Colorado CMAS Grade 4 Math Practice
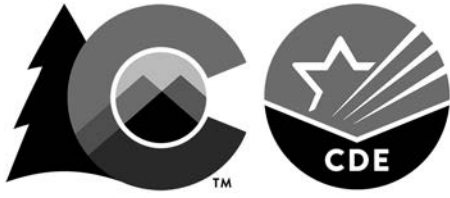
Exam Materials
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Answer Key Materials
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Colorado Measures of Academic Success

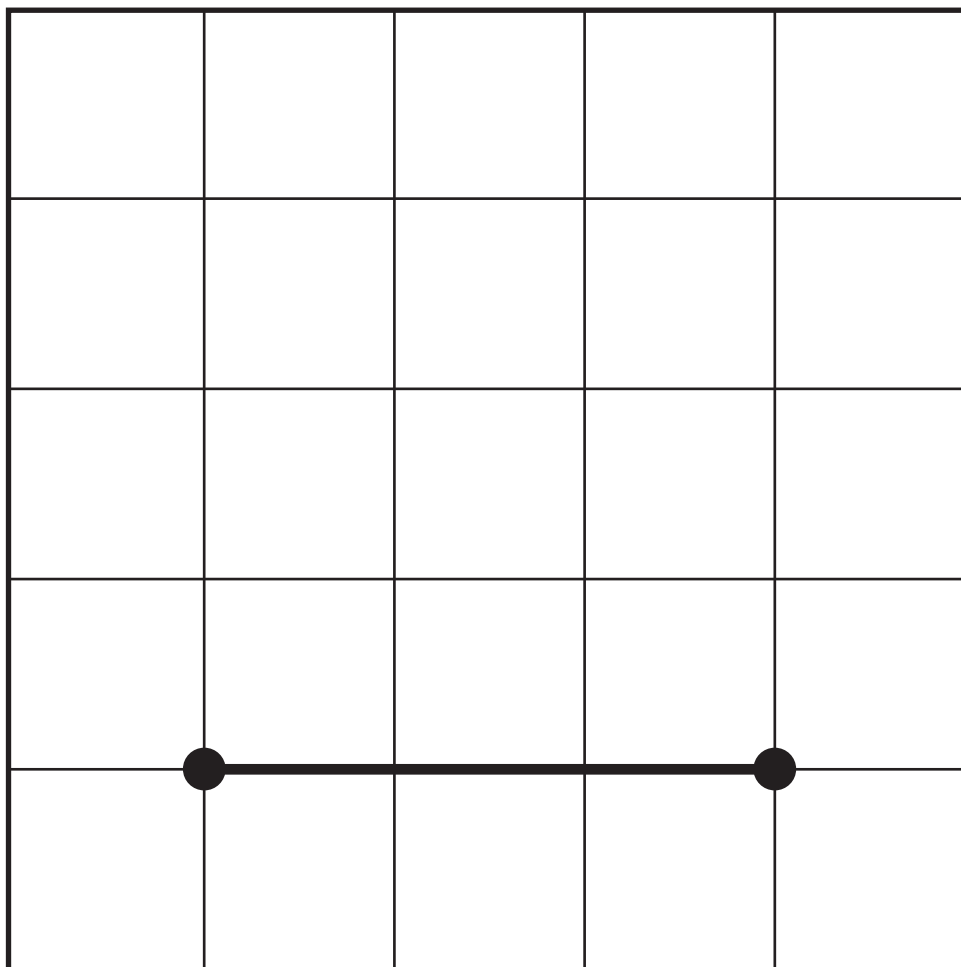# Grade 4
Mathematics

Paper Practice Resource for Students

1. What is the value of the expression $1{,}924 \times 8$?

Enter your answer in the box.

2. Create a line segment parallel to the given line segment.

Plot **two** points on the coordinate grid, and then draw a line through the points.

Use the information provided to answer Part A and Part B for question 3.

A photographer has a picture album that holds 100 pictures. The photographer fills $\frac{57}{100}$ of the album with pictures of trees. She fills $\frac{30}{100}$ of the album with pictures of animals.

3. **Part A**

What fraction of the album is filled with either pictures of trees or animals?

(A) $\frac{27}{100}$

(B) $\frac{54}{100}$

(C) $\frac{60}{100}$

(D) $\frac{87}{100}$

Part B

The photographer fills $\frac{9}{100}$ of the album with pictures of flowers.

What decimal represents the part of the album that is filled with flowers?

(A) 0.009

(B) 0.09

(C) 0.90

(D) 1.09

4. A student wants to compare the numbers 38,947 and 39,261.

- Explain how to use place value when deciding which number, 38,947 or 39,261, is greater.
- Explain how to round each number to the nearest thousand.
- After rounding to the nearest thousand, compare the numbers. Use <, >, or = in your comparison.

Enter your explanations and your answer in the space provided.

5. Which two numbers are prime numbers?

Select the **two** correct answers.

- (A) 27
- (B) 37
- (C) 57
- (D) 67
- (E) 77

Use the information provided to answer Part A and B for question 6.

The lengths of three rivers are shown in the table.

Lengths of Rivers

River	Length (miles)
Colorado	1,450
Congo	2,922
Nile	4,135

6. **Part A**

What is the total length, in miles, of all three rivers?

Ⓐ 7,407

Ⓑ 7,507

Ⓒ 8,407

Ⓓ 8,507

Part B

How much longer, in miles, are the Colorado and Congo Rivers combined than the Nile River?

Ⓐ 237

Ⓑ 243

Ⓒ 247

Ⓓ 257

7. The value of the digit 6 in the number 3,694 is equal to 600.

Write the correct numbers from the list in the blank boxes to show the correct values of the digit 6. Each number may be used once, more than once, or not at all.

| 6 | 60 | 600 | 6,000 |

When moved one place to the left, the value of the digit 6
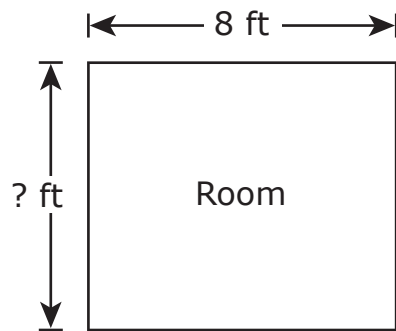
in the number 3,694 would equal [ ] .

When moved one place to the right, the value of the digit 6

in the number 3,694 would equal [ ] .

8. The length of a rectangular room is 8 feet. The area of the room is 56 square feet.
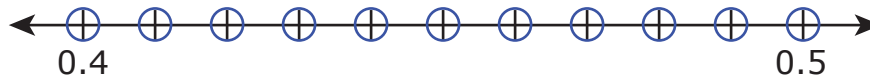

What is the perimeter, in feet, of the room?

Enter your answer in the box.

This is the end of Item Set 1.

1. Where is $\frac{42}{100}$ located on the number line?

Fill in **one** circle on the number line to plot the point.

0.4   0.5

2. A baker has cupcake pans that can hold 12 cupcakes each. The baker made 9 cupcake pans full of vanilla cupcakes and 4 cupcake pans full of strawberry cupcakes.

The baker then puts the cupcakes into boxes. The baker puts 8 cupcakes in each box.

What is the **fewest** number of boxes the baker will need for all the cupcakes?

- Ⓐ 18
- Ⓑ 20
- Ⓒ 24
- Ⓓ 32

Use the information provided to answer Part A and Part B for question 3.

The table shows the items and amounts needed to make 1 bottle of bubble mix. The two items in a bubble mix are water and dish soap.

Bubble Mix

Item	Amount
water	$\frac{5}{8}$ cup
dish soap	$\frac{2}{8}$ cup

3.   Part A

How much more water than dish soap is needed to make 1 bottle of bubble mix?

Enter your answer in the space provided. Enter **only** your answer.

☐
—— cup
☐

Part B

A student wants to make enough bubble mix for 7 bottles.

- How many cups of bubble mix does the student need to make to fill 7 bottles? Include in your answer the number of cups of water and the number of cups of dish soap the student needs.
- Explain your answer or show your work.

Enter your answers and your work or explanation in the space provided.

4. A store has two lamps for sale. Lamp A costs $9. Lamp B costs 6 times more than Lamp A.

How much is Lamp B?

(A) $3

(B) $15

(C) $45

(D) $54

Use the information provided to answer Part A and B for question 5.

The distances, in miles, a person ran in four days is shown in the table.

Distances Ran

Day	Distance (miles)
1	$\frac{3}{2}$
2	$\frac{5}{8}$
3	$\frac{10}{6}$
4	$\frac{6}{12}$

5. Part A

What is the greatest distance, in miles, the person ran?

Ⓐ $\frac{3}{2}$

Ⓑ $\frac{5}{8}$

Ⓒ $\frac{10}{6}$

Ⓓ $\frac{6}{12}$

Part B

On Day 5, the person wants to run between $\frac{3}{4}$ mile and $\frac{6}{12}$ mile.

Which distance, in miles, is between $\frac{3}{4}$ mile and $\frac{6}{12}$ mile?

Ⓐ $\frac{6}{10}$

Ⓑ $\frac{4}{10}$

Ⓒ $\frac{5}{4}$

Ⓓ $\frac{5}{12}$

---

6. A person went on a hike that lasted 3 hours.

How many minutes was the hike?

Enter your answer into the box.

7. A group of 63 birds is 9 times more than a group of 7 birds.

Which equation has the same meaning as this statement?

Ⓐ $63 = 9 \times 7$

Ⓑ $7 = 63 \times 9$

Ⓒ $7 = 9 \div 63$

Ⓓ $63 = 7 \div 9$

8. Two friends each have a piece of yarn that is $\frac{2}{10}$ meter long.

Friend A says that $\frac{2}{10}$ meter is equivalent to $\frac{4}{12}$ meter because

$$\frac{2}{10} = \frac{2+2}{10+2} = \frac{4}{12}.$$

Friend B says that $\frac{2}{10}$ meter is equivalent to $\frac{2}{5}$ meter because

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

- Explain the mistake that Friend A made.
- Explain the mistake that Friend B made.
- Show a fraction that is equivalent in length to $\frac{2}{10}$ meter. Show or explain your work.

Enter your explanations and your answer in the space provided.

9. There are 3,726 students spending the summer at a camp. The students are divided equally into 9 groups.

How many students are in each group?

ⓐ 302

ⓑ 414

ⓒ 482

ⓓ 512

10. A student has an unknown amount of water in Container 1. She pours the amount into Container 2, which already has 450 milliliters of water inside. After she combines the two amounts, there is a total of 1 liter of water in Container 2.

What was the original amount of water, in milliliters, in Container 1 before the student combined the two amounts?

Draw a line and shade the container to the correct height.

Container 1

mL
1,000
900
800
700
600
500
400
300
200
100
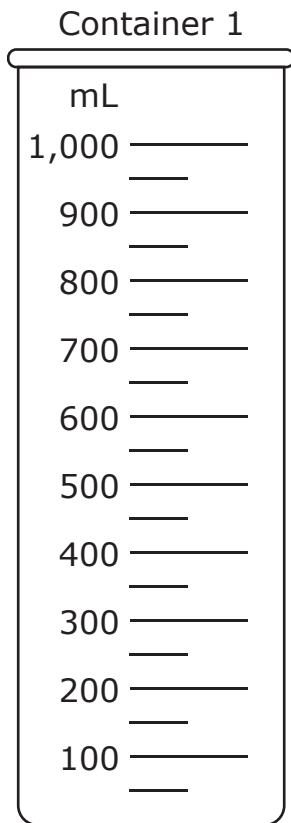
11. What number on the number line represents the value of $2 \times \frac{2}{3}$?

Fill in the circle on the number line to plot the point.

0   1   2   3   4   5   6
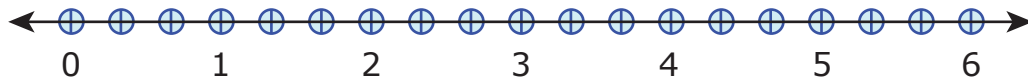
12. Create a fraction model with a denominator of 10 that is equivalent to $\frac{70}{100}$.

Divide the figure into the correct number of equal parts. Then shade the correct number of parts.
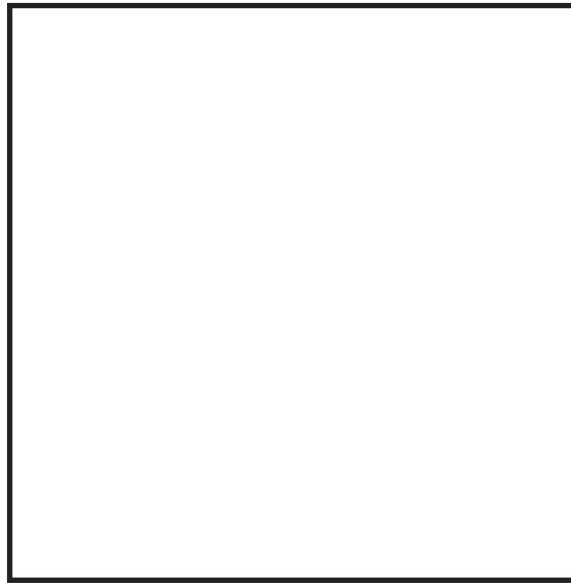
This is the end of Item Set 2.

Colorado Measures of Academic Success

Grade 4 Mathematics

Answer Key
with
Scoring Rubrics

Practice Resource for Students

ANSWER KEY: ITEM SET 1

Item Set 1 – Question 1 (Fill in the Blank)

What is the value of the expression $1,924 \times 8$?

Enter your answer in the box.
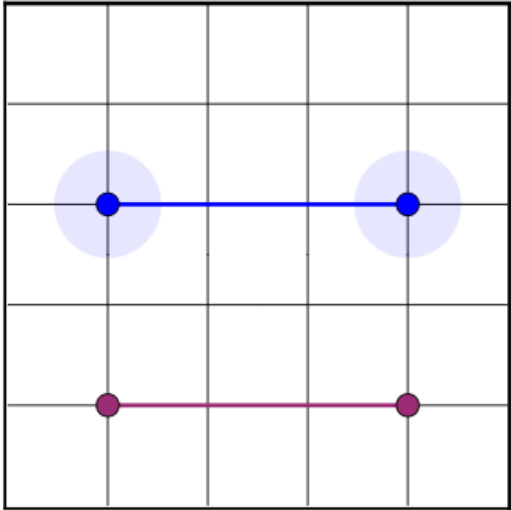
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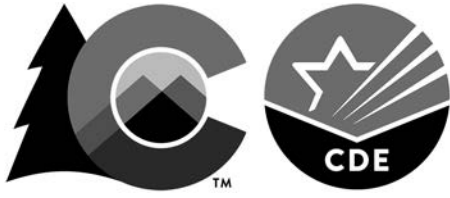| Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NBT.B.5	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
Evidence Statement:	4.NBT.5-1	Multiply a whole number of up to four digits by a one-digit whole number using strategies based on place value and the properties of operations.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.484	

Create a line segment parallel to the given line segment.

Select **two** places on the coordinate grid to plot the points.

OR

OR

Item Information		
Answer:	See Image Examples	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.G.A.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
Evidence Statement:	4.G.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
Subclaim:	B - Supporting Content	The student solves problems involving the Additional and Supporting Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.847	

A photographer has a picture album that holds 100 pictures. The photographer fills $\frac{57}{100}$ of the album with pictures of trees. She fills $\frac{30}{100}$ of the album with pictures of animals.

Part A

What fraction of the album is filled with either pictures of trees or animals?

- A. $\frac{27}{100}$

- B. $\frac{54}{100}$

- C. $\frac{60}{100}$

- ● D. $\frac{87}{100}$

Part B

The photographer fills $\frac{9}{100}$ of the album with pictures of flowers.

What decimal represents the part of the album that is filled with flowers?

- A. 0.009

- ● B. 0.09

- C. 0.90

- D. 1.09

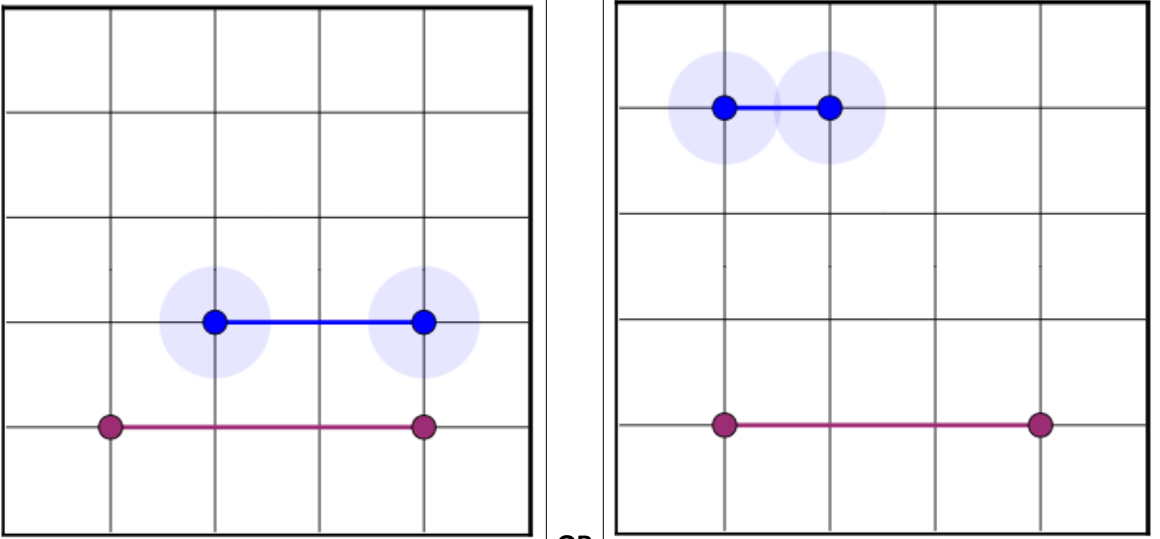| Item Information		
Answer:	Part A = D Part B = B	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NF.C.5	Express a fraction with denominator 10 as an equivalent fraction with denominator 100 and use this technique to add two fractions with respective denominators 10 and 100. (Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.) For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100. (CCSS: 4.NF.C.5)
	4.NF.C.6	Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.
Evidence Statement:	4.NF.Int.2	Solve one-step addition word problems. Content Scope: 4.NF.5, 4.NF.6.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.722	

Item Set 1 – Question 4 (Constructed Response)

> A student wants to compare the numbers 38,947 and 39,261.
>
> - Explain how to use place value when deciding which number, 38,947 or 39,261, is greater.
> - Explain how to round each number to the nearest thousand.
> - After rounding to the nearest thousand, compare the numbers. Use <, >, or = in your comparison.
>
> Enter your explanations and your answer in the space provided.

Item Information		
Answer:	See Scoring Rubric	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NBT.A.3	Use place value understanding to round multi-digit whole numbers to any place.
	4.NBT.A.2	Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
Evidence Statement:	4.C.3	Reason about the place value system itself. Content Scope: Knowledge and skills articulated in 4.NBT.A.
Subclaim:	C - Expressing Mathematical Reasoning	The student expresses grade/course-level appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others, and/or attending to precision when making mathematical statements.
P Value:	0.205	

Scoring Rubric	
Points	**Attributes**
3	Student response includes each of the following 3 elements. • **Reasoning component**: Valid explanation of how to compare 38,947 to 39,261 using place value • **Reasoning component:** Valid explanation how to round each number to the thousands place • **Computation component**: Correct comparison using <, >, or = symbol, 39,000 = 39,000
2	Student response includes 2 of the 3 elements.
1	Student response includes 1 of the 3 elements.
0	Student response is incorrect or irrelevant.
Sample Student Response:	**Sample Solution 1:** To compare 38,947 to 39,261, first I look at the number in the ten-thousands place. 3 is the same in both 38,947 and 39,261, so then I compare the numbers in the thousands place. I know that 9,000 is greater than 8,000, so 39,261 is greater than 38,947. To round each number to the thousands place, first I look at the digit in the hundreds place. If the digit is 5 or greater, I round up the number in the thousands place, and if the digit is less than 5, I round down. For 38,947, 9 is greater than 5, so I round up to 39,000. For 39,261, 2 is less than 5, so I round down to 39,000. When I compare the numbers rounded to the thousandths place, 39,000 = 39,000.

Annotation for Sample Student Response:	**Solution 1, Score Point 3**
	The response receives full credit. It includes each of the 3 required elements.
	Reasoning Component:
	 • **Student Response:** To compare 38,947 to 39,261, first I look at the number in the ten-thousands place. 3 is the same in both 38,947 and 39,261, so then I compare the numbers in the thousands place. I know that 9,000 is greater than 8,000, so 39,261 is greater than 38,947.
	   ○ **Rationale for Score:** The student provides a valid explanation, using place value, for how to compare 38,947 and 39,261 (To compare 38,947 to 39,261, first I look at the number in the ten-thousands place. 3 is the same in both 38,947 and 39,261, so then I compare the numbers in the thousands place. I know that 9,000 is greater than 8,000, so 39,261 is greater than 38,947). Explaining the comparison of the values in both the ten-thousands place and the thousands place, demonstrates complete understanding of how to compare numbers using place value.
	Reasoning Component:
	 • **Student Response:** To round each number to the thousands place, first I look at the digit in the hundreds place. If the digit is 5 or greater, I round up the number in the thousands place, and if the digit is less than 5, I round down. For 38,947, 9 is greater than 5, so I round up to 39,000. For 39,261, 2 is less than 5, so I round down to 39,000.
	   ○ **Rationale for score:** The student provides a valid explanation of how to round numbers to the thousands place (To round each number to the thousands place, first I look at the digit in the hundreds place. If the digit is 5 or greater, I round up the number in the thousands place, and if the digit is less than 5, I round down) and correctly applies the rounding rules to round each number to the thousands place (For 38,947, 9 is greater than 5, so I round up to 39,000. For 39,261, 2 is less than 5, so I round down to 39,000).
	Computation Component:
	 • **Student Response:** When I compare the numbers rounded to the thousandths place, 39,000 = 39,000.
	   ○ **Rationale for score:** The student provides a correct comparison of the rounded numbers using the equals symbol (When I compare the numbers rounded to the thousandths place, 39,000 = 39,000).
	Note: Sample student responses are not representative of all correct answers for an item and are only provided as a guide to assist teachers with scoring.

Item Set 1 – Question 5 (Selected Response)

Which two numbers are prime numbers?

Select the **two** correct answers.

☐ A. 27

☑ B. 37

☐ C. 57

☑ D. 67

☐ E. 77

Item Information		
Answer:	B, D	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.OA.B.4	Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.
Evidence Statement:	4.OA.4-4	Determine whether a given whole number in the range 1–100 is prime or composite.
Subclaim:	B - Supporting Content	The student solves problems involving the Additional and Supporting Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.208	

The lengths of three rivers are shown in the table.

Lengths of Rivers

River	Length (miles)
Colorado	1,450
Congo	2,922
Nile	4,135

Part A

What is the total length, in miles, of all three rivers?

○ A. 7,407

○ B. 7,507

○ C. 8,407

◉ D. 8,507

Part B

How much longer, in miles, are the Colorado and Congo Rivers combined than the Nile River?

◉ A. 237

○ B. 243

○ C. 247

○ D. 257

Item Information		
Answer:	Part A = D Part B = A	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NBT.B.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm.
Evidence Statement:	4.Int.8	Solve addition and subtraction word problems involving three four-digit addends, or two four-digit addends and a four-digit subtrahend.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.718	

The value of the digit 6 in the number 3,694 is equal to 600.

Drag and drop a number into each box to show the correct values of the digit 6. Each number may be used once, more than once, or not at all.

| 6 | 60 | 600 | 6,000 |

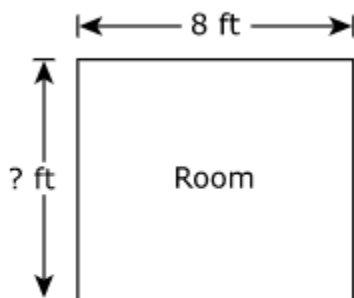When moved one place to the left, the value of the digit 6 in the number 3,694 would equal

| 6,000 |

.

When moved one place to the right, the value of the digit 6 in the number 3,694 would equal

| 60 |

.

Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NBT.A.1	Explain that in a multi-digit whole number, a digit in one place represents ten × what it represents in the place to its right. For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.
Evidence Statement:	4.NBT.1	Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.547	

The length of a rectangular room is 8 feet. The area of the room is 56 square feet.

What is the perimeter, in feet, of the room?

Enter your answer in the box.

```
30
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Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.MD.A.3	Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.
Evidence Statement:	4.MD.3	Solve real-world and mathematical problems about perimeter involving grade-level addition and subtraction of fractions, such as finding an unknown side of a rectangle. Content Scope: 4.NF.3, 4.MD.3.
Subclaim:	B - Supporting Content	The student solves problems involving the Additional and Supporting Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.266	

ANSWER KEY: ITEM SET 2

Item Set 2 – Question 1 (TEI Hot Spot)

Where is $\frac{42}{100}$ located on the number line?

Select a place on the number line to plot the point.

Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NF.C.6	Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.
Evidence Statement:	4.NF.6	Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram. i) Measuring to the nearest mm or cm isequivalent to measuring on the number line.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.596	

A baker has cupcake pans that can hold 12 cupcakes each. The baker made 9 cupcake pans full of vanilla cupcakes and 4 cupcake pans full of strawberry cupcakes.

The baker then puts the cupcakes into boxes. The baker puts 8 cupcakes in each box.

What is the **fewest** number of boxes the baker will need for all the cupcakes?

- ○ A. 18

- ● B. 20

- ○ C. 24

- ○ D. 32

Item Information		
Answer:	B	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.OA.A.3	Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
Evidence Statement:	4.OA.3-2	Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, in which remainders must be interpreted. i) Assessing reasonableness of answer is not assessed here, see 4.C.5-1 and 4.C.6-1. ii) Tasks involve interpreting remainders. iii) Multi-step problems must have at least 3 steps.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.328	

The table shows the items and amounts needed to make 1 bottle of bubble mix. The two items in a bubble mix are water and dish soap.

Bubble Mix

Item	Amount
water	$\frac{5}{8}$ cup
dish soap	$\frac{2}{8}$ cup

Part A

How much more water than dish soap is needed to make 1 bottle of bubble mix?

Enter your answer in the space provided. Enter **only** your answer.

$\frac{3}{8}$ cup

Part B

A student wants to make enough bubble mix for 7 bottles.

- How many cups of bubble mix does the student need to make to fill 7 bottles? Include in your answer the number of cups of water and the number of cups of dish soap the student needs.
- Explain your answer or show your work.

Enter your answers and your work or explanation in the space provided.

Item Information		
Answer:	See Scoring Rubric and Sample Student Responses	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NF.B.4.c	Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. For example, if each person at a party will eat $\frac{3}{8}$ of a poundof roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?
	4.NF.B.3.d	Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
Evidence Statement:	4.D.1	Solve multi-step contextual word problems with degree of difficulty appropriate to Grade 4, requiring application of knowledge and skills articulated in Type I, Sub-Claim A Evidence Statements. i) Tasks may have scaffolding if necessary, in order yield a degree of difficulty appropriate to Grade 4. ii) Multi step problems must have at least 3 steps.

Subclaim:	D – Modeling and Application	The student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), engaging particularly in the Modeling practice, and where helpful making sense of problems andpersevering to solve them (MP. 1) ,reasoning abstractly and quantitatively (MP. 2), using appropriate tools strategically (MP.5), looking for and making use of structure (MP.7), and/or looking for and expressing regularity in repeated reasoning (MP.8).
Score Point Distribution:	7.4% of students earned 3 points. 3.8% of students earned 2 points. 54.8% of students earned 1 point. 34.1% of students earned 0 points.	

Scoring Rubric – Part A (Machine Scored)	
Points	**Attributes**
1	Computation Component: Student provides the correct fraction: $\frac{3}{8}$ Note: Other equivalent fractions are acceptable.
0	Student response is incorrect or irrelevant.

Scoring Rubric – Part B	
Points	**Attributes**
2	Student response includes each of the following 2 elements. • **Computation component**: Correct number of cups of bubble mix, water, and dish soap that is needed to fill 7 bottles. • **Modeling component**: Valid explanation or work to determine the number of cups of bubble mix, water and dish soap that is needed to fill 7 bottles.
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.
Sample Student Response:	$(\frac{5}{8} \times 7) + (\frac{2}{8} \times 7) = \frac{49}{8} = 6\frac{1}{8}$ cups for 7 bottles of bubble mix. First, I found out how much water I needed to make the 7 bottles of bubble mix by $\frac{5}{8} \times 7 = \frac{35}{8}$ cups of water. Then, I found out how much dish soap I needed by $\frac{2}{8} \times 7 = \frac{14}{8}$.

Annotation for Sample Student Response:	**Score Point 2**
	 The response receives full credit. It includes each of the 2 required elements.
	 Computation Component:
	 • **Student Response:** $6\frac{1}{8}$ cups of bubble mix, $\frac{35}{8}$ cups of water, $\frac{14}{8}$ cups of dish soap.
	      o **Rationale for Score:** The student provides the correct number of cups of bubble mix, water and dish soap needed to fill 7 bottles ($6\frac{1}{8}$ cups for 7 bottles, $\frac{35}{8}$ cups of water, dish soap I needed, $\frac{14}{8}$).
	 Modeling Component:
	 • **Student Response:** $(\frac{5}{8} \times 7) + (\frac{2}{8} \times 7) = \frac{49}{8} = 6\frac{1}{8}, \frac{5}{8} \times 7 = \frac{35}{8}, \frac{2}{8} \times 7 = \frac{14}{8}$.
	      o **Rationale for score:** The student provides valid work to find how many cups of bubble mix, water and dish soap is needed to fill 7 bottles $[(\frac{5}{8} \times 7) + (\frac{2}{8} \times 7) = \frac{49}{8} = 6\frac{1}{8}, \frac{5}{8} \times 7 = \frac{35}{8}, \frac{2}{8} \times 7 = \frac{14}{8}]$.
	
	 Note: Sample student responses are not representative of all correct answers for an item and are only provided as a guide to assist teachers with scoring.

A store has two lamps for sale. Lamp A costs $9. Lamp B costs 6 times more than Lamp A.

How much is Lamp B?

○ A. $3

○ B. $15

○ C. $45

● D. $54

Item Information		
Answer:	D	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.OA.A.2	Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. (See Appendix, Table 2)
Evidence Statement:	4.OA.2	Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. i) See 2020 CAS, Appendix: Table 2 ii) Tasks sample equally the situations in the third row of 2020 CAS, Appendix: Table 2.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.879	

The distances, in miles, a person ran in four days is shown in the table.

Distances Ran

Day	Distance (miles)
1	$\frac{3}{2}$
2	$\frac{5}{8}$
3	$\frac{10}{6}$
4	$\frac{6}{12}$

Part A

What is the greatest distance, in miles, the person ran?

○ A. $\frac{3}{2}$

○ B. $\frac{5}{8}$

◉ C. $\frac{10}{6}$

○ D. $\frac{6}{12}$

Part B

On Day 5, the person wants to run between $\frac{3}{4}$ mile and $\frac{6}{12}$ mile.

Which distance, in miles, is between $\frac{3}{4}$ mile and $\frac{6}{12}$ mile?

◉ A. $\frac{6}{10}$

○ B. $\frac{4}{10}$

○ C. $\frac{5}{4}$

○ D. $\frac{5}{12}$

Item Information		
Answer:	Part A = C, Part B = A	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NF.A.2	Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
	4.NF.A.1	Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Evidence Statement:	4.NF.A.Int.1	Apply conceptual understanding of fraction equivalence and ordering to solve simple word problems requiring fraction comparison. Content Scope: 4.NF.A i) Tasks have "thin context." ii) Tasks do not require adding, subtracting, multiplying, or dividing fractions. iii) Prompts do not provide visual fraction models; students may at their discretion draw visual fraction models as a strategy. iv) Tasks are limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. v) Tasks may include fractions that equal whole numbers. Whole numbers are limited to 0 through 5.
Subclaim:	A - MajorContent	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.395	

Item Set 2 – Question 6 (*Fill in the Blank*)

A person went on a hike that lasted 3 hours.

How many minutes was the hike?

Enter your answer into the box.

180

Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr., min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in.Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36)...
Evidence Statement:	4.MD.1	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two- column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36)...
Subclaim:	B - Supporting Content	The student solves problems involving the Additional and Supporting Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.838	

A group of 63 birds is 9 times more than a group of 7 birds.

Which equation has the same meaning as this statement?

- ⦿ A. $63 = 9 \times 7$

- ○ B. $7 = 63 \times 9$

- ○ C. $7 = 9 \div 63$

- ○ D. $63 = 7 \div 9$

Item Information		
Answer:	A	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.OA.A.1	Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
Evidence Statement:	4.OA.1-2	Represent verbal statements of multiplicative comparisons as multiplication equations. i) Tasks have "thin context" or no context.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.743	

Two friends each have a piece of yarn that is $\frac{2}{10}$ meter long.

Friend A says that $\frac{2}{10}$ meter is equivalent to $\frac{4}{12}$ meter because $\frac{2}{10} = \frac{2+2}{10+2} = \frac{4}{12}$.

Friend B says that $\frac{2}{10}$ meter is equivalent to $\frac{2}{5}$ meter because $\frac{2}{5} = \frac{2}{5 \times 2} = \frac{2}{10}$.

- Explain the mistake that Friend A made.
- Explain the mistake that Friend B made.
- Show a fraction that is equivalent in length to $\frac{2}{10}$ meter. Show or explain your work.

Enter your explanations and your answer in the space provided.

Item Information	
Answer:	See Scoring Rubric and Sample Student Responses
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NF.A.1 — Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Evidence Statement:	4.C.5-2 — Distinguish correct explanation/reasoning from that which is flawed, and – if there is a flaw in the argument – present corrected reasoning. (For example, some flawed 'student' reasoning is presented, and the task is to correct and improve it.) Content Scope: Knowledge and skills articulated in 4.NF.1. i) Tasks have "thin context" or no context. ii) Tasks are limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. iii) Tasks may include fractions that equal whole numbers. Whole numbers are limited to 0 through 5.
Subclaim:	C – Expressing Mathematical Reasoning — The student expresses grade/course-level appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others, and/or attending to precision when making mathematical statements.
Score Point Distribution:	12.2 % of students earned 4 points. 12.3 % of students earned 3 points. 16.2% of students earned 2 points. 19.3% of students earned 1 point. 39.9% of students earned 0 points.

Scoring Rubric	
Points	**Attributes**
4	Student response includes each of the following 4 elements. • **Reasoning component**: Valid explanation of the mistake that Friend A makes. • **Reasoning component:** Valid explanation of the mistake that Friend B makes. • **Reasoning component:** Valid explanation or work to find a fraction equivalent in length to $\frac{2}{10}$ meter. • **Computation component**: Correct fraction equivalent in length to $\frac{2}{10}$ meter.
3	Student response includes 3 of the 4 elements.
2	Student response includes 2 of the 4 elements.
1	Student response includes 1 of the 4 elements.
0	Student response is incorrect or irrelevant.
Sample Student Response:	Equivalent fraction is $\frac{6}{30}$. The mistake friend A made was he did $\frac{2}{10} + \frac{2}{2} = \frac{4}{12}$ not $\frac{2}{10} \times \frac{2}{2} = \frac{4}{20}$. The mistake friend B made was he only multiplied the 5 in $\frac{2}{5}$ not both 2 and 5. My equivalent fraction is correct because $\frac{2}{10} \times \frac{3}{3} = \frac{6}{30}$.

Annotation for Sample Student Response:	**Score Point 4**
	The response receives full credit. It includes each of the 4 required elements.
	Reasoning Component:
	• **Student Response:** The mistake friend A made was he did $\frac{2}{10} + \frac{2}{2} = \frac{4}{12}$ not $\frac{2}{10} \times \frac{2}{2} = \frac{4}{20}$.
	   o **Rationale for Score:** The student provided a valid explanation of the mistake made by providing the incorrect addition used and then showing how to correct the mistake using multiplication (he did $\frac{2}{10} + \frac{2}{2} = \frac{4}{12}$ not $\frac{2}{10} \times \frac{2}{2} = \frac{4}{20}$).
	Reasoning Component:
	• **Student Response:** The mistake friend B made was he only multiplied the 5 in $\frac{2}{5}$ not both 2 and 5.
	   o **Rationale for score:** The student provided a valid explanation of the mistake made by identifying that both the numerator and denominator should be multiplied by the same number (he only multiplied the 5 in $\frac{2}{5}$ not both 2 and 5).
	Reasoning Component:
	• **Student Response:** My equivalent fraction is correct because $\frac{2}{10} \times \frac{3}{3} = \frac{6}{30}$.
	   o **Rationale for score:** The student provides valid work to determine a fraction equivalent to $\frac{2}{10}$ ($\frac{2}{10} \times \frac{3}{3}$).
	Computation Component:
	• **Student Response:** Equivalent fraction is $\frac{6}{30}$ . . . $\frac{2}{10} \times \frac{3}{3} = \frac{6}{30}$.
	   o **Rationale for score:** A correct fraction equivalent to $\frac{2}{10}$ is provided (Equivalent fraction $\frac{6}{30}$). Note that the fraction $\frac{6}{30}$ provided as a part of the work used to find an equivalent fraction would also be sufficient to receive credit for this element.
	Note: Sample student responses are not representative of all correct answers for an item and are only provided as a guide to assist teachers with scoring.

There are 3,726 students spending the summer at a camp. The students are divided equally
into 9 groups.

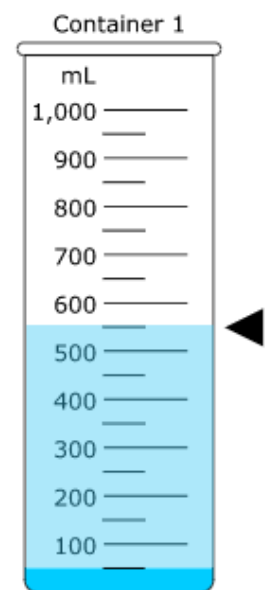How many students are in each group?

○ A. 302

● B. 414

○ C. 482

○ D. 512

Item Information		
Answer:	B	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NBT.B.6	Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
Evidence Statement:	4.Int.4	Solve one-step word problems involving dividing a four-digit number by a one-digit number. i) The given numbers are such as to require a general strategy based on place value and the properties of operations (e.g., 2,328Ã· 8). ii) Quotients are whole numbers (i.e., there are no remainders). iii) Word problems shall include a variety of grade-level appropriate applications and contexts.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	0.677	

A student has an unknown amount of water in Container 1. She pours the amount into Container 2, which already has 450 milliliters of water inside. After she combines the two amounts, there is a total of 1 liter of water in Container 2.

What was the original amount of water, in milliliters, in Container 1 before the student combined the two amounts?

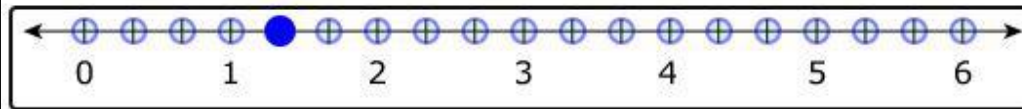Adjust the slider by dragging the top of the slider to the correct height.

Container 1

mL
1,000 —
900 —
800 —
700 —
600 —
500 —
400 —
300 —
200 —
100 —

Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.MD.A.2	Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
Evidence Statement:	4.MD.2-2	Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, in problems involving simple fractions. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. i) Situations involve two measurements given in the same units, one a whole-number measurement and the other a non-whole-number measurement (given as a fraction).ii) Tasks may present number line diagrams featuring a measurement scale. iii) Tasks may include measuring distances to the nearest cm or mm. iv) Units of mass are limited to grams and kilograms. v) Task will not include division involving fractions.
Subclaim:	B - Supporting Content	The student solves problems involving the Additional and Supporting Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	Not Available	

Item Set 2 – Question 11 (TEI Hot Spot)

What number on the number line represents the value of $2 \times \frac{2}{3}$?

Select **one** place on the number line to plot the point.

Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NF.B.4.a	Understand a fraction a/b as a multiple of 1/b. For example, use a visual fraction model to represent $\frac{5}{4}$ as the product 5 x $(\frac{1}{4})$, recording the conclusion by the equation $\frac{5}{4}$= 5 x $(\frac{1}{4})$.
Evidence Statement:	4.NF.4a	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction a/b as a multiple of 1/b. For example, use a visual fraction model to represent $\frac{5}{4}$ as the product 5 x $(\frac{1}{4})$, recording the conclusion by the equation $\frac{5}{4}$= 5 x $(\frac{1}{4})$. i) Tasks are limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.
Subclaim:	A - MajorContent	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	Not Available	

Create a fraction model with a denominator of 10 that is equivalent to $\frac{70}{100}$.

Divide the figure into the correct number of equal parts by using the More and Fewer buttons. Then shade by selecting the part or parts.

| Fewer | More | Reset |

Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.NF.A.1	Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Evidence Statement:	4.NF.1-2	Use the principal a/b = (n x a)/(n x b) to recognize and generate equivalent fractions. i) The explanation aspect of 4.NF.1 is not assessed here; for that aspect of the standard, see 4.C.4-1, 4.C.5-2, and 4.C.7-1. ii) Tasks are limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. iii) Tasks may include fractions that equal whole numbers. Whole numbers are limited to 0 through 5.
Subclaim:	A – Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.
P Value:	Not Available	