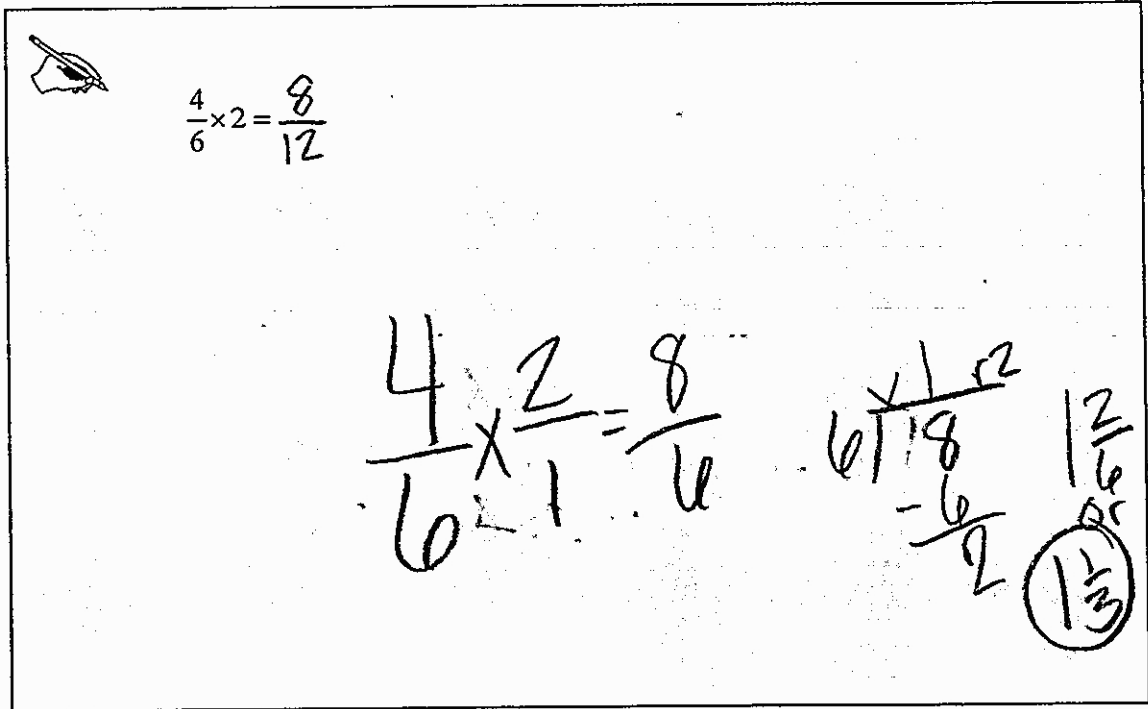
b. $\frac{4}{6} \times \frac{1}{2} = \frac{4 \cdot 1}{6 \cdot 2} = \frac{4}{12} \xrightarrow{\text{simp}} \frac{1}{3}$



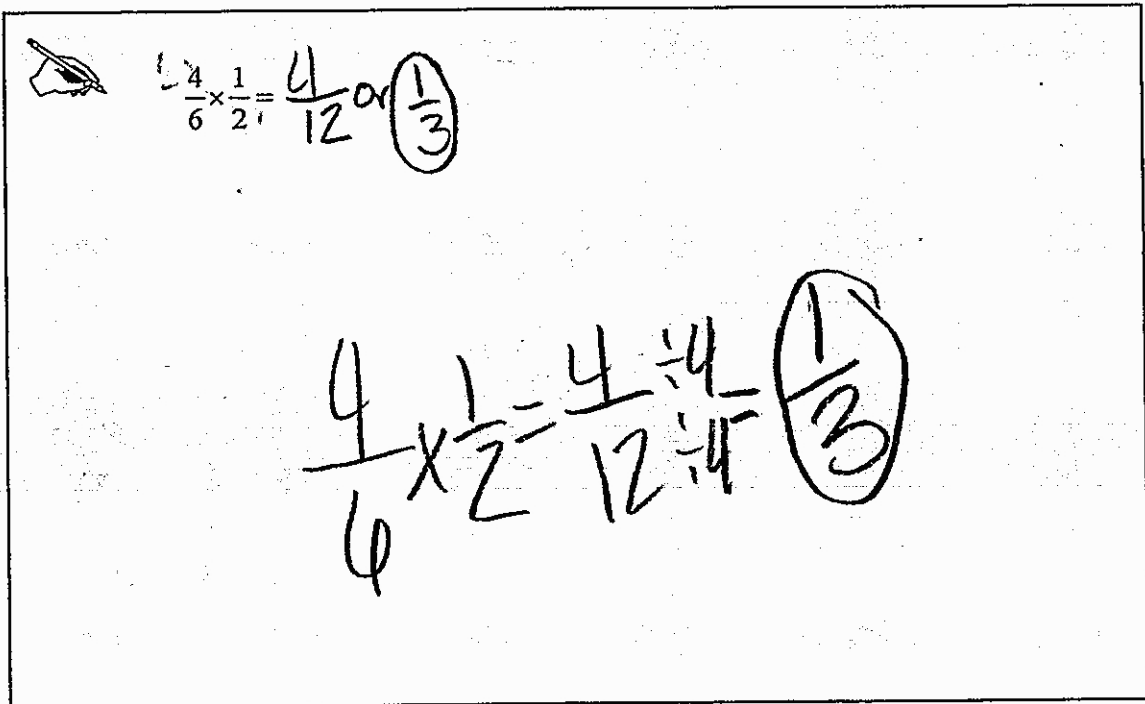
Without calculating, explain how you decided where to place the estimated product on the number line.

 $\frac{1}{3}$ isn't a whole #, so you can't place it on 1 or higher. You can't place $\frac{1}{3}$ on a # line so you multiply by 4 and get $\frac{4}{12}$. You make 12 lines in front of 0. You can't over 4 and get your answer

c. Calculate each expression.



Handwritten solution for $\frac{4}{6} \times 2 = \frac{8}{12}$. The student shows the multiplication $\frac{4}{6} \times \frac{2}{1} = \frac{8}{6}$. To the right, there is a vertical calculation: $\begin{array}{r} 6 \overline{) 18} \\ - 6 \\ \hline 12 \\ - 6 \\ \hline 6 \\ - 6 \\ \hline 0 \end{array}$. To the right of this is a vertical division: $\begin{array}{r} 12 \\ \overline{) 6} \\ 1 \\ \hline 3 \end{array}$. The final answer $\frac{1}{3}$ is circled.



Handwritten solution for $\frac{4}{6} \times \frac{1}{2} = \frac{4}{12}$ or $\frac{1}{3}$. The student shows the multiplication $\frac{4}{6} \times \frac{1}{2} = \frac{4}{12}$. To the right, there is a vertical division: $\begin{array}{r} 12 \\ \overline{) 4} \\ 1 \\ \hline 3 \end{array}$. The final answer $\frac{1}{3}$ is circled.

Anchor 9

Litho 0029

Total Content Points: 1 (5.NF.B.4)

Total Practice Points: 0

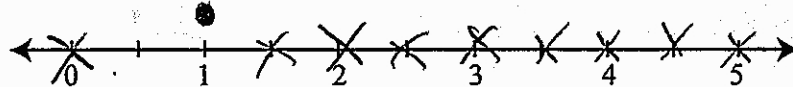
In Parts A and B, the student fails to explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. Simply providing values that are less than the given numbers is not enough to explain why this will always be the case (no credit for 5.NF.B.5bx, no credit for 5.NF.B.5bz). The student multiplies a fraction by a whole number $\left(\frac{4}{6} \times 2\right)$ and by a fraction $\left(\frac{4}{6} \times \frac{1}{2}\right)$ and finds correct products $\left(1\frac{1}{3}, \frac{1}{3}\right)$ for each expression in Part C (5.NF.B.4). In Parts A and B, the student does not provide any justification, beyond the calculation of the exact numerical values of the products, for where the dots were placed on the number line. In Part A, the student describes how to place the incorrectly calculated product of $\frac{8}{12}$ on the number line; in Part B, the product is correctly calculated, but the explanation still goes to how to find that exact point on the number line. There is no evidence that the student attempted to estimate the products (no credit for MP3). In Part B, the student accurately places the product on the given number line. However, the student's placement of the product in Part A falls outside the acceptable range (no credit for MP4).

Total Awarded Points: 1 out of 5


1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

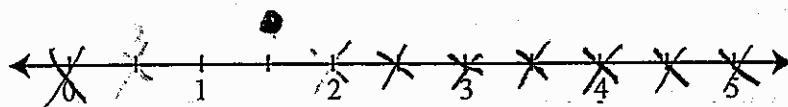
a. $\frac{4}{6} \times 2$




Without calculating, explain how you decided where to place the estimated product on the number line.

 It could not be greater than 2 I knew that. So, I crossed out 2 or greater. It can't be zero because the numbers are greater than zero. I decided it is either 1 or $\frac{1}{2}$ so I picked 1. Because I imagined mentally it had to be greater than $\frac{1}{2}$ though.


b. $\frac{4}{6} \times \frac{1}{2}$



Without calculating, explain how you decided where to place the estimated product on the number line.

 I eliminated anything greater than 2 because they were too great for fractions less than 1. I also eliminated 0 because the fractions were both greater than 0. I placed my dot at $1\frac{1}{2}$ because the numbers are greater than 0 but less than 1.

c. Calculate each expression.


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

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

$4 \times 2 = 8$

$\frac{8}{6}$

$\frac{6 \overline{) 8}}{\underline{6}} = 1\frac{2}{6} \xrightarrow{\div 2} 1\frac{1}{3}$
simplify

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

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

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

$4 \times 3 = 12$

$\frac{12}{6}$

$\frac{6 \overline{) 12}}{\underline{12}} = 2 \frac{0}{6} = 2$

Anchor 10

Litho 0046

Total Content Points: 0

Total Practice Points: 0

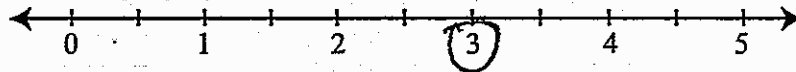
In Part A, the student states that the product of $\frac{4}{6} \times 2$ cannot be greater than 2, but fails to explain why multiplying a given number by a fraction less than 1 always results in a product smaller than the given number (no credit for 5.NF.B.5bx). In Part B, the student states that the product of fractions less than 0 cannot be greater than 2, but fails to explain why the product must be smaller than $\frac{4}{6}$ or $\frac{1}{2}$ (no point for 5.NF.B.5bz). In Part C, the student gives a correct product for $\frac{4}{6} \times 2 \left(1\frac{1}{3}\right)$, but an incorrect product for $\frac{4}{6} \times \frac{1}{2}$ (2) (no credit for 5.NF.B.4). The student describes estimating the products in Parts A and B, but does not sufficiently explain how they were estimated. The student provides little justification of why certain values were eliminated and makes statements that are not logically connected (“I placed my dot at $1\frac{1}{2}$ because the numbers are greater than zero but less than 1”) (no credit for MP3). In Part A, the student places the estimated product within the acceptable range on the given number line. However, the student’s placement of the product in Part B falls outside of the acceptable range (no credit for MP4).

Total Awarded Points: 0 out of 5


1. Multiplying Fractions on a Number Line Task

Without calculating, *estimate* the product of each expression. Mark your estimate with a dot on the number line.

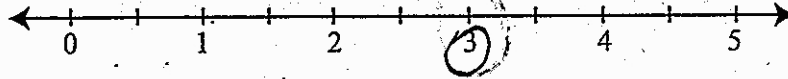
a. $\frac{4}{6} \times 2$




Without calculating, explain how you decided where to place the estimated product on the number line.

 Well I did $6 \div 2 = 3$ so that's where it should be.

b. $\frac{4}{6} \times \frac{1}{2}$



Without calculating, explain how you decided where to place the estimated product on the number line.

 It's the same product as the last one

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

$\frac{1}{2}$

c. Calculate each expression.



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



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

Anchor 11

Litho 0092

Total Content Points: 0

Total Practice Points: 0

In Parts A and B, the student fails to explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number (no credit for 5.NF.B.5bx, no credit for 5.NF.B.5bz). In Part C, the student gives a correct product for $\frac{4}{6} \times \frac{1}{2} \left(\frac{1}{3} \right)$, but an incorrect product for $\frac{4}{6} \times 2$ (3) (no credit for 5.NF.B.4). The student fails in Parts A and B to construct viable arguments to justify the placement of the products on the number line (no credit for MP3). In Parts A and B, the student's placements of products on the given number line fall outside of the acceptable ranges (no credit for MP4).

Total Awarded Points: 0 out of 5