

Colorado Measures of Academic Success



Grade 4 Mathematics

Answer Key with Scoring Rubrics

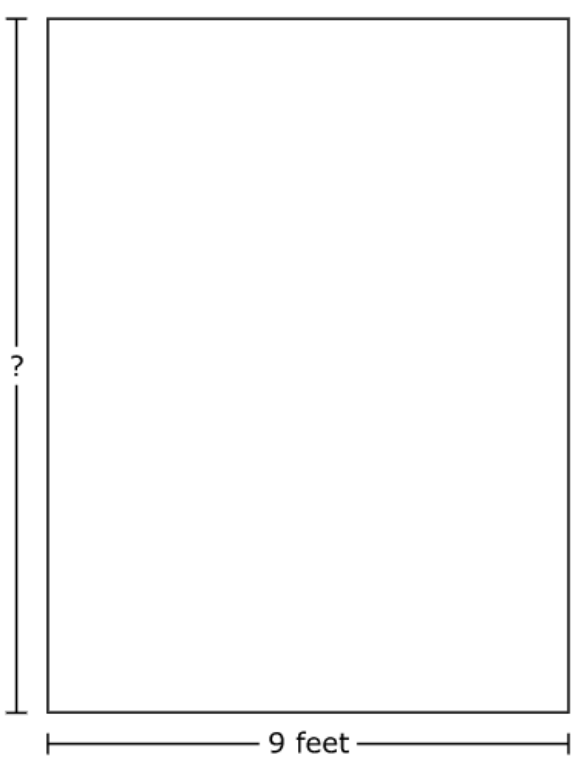
Practice Resource for Students

Colorado continues to use the Evidence Statements that were developed in collaboration with the Partnership for Assessment of Readiness for College and Careers (PARCC) consortium. Evidence statements describe the knowledge and skills that an assessment item/task elicits from students. For a detailed description of the Evidence Statements, please visit https://www.cde.state.co.us/assessment/cmas_testdesign.

ANSWER KEY: ITEM SET 1

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

The area of the rectangular sandbox at Dave's school is 108 square feet.
 The sandbox has a width of 9 feet as shown in the diagram.



What is the length, in feet, of the sandbox?
 Enter your answer in the box.

feet

Item Information		
Answer:	12	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.4.1.a.v	Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
Evidence Statement:	4.MD.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.
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.

The table shows the heights of three different plants.

PLANT HEIGHTS

Type of Plant	Height (feet)
tomato	$\frac{1}{3}$
pepper	$\frac{3}{6}$
bean	$\frac{5}{12}$

Part A

Which statements about the heights of the plants are true?

Select the **three** correct statements.

- A. The bean plant is the tallest plant.
- B. The tomato plant is the shortest plant.
- C. The pepper plant is taller than the bean plant.
- D. The tomato plant is shorter than the bean plant.
- E. The pepper plant is shorter than the tomato plant.

Part B

How much taller is the tallest plant than the shortest plant?

- A. $\frac{1}{12}$ foot
- B. $\frac{2}{12}$ foot
- C. $\frac{6}{12}$ foot
- D. $\frac{10}{12}$ foot

Item Information		
Answer:	Part A = B,C,D; Part B = B	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.1.b	Use decimal notation to express fractions, and compare decimal fractions.
	4.1.2.a.iii	Compare two fractions with different numerators and different denominators, and justify the conclusions.
	4.1.2.b.i.3	Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.
Evidence Statement:	4.NF.Int.1	Solve one-step word problems requiring integration of knowledge and skills articulated in 4.NF. Content Scope: 4.NF.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 1 - Question 3 (Multiple Select)

Select the **three** choices that are factor pairs for the number 28.

A. 1 and 28

B. 2 and 14

C. 3 and 9

D. 4 and 7

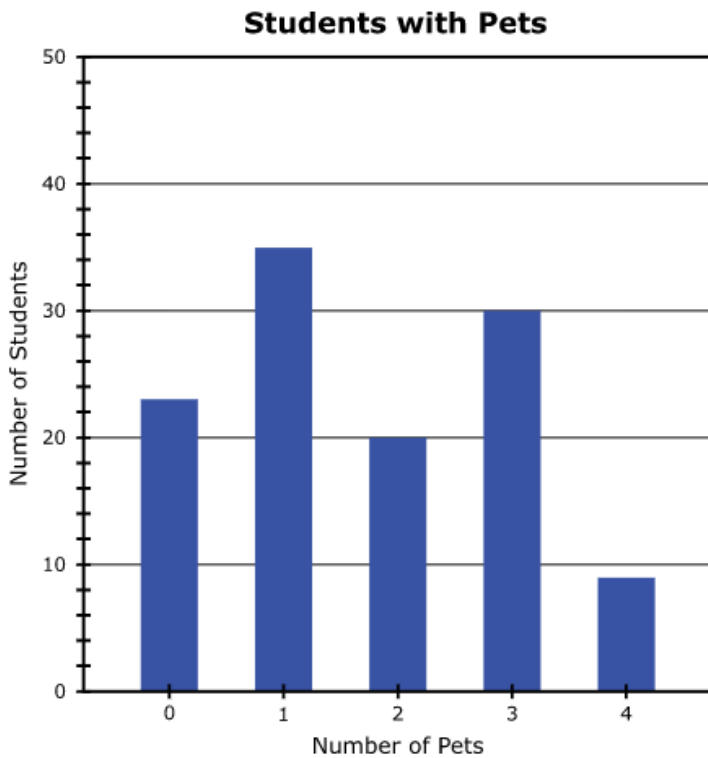
E. 6 and 5

F. 8 and 3

Item Information		
Answer:	A,B,D	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.2.1.b.i	Find all factor pairs for a whole number in the range 1–100.
	4.2.1.b.ii	Recognize that a whole number is a multiple of each of its factors.
	4.2.1.b.iii	Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number.
	4.2.1.b.iv	Determine whether a given whole number in the range 1–100 is prime or composite.
Evidence Statement:	4.OA.4-1	Find all factor pairs for a whole number in the range 1–100.
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.

Item Set 1 - Question 4 (Fill in the Blank, Equation Editor, Equation Editor)

Ms. Sloan asked 117 fourth-grade students the question, "How many pets do you have?" She displayed the data she collected in the bar graph shown.



Part A

How many of the students that responded have 2 pets?

Enter your answer in the box.

Part B

How many more students have 1 pet than students who have 3 pets? Explain your answer.

Enter your answer and explanation in the space provided.



▼ Math symbols

+	-	×	÷
$\frac{\square}{\square}$	$\frac{\square}{\square}$	()	[]
=	<	>	≠
\$	°	?	

Part C

Find the total number of pets the fourth-grade students have.

- Explain how you used the bar graph to solve the problem.
- Show your work using equations.

Enter your explanation, your work, and the total number of pets in the space provided.

Item Information		
Answer:	Part A = 20; Part B – See Scoring Rubric; Part C – See Scoring Rubric	
Colorado Academic Standards (CAS) Evidence Outcomes:	3.3.1.a.ii	Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.
Evidence Statement:	4.D.2	Solve multi-step contextual word problems with degree of difficulty appropriate to Grade 4, requiring application of knowledge and skills articulated in 3.OA.A, 3.OA.8, 3.NBT, and/or 3.MD.
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 and persevering 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).

Scoring Rubric – Part A	
Points	Attributes
1	Computation Component: Student provides the correct number of student that have 2 pets, 20
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 additional students that have 1 pet rather than 3 pets, 5 students Modeling Component: Valid explanation or work showing how to use the bar graph to determine how many more students have 1 pet than 3 pets
1	Student response includes 1 of the 2 elements. If a computation mistake is made, credit cannot be given for the computation component, but 1 point can be given for stating a correct process in the explanation.
0	Student response is incorrect or irrelevant.
Sample Student Response:	I looked at the height of the bar to find the number of students with one pet and saw it was 35. Then I looked at the height of the bar to find the number of students with 3 pets and saw it was 30. I subtracted $35 - 30$ and got 5. So, there are 5 more students who have 1 pet than 3 pets.
Annotation for Sample Student Response:	Score Point 2 The response receives full credit. It includes each of the two required elements. Computation Component: <ul style="list-style-type: none"> • Student Response: 5 more students who have 1 pet than 3 pets. <ul style="list-style-type: none"> ○ Rationale for Score: A correct number of additional students who have 1 pet rather than 3 pets is given (5). Modeling Component: <ul style="list-style-type: none"> • Student Response: I looked at the height of the bar to find the number of students with one pet and saw it was 35. Then I looked at the height of the bar to find the number of students with 3 pets and saw it was 30. I subtracted $35 - 30$ and got 5.

	<ul style="list-style-type: none"> ○ Rationale for Score: A valid explanation is provided to determine the additional number of students with 1 pet rather than 3 pets. The bar graph is correctly read to find the number of students with 1 pet (looked at the height of the bar to find the number of students with one pet and saw it was 35) and the number of students with 3 pets (looked at the height of the bar to find the number of students with 3 pets and saw it was 30), then the numbers are subtracted to find the difference for how many more students have 1 pet rather than 3 pets (subtracted $35 - 30$ and got 5). <p>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.</p>
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Scoring Rubric – Part C	
Points	Attributes
3	Student response includes each of the following 3 elements. Computation Component: Correct total number of pets in grade 4, 201 Modeling Component: Valid explanation or work for how to use the bar graph to find the total number of pets Modeling Component: Valid equations to find the total number of pets
2	Student response includes 2 of the 3 elements. If a computation mistake is made, credit cannot be given for the computation component, but points can be given for modeling.
1	Student response includes 1 of the 3 elements.
0	Student response is incorrect or irrelevant.
Sample Student Response:	I read the height of each bar to know how many students had 1 pet, 2 pets, 3 pets, and 4 pets. I determined how many pets each bar shows by multiplying the number of students by the number of pets for each bar. Adding the numbers of pets for all the bars gives the total. 35 students have 1 pet, $1 \times 35 = 35$ pets. 20 students have 2 pets, $2 \times 20 = 40$ pets. 30 students have $3 \times 30 = 90$ pets. 9 students have 4 pets, $4 \times 9 = 36$ pets. $35 + 40 + 90 + 36 = 201$ total pets.
Annotation for Sample Student Response:	<p>Score Point 3</p> <p>The response receives full credit. It includes each of the three required elements.</p> <p>Computation Component:</p> <ul style="list-style-type: none"> ● Student Response: 201 total pets <ul style="list-style-type: none"> ○ Rationale for Score: A correct total number of pets in grade 4 is provided (201). <p>Modeling Component:</p> <ul style="list-style-type: none"> ● Student Response: I read the height of each bar to know how many students had 1 pet, 2 pets, 3 pets, and 4 pets. I determined how many pets each bar shows by multiplying the number of students by the number of pets for each bar. <ul style="list-style-type: none"> ○ Rationale for Score: The student provides a valid explanation of how to use the bar graph to find the total number of pets. The student reads the bar graph for the number of students who have 1, 2, 3 or 4 pets (I read the height of each bar to know how many students had 1 pet, 2 pets, 3 pets, and 4 pets . . . 35 students have 1 pet . . . 20 students have 2 pets . . . 30 students have 3 . . . 9 students have 4 pets). <p>Modeling Component:</p> <ul style="list-style-type: none"> ● Student Response: 35 students have 1 pet, $1 \times 35 = 35$ pets. 20 students have 2 pets, $2 \times 20 = 40$ pets. 30 students have $3 \times 30 = 90$ pets. 9 students have 4 pets, $4 \times 9 = 36$ pets. $35 + 40 + 90 + 36 = 201$ total pets.

- **Rationale for Score:** Valid equations are used to find the total number of pets in grade 4. First, the number of students is multiplied by the number of pets they have to find the total pets for each bar ($1 \times 35 = 35$, $2 \times 20 = 40$, $3 \times 30 = 90$, $4 \times 9 = 36$) and then the totals are added to find the final total number of pets in grade 4 ($35 + 40 + 90 + 36 = 201$).

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 (TEI – Drag-and-Drop)

Which fractions complete the number sentences shown to make true comparisons?

Complete each number sentence so that it is a true comparison.

Drag and drop a fraction into each box.

$$\frac{20}{100}$$

$$\frac{6}{10}$$

$$\frac{1}{2}$$

$$\frac{2}{12}$$

$$\frac{2}{5} =$$

$$\frac{40}{100}$$

$$\frac{3}{5} <$$

$$\frac{2}{3}$$

Item Information		
Answer:	See image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.2.a.iii	Compare two fractions with different numerators and different denominators, and justify the conclusions.
Evidence Statement:	4.NF.2-1	Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or by comparing to a benchmark fraction such as $\frac{1}{2}$. Record the results of comparisons with symbols $<$, $=$, or $>$.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 1 - Question 6 (Equation Editor, Equation Editor)

Jian's family sells honey from beehives. They collected 3,311 ounces of honey from the beehives this season. They will use the honey to completely fill 4-ounce jars or 6-ounce jars.

Jian's family will sell 4-ounce jars for \$5 each or 6-ounce jars for \$8 each.

Jian says if they use only 4-ounce jars, they could make \$4,140 because $3,311 \div 4 = 827 \text{ R } 3$. That rounds up to 828, and 828 multiplied by \$5 is \$4,140.

Part A

Explain the error that Jian made when finding the amount of money his family could make if they use only 4-ounce jars.

Enter your explanation in the space provided.



▼ Math symbols

+	-	×	÷
$\frac{\square}{\square}$	$\square \square$	(.)	[.]
=	<	>	≠
\$	°	?	

Part B

Explain how to determine the money Jian's family could make if they use only 6-ounce jars. Include the total amount of money and the total number of 6-ounce jars in your explanation.

Enter your answers and your explanation in the space provided.

Item Information		
Answer:	See Scoring Rubric	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.b.iv	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.
	4.1.3.b.v	Represent multistep word problems with equations using a variable to represent the unknown quantity.
	4.1.3.b.vi	Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
Evidence Statement:	4.C.5-1	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.OA.3.
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.

Scoring Rubric – Part A	
Points	Attributes
1	Student response includes the following element. Reasoning Component: Valid explanation of the error made by Jian
0	Student response is incorrect or irrelevant.
Sample Student Response:	Jian rounded the quotient up, but that won't work because the remainder of 3 means there are only 3 ounces of honey left, and that is not enough to fill the last jar.
Annotation for Sample Student Response:	<p>Score Point 1 The response receives full credit. It includes the required element.</p> <p>Reasoning Component:</p> <ul style="list-style-type: none"> • Student Response: Jian rounded the quotient up, but that won't work because the remainder of 3 means there are only 3 ounces of honey left, and that is not enough to fill the last jar. <ul style="list-style-type: none"> ○ Rationale for Score: A valid explanation of the error Jian made is provided. The student explains that when using 4 ounce jars, the remainder left indicates that one jar is not completely full and only has 3 ounces, so the quotient should not be rounded up (Jian rounded the quotient up, but that won't work because the remainder of 3 means there are only 3 ounces of honey left, and that is not enough to fill the last jar). <p>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.</p>

Scoring Rubric – Part B	
Points	Attributes
2	Student response includes each of the following 2 elements. Computation Component: Correct total number of 6 ounce jars of honey, 551 and correct total amount of money, \$4,408 Reasoning Component: Valid explanation or work to correctly interpret the remainder and solve the problem
1	Student response includes 1 of the 2 elements. If a computation mistake is made, credit cannot be given for the computation component, but points can be given for valid reasoning.
0	Student response is incorrect or irrelevant.
Sample Student Response:	I would divide 3,311 by 6 and find a quotient of 551, with a remainder of 5. This means they could completely fill 551 jars, but the leftover honey would not be enough to fill another jar. I multiplied 551 x 8 to equal \$4,408.
Annotation for Sample Student Response:	<p>Score Point 2 The response receives full credit. It includes each of the two required elements.</p> <p>Computation Component:</p> <ul style="list-style-type: none"> • Student Response: This means they could completely fill 551 jars, but the leftover honey would not be enough to fill another jar. I multiplied 551 x 8 to equal \$4,408. <ul style="list-style-type: none"> ○ Rationale for Score: A correct number of jars of honey is provided (551 jars) and a correct total amount of money earned from the sale of the honey is given (\$4,408).

	<p>Reasoning Component:</p> <ul style="list-style-type: none"> ● Student Response: I would divide 3,311 by 6 and find a quotient of 551, with a remainder of 5. This means they could completely fill 551 jars, but the leftover honey would not be enough to fill another jar. <ul style="list-style-type: none"> ○ Rationale for Score: Valid work is provided to show the steps to solve the problem (divide 3,311 by 6 and find a quotient of 551 . . . multiplied 551 x \$8 to equal \$4,408) with a valid interpretation of the remainder integrated into the solution process (divide 3,311 by 6 and find a quotient of 551, with a remainder of 5. This means they could completely fill 551 jars, but the leftover honey would not be enough to fill another jar). <p>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.</p>
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Item Set 1 - Question 7 (Multiple Select)

Which numbers make the comparison true?

$27,768 < \square$

Select the **two** correct answers.

A. 27,759

B. 28,744

C. 26,773

D. 27,568

E. 27,836

Item Information		
Answer:	B,E	
Colorado Academic Standards (CAS)	4.1.1.a.ii	Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form.
Evidence Outcomes:	4.1.1.a.iii	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.NBT.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.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 1 - Question 8 (TEI Drag-and-Drop, Equation Editor)

Each student in a class chose one sport to play. This table shows the fractions of all students who chose each sport.

Sport	Fraction of All Students
soccer	$\frac{3}{10}$
football	$\frac{2}{10}$
hockey	$\frac{1}{10}$
basketball	$\frac{4}{10}$

Part A

Drag and drop the fractions and operation symbols into the blanks to create an equation that can be used to find s , the fraction of all students who chose to play either soccer or basketball.

Drag and drop the answers into the correct order.

$\frac{1}{10}$ $\frac{2}{10}$ $-$ \times \div

$\frac{3}{10}$ $+$ $\frac{4}{10}$ = s

Part B

Enter the fraction of all the students who chose to play either soccer or basketball.

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



$\frac{7}{10}$ |

Math symbols
 $+$ $-$ \times \div

Item Information		
Answer:	Part A – See image; Part B = $\frac{7}{10}$	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.2.b.i.3	Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.
Evidence Statement:	4.NF.3d	Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. 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.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 1 - Question 9 (Fill in the Blank)

Enter your answer in the box.

$$3,950 + 405 = \boxed{4,355}$$

Item Information		
Answer:	4,355	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.a.i	Fluently add and subtract multi-digit whole numbers using standard algorithms.
Evidence Statement:	4.NBT.Int.1	Perform computations by applying conceptual understanding of place value, rather than by applying multi-digit algorithms.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

ANSWER KEY: ITEM SET 2

Item Set 2 - Question 1 (Fill in the Blank)

Enter your answer in the box.

$$522 \div 9 = \boxed{58}$$

Item Information		
Answer:	58	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.a.iii	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.
	4.1.3.a.iv	Illustrate and explain multiplication and division calculation by using equations, rectangular arrays, and/or area models.
Evidence Statement:	4.NBT.6-1	Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication 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.

Item Set 2 - Question 2 (Selected Response)

The value of the digit 4 in the number 42,780 is 10 times the value of the digit 4 in which number?

- A. 34,651
- B. 146,703
- C. 426,135
- D. 510,400

Item Information		
Answer:	A	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.1.a.i	Explain that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.
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 $700 \div 70 = 10$ 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.

Item Set 2 - Question 3 (Equation Editor, Equation Editor)

Part A

Shaun plotted a point on the number line by drawing 5 equally spaced marks between 0 and 1 and placing a point on the third mark. He claims that the point represents the fraction $\frac{3}{5}$ because each mark represents $\frac{1}{5}$, so the third mark represents $\frac{3}{5}$.



- Explain why Shaun's reasoning is incorrect.
- Explain how you can use the number line to determine the fraction that Shaun's point represents.
- Determine the fraction that Shaun's point represents.

Enter your explanations and your answer in the space provided.



▼ Math symbols

+	-	×	÷
$\frac{\square}{\square}$	$\frac{\square}{\square}$	(·)	[·]
=	<	>	≠
\$	°	?	

Part B

Shaun wants to write a fraction that is equivalent to the fraction $\frac{2}{3}$.

Describe how Shaun can find a fraction that is equivalent to $\frac{2}{3}$.

Enter your description in the space provided.

Item Information		
Answer:	See Scoring Rubric	
Colorado Academic Standards (CAS)	3.1.2.a.ii	Describe a fraction as a number on the number line; represent fractions on a number line diagram.
Evidence Outcomes:	3.1.2.a.ii	Describe a fraction as a number on the number line; represent fractions on a number line diagram.
Evidence Statement:	4.C.5-6	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 3.OA.B, 3.NF, 3.MD.C.
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.

Scoring Rubric – Part A	
Points	Attributes
3	Student response includes each of the following 3 elements. Reasoning Component: Valid explanation of why Shaun’s reasoning is incorrect Reasoning Component: Valid explanation or work on how to use the number line to determine the fraction that Shaun’s point represents Computation Component: Correct fraction that Shaun’s point represents, $\frac{3}{6}$
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:	Shaun’s reasoning is incorrect because he drew 5 lines between 0 and 1 and said that this divided the line into fifths. This actually divides the line into sixths because there are six equal sections between 0 and 1. Shaun’s point represents the fraction $\frac{3}{6}$ because each mark on the number line is $\frac{1}{6}$. So the third mark is the point $\frac{3}{6}$.
Annotation for Sample Student Response:	Score Point 3 The response receives full credit. It includes each of the three required elements. Reasoning Component: <ul style="list-style-type: none"> • Student Response: Shaun’s reasoning is incorrect because he drew 5 lines between 0 and 1 and said that this divided the line into fifths. This actually divides the line into sixths because there are six equal sections between 0 and 1. <ul style="list-style-type: none"> ○ Rationale for Score: The student explains that dividing the number line using 5 tick marks divides the line into sixths, not fifths (Shaun’s reasoning is incorrect because he drew 5 lines between 0 and 1 and said that this divided the line into fifths. This actually divides the line into sixths because there are six equal sections between 0 and 1).
	Reasoning Component: <ul style="list-style-type: none"> • Student Response: Shaun’s point represents the fraction $\frac{3}{6}$ because each mark on the number line is $\frac{1}{6}$.

	<ul style="list-style-type: none"> ○ Rationale for Score: A valid explanation using the number line to determine the fraction represented by the point is given (each mark on the number line is $\frac{1}{6}$. So the third mark is the point $\frac{3}{6}$). The student determines what each space represents on the number line ($\frac{1}{6}$), and counts 3 spaces to the right starting at 0, to find $\frac{3}{6}$. <p>Computation Component:</p> <ul style="list-style-type: none"> ● Student Response: So the third mark is the point $\frac{3}{6}$. ○ Rationale for Score: The student provides the correct fraction that the point on the number line represents ($\frac{3}{6}$). <p>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.</p>
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Scoring Rubric – Part B	
Points	Attributes
1	Student response includes the following element. Reasoning Component: Valid description of the process to find a fraction equivalent to $\frac{2}{3}$
0	Student response is incorrect or irrelevant.
Sample Student Response:	I can find a fraction equivalent to $\frac{2}{3}$ by multiplying the numerator, 2, and denominator, 3, by the same number.
Annotation for Sample Student Response:	<p>Score Point 1 The response receives full credit. It includes the required element.</p> <p>Reasoning Component:</p> <ul style="list-style-type: none"> ● Student Response: I can find a fraction equivalent to $\frac{2}{3}$ by multiplying the numerator, 2, and denominator, 3, by the same number. <ul style="list-style-type: none"> ○ Rationale for Score: The student provides a valid explanation of the process to find an equivalent fraction by multiplying the numerator and denominator by the same number (I can find a fraction equivalent to $\frac{2}{3}$ by multiplying the numerator, 2, and denominator, 3, by the same number). <p>Note: Other strategies are valid such as showing that another fraction is the in the same position on a number line. 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.</p>

Item Set 2 - Question 4 (Fill in the Blank)

Enter your answer in the box.

$$3,649 \times 6 = \boxed{}$$

Item Information		
Answer:	21,894	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.a.ii	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.
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.

Item Set 2 - Question 5 (Fill in the Blank)

Enter your answer in the box.

$$7,564 + 8,239 = \boxed{}$$

Item Information		
Answer:	15,803	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.a.i	Fluently add and subtract multi-digit whole numbers using standard algorithms.
Evidence Statement:	4.NBT.4-1	Fluently add multi-digit whole numbers using the standard algorithm.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 2 - Question 6 (Multiple Select, TEI Inline Choice)

Part A

The table shows the lengths of five different animals in a zoo. For each animal, select a place in the table to show whether it is less than or greater than $\frac{5}{10}$ meter in length.

Select one cell per row.

Animal	Length (in meters)	Less than $\frac{5}{10}$ meter	Greater than $\frac{5}{10}$ meter
Blue jay	$\frac{25}{100}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cottontail rabbit	$\frac{4}{10}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Raccoon	$\frac{8}{10}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Snowy owl	$\frac{67}{100}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Thread snake	$\frac{11}{100}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Part B

Use the lengths in the table to compare the lengths of the animals.

Select from the drop-down menus to correctly complete each comparison.

blue jay cottontail rabbit

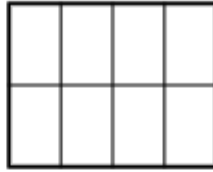
raccoon snowy owl

thread snake blue jay

Item Information		
Answer:	See image	
Colorado Academic Standards (CAS)	4.1.1.b	Use decimal notation to express fractions, and compare decimal fractions.
Evidence Outcomes:	4.1.2.a.iii	Compare two fractions with different numerators and different denominators, and justify the conclusions.
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
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 2 - Question 7 (Multiple Select)

The rectangle is divided into eight equal sections.



Jodi colors 4 sections. Then she colors 3 more sections.

Which **two** of these represent the fraction of the rectangle that Jodi colors in all?

Select the **two** correct answers.

- A. $\frac{4}{8} + \frac{3}{8}$
- B. $4 + 3$
- C. $\frac{8}{4} + \frac{8}{3}$
- D. $\frac{1}{8} + 3$
- E. $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$

Item Information		
Answer:	A,E	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.2.b.i	Apply previous understandings of addition and subtraction to add and subtract fractions.
Evidence Statement:	4.NF.3a	Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 2 - Question 8 (Selected Response)

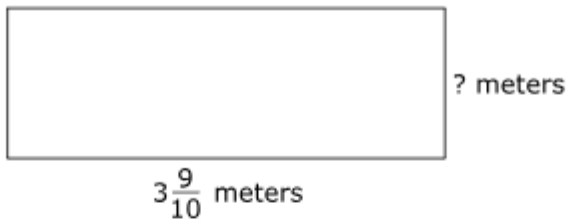
Which statement about angles is true?

- A. An angle is formed by two rays that do not have the same endpoint.
- B. An angle that turns through $\frac{1}{360}$ of a circle has a measure of 360 degrees.
- C. An angle that turns through five 1-degree angles has a measure of 5 degrees.
- D. An angle measure is equal to the total length of the two rays that form the angle.

Item Information		
Answer:	C	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.4.1.b.i	Describe angles as geometric shapes that are formed wherever two rays share a common endpoint, and explain concepts of angle measurement.
Evidence Statement:	4.MD.5	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement. a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle," and can be used to measure angles. b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.
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.

Item Set 2 - Question 9 (Equation Editor, Equation Editor)

The model shows a hallway in Clark's house.



Part A

The perimeter of the hallway is $10\frac{4}{10}$ meters.

What is the width, in meters, of the hallway?

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

Calculator interface showing basic arithmetic and fraction buttons.

Part B

Clark's family adds a closet that shortens the length of the hallway by $\frac{6}{10}$ meter.

What is the new perimeter, in meters, of the hallway?

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

Calculator interface showing basic arithmetic and fraction buttons.

Item Information		
Answer:	Part A = $1\frac{3}{10}$; Part B = $9\frac{2}{10}$	
Colorado Academic Standards (CAS) Evidence Outcomes:	3.4.2.c	Solve real world and mathematical problems involving perimeters of polygons.
Evidence Statement:	4.Int.6	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:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 2 - Question 10 (Equation Editor)

Ryan makes 6 backpacks. He uses $\frac{3}{4}$ yard of cloth to make each backpack. What is the total amount of cloth, in yards, Ryan uses to make all 6 backpacks?

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

$4\frac{1}{2}$

Item Information		
Answer:	$4\frac{1}{2}$	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.2.b.ii.3	Solve word problems involving multiplication of a fraction by a whole number.
Evidence Statement:	4.NF.4c	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. 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 pound of 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?
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

ANSWER KEY: ITEM SET 3

Item Set 3 - Question 1 (TEI Inline Choice)

Select the correct symbol from each drop-down menu to compare the measurements.

0.4 meter 0.04 meter

0.3 meter 0.5 meter

0.65 meter 0.61 meter

Item Information		
Answer:	See image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.1.b.iii	Compare two decimals to hundredths by reasoning about their size.
Evidence Statement:	4.NF.7	Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual model.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 3 - Question 2 (Fill in the Blank, Fill in the Blank)

Four teachers offer an after-school chess club. The table shows the number of students who joined.

Grade	Number of Students
third	12
fourth	36
fifth	9

Part A

The teachers will divide the total group of students who joined into teams of **no more than 6** students.

What is the **least** number of teams that will include all of the students?

Enter your answer in the box.

teams

Part B

The chess club started with 18 chess sets. The teachers ordered 3 cases of 15 chess sets. They will divide the total number of chess sets so that each teacher receives an equal number. Then they will give any extra sets to the school library.

What is the **greatest** number of chess sets each of the 4 teachers should get?

Enter your answer in the box.

chess sets

Item Information		
Answer:	Part A = 10; Part B = 15	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.b.iv	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.
	4.1.3.b.v	Represent multistep word problems with equations using a variable to represent the unknown quantity.
	4.1.3.b.vi	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.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 3 - Question 3 (Equation Editor)

Henry cut a piece of yarn that was $\frac{11}{6}$ feet long into two pieces. List two different pairs of fractions that could show the lengths, in feet, of the two pieces. Explain how you found your pairs of fractions.

Enter your fraction pairs and your explanation in the space provided.

Item Information		
Answer:	See Scoring Rubric	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.2.b.i	Apply previous understandings of addition and subtraction to add and subtract fractions.
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.
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 and persevering 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).

Scoring Rubric	
Points	Attributes
3	<p>Student response includes each of the following 3 elements.</p> <p>Modeling Component: Valid fraction pair that sums to $\frac{11}{6}$</p> <p>Modeling Component: Valid, different fraction pair, that sums to $\frac{11}{6}$</p> <p>Modeling Component: Valid explanation or work for how to find the two fraction pairs</p>
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:	The two fraction pairs could be, $\frac{5}{6}$ and $\frac{6}{6}$ or $\frac{7}{6}$ and $\frac{4}{6}$. Each pair adds up to $\frac{11}{6}$ because when you add fractions with the same denominator, you add the numerators and the denominator does not change.

<p>Annotation for Sample Student Response:</p>	<p>Score Point 3 The response receives full credit. It includes each of the three required elements.</p> <p>Modeling Component:</p> <ul style="list-style-type: none"> • Student Response: $\frac{5}{6}$ and $\frac{6}{6}$ <ul style="list-style-type: none"> ○ Rationale for Score: The student provides a pair of fractions that add to $\frac{11}{6}$ ($\frac{5}{6}$ and $\frac{6}{6}$). <p>Modeling Component:</p> <ul style="list-style-type: none"> • Student Response: $\frac{7}{6}$ and $\frac{4}{6}$ <ul style="list-style-type: none"> ○ Rationale for Score: The student provides a different pair of fractions that add to $\frac{11}{6}$ ($\frac{7}{6}$ and $\frac{4}{6}$). <p>Modeling Component:</p> <ul style="list-style-type: none"> • Student Response: Each pair adds up to $\frac{11}{6}$ because when you add fractions with the same denominator, you add the numerators and the denominator does not change. <ul style="list-style-type: none"> ○ Rationale for Score: The student provides a valid explanation of how the pairs of fractions that equal $\frac{11}{6}$ were found (Each pair adds up to $\frac{11}{6}$ because when you add fractions with the same denominator, you add the numerators and the denominator does not change). Explaining the process of keeping the denominator the same while adding the numerators shows a complete understanding of how to add fractions. <p>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.</p>
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Item Set 3 - Question 4 (Selected Response)

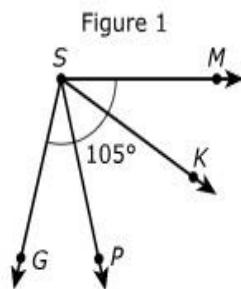
A basketball team scored a total of 747 points for the season. This was 9 times the number of points scored in the first game. How many points were scored during the first game?

- A. 73
- B. 75
- C. 82
- D. 83

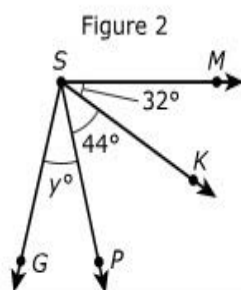
Item Information		
Answer:	D	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.b.iii	Multiply or divide to solve word problems involving multiplicative comparison.
Evidence Statement:	4.OA.2	Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 3 - Question 5 (TEI Drag-and-Drop, Fill in the Blank)

Two figures are shown. In Figure 1, the measure of angle MSG is 105° .



The measures of angle MSK , angle KSP , and angle PSG are shown in Figure 2. The measure of angle MSG is still 105° .



Part A

Drag and drop numbers and symbols into the blanks to complete an equation that can be used to find the value of y . Each symbol may be used more than once or not at all.

Drag and drop the numbers and symbols into the correct order.

= 105

Part B

What is the value of y ?

Enter your answer in the box.

Item Information		
Answer:	Part A – See image; Part B = 29	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.4.1.b.iii	Demonstrate that angle measure as additive.
	4.4.1.b.iv	Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems.
Evidence Statement:	4.MD.7	Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.
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.

Item Set 3 - Question 6 (Fill in the Blank)

Hayley has 272 beads. She buys 38 more beads. She will use 89 beads to make bracelets and the rest to make necklaces. She will use 9 beads for each necklace.

What is the **greatest** number of necklaces Hayley can make?

Enter your answer in the box.

necklaces

Item Information		
Answer:	24	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.b.iv	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.
	4.1.3.b.v	Represent multistep word problems with equations using a variable to represent the unknown quantity.
	4.1.3.b.vi	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.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 3 - Question 7 (Fill in the Blank)

The length of a desktop is 4 feet. How many inches is the length of the desktop?

Enter your answer in the box.

inches

Item Information		
Answer:	48	
Colorado Academic Standards (CAS)	4.4.1.a.i	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec.
Evidence Outcomes:	4.4.1.a.ii	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.
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.

Item Set 3 - Question 8 (Multiple Select)

Which **two** equations represent the statement "48 is 6 times as many as 8"?

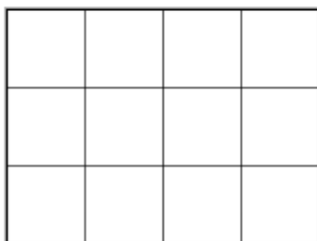
Select the **two** correct answers.

- A. $48 = 6 + 8$
- B. $48 = 6 \times 8$
- C. $48 = 6 \times 6$
- D. $48 = 8 + 6$
- E. $48 = 8 \times 6$

Item Information		
Answer:	B,E	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.3.b.i	Interpret a multiplication equation as a comparison.
	4.1.3.b.ii	Represent verbal statements of multiplicative comparisons as multiplication equations.
Evidence Statement:	4.OA.1-2	Represent verbal statements of multiplicative comparisons as multiplication equations.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 3 - Question 9 (Equation Editor, Equation Editor)

Martin cut a pan of corn bread into equal pieces as shown in the model. **Part A**



Martin gave $\frac{1}{3}$ of the corn bread to his neighbor.

Explain how you can use the model to show $\frac{1}{3}$. Then write a fraction that is equivalent to $\frac{1}{3}$.

Enter your explanation and your answer in the space provided.



▼ Math symbols

+	-	×	÷
$\frac{\square}{\square}$	$\frac{\square}{\square}$	(·)	[·]
=	<	>	≠
\$	°	?	

Part B

Martin gave $\frac{6}{12}$ of the corn bread to his teacher.

Write a comparison using <, >, or = to compare the fractions $\frac{1}{3}$ and $\frac{6}{12}$. Explain how the model can be used to compare these fractions.

Enter your comparison and your explanation in the space provided.



Item Information		
Answer:	See Scoring Rubric	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.1.b	Use decimal notation to express fractions, and compare decimal fractions.
	4.1.2.a.ii	Use the principle of fraction equivalence to recognize and generate equivalent fractions.
	4.1.2.a.iii	Compare two fractions with different numerators and different denominators, and justify the conclusions.
Evidence Statement:	4.C.4-1	Base arithmetic explanations/reasoning on concrete referents such as diagrams (whether provided in the prompt or constructed by the student in her response), connecting the diagrams to a written (symbolic) method. Content Scope: Knowledge and skills articulated in 4.NF.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.

Scoring Rubric – Part A	
Points	Attributes
2	<p>Student response includes each of the following 2 elements.</p> <p>Computation Component: Valid fraction that is equivalent to $\frac{1}{3}$</p> <p>Reasoning Component: Valid explanation or work for how to use the model to represent $\frac{1}{3}$</p>
1	<p>Student response includes 1 of the 2 elements.</p> <p>If a computation mistake is made, credit cannot be given for the computation component, but 1 point can be given for a correct explanation.</p>
0	<p>Student response is incorrect or irrelevant.</p>
Sample Student Response:	<p>There are 3 rows, so $\frac{1}{3}$ is one row. There are 4 pieces in each row and 12 pieces in all, so $\frac{4}{12}$ would be equal to $\frac{1}{3}$.</p>
Annotation for Sample Student Response:	<p>Score Point 2</p> <p>The response receives full credit. It includes each of the two required elements.</p> <p>Reasoning Component:</p> <ul style="list-style-type: none"> • Student Response: There are 4 pieces in each row and 12 pieces in all, so $\frac{4}{12}$ would be equal to $\frac{1}{3}$. <ul style="list-style-type: none"> ○ Rationale for Score: A valid fraction equivalent to $\frac{1}{3}$ is provided ($\frac{4}{12}$). <p>Computation Component:</p> <ul style="list-style-type: none"> • Student Response: There are 3 rows, so $\frac{1}{3}$ is one row. <ul style="list-style-type: none"> ○ Rationale for Score: The student provides a valid explanation for how to use the model to represent the fraction $\frac{1}{3}$ (3 rows, so $\frac{1}{3}$ is one row). <p>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.</p>

Scoring Rubric – Part B	
Points	Attributes
2	<p>Student response includes each of the following 2 elements.</p> <p>Reasoning Component: Correct comparison of the fractions $\frac{1}{3}$ and $\frac{6}{12}$ using the appropriate symbol, $\frac{1}{3} < \frac{6}{12}$ or $\frac{6}{12} > \frac{1}{3}$</p> <p>Reasoning Component: Valid explanation of how to use the model to compare the fractions</p>
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.
Sample Student Response:	Using the model to compare the fractions I see that $\frac{1}{3}$ is 4 out of 12 pieces, and $\frac{6}{12}$ is 6 out of 12 pieces. 4 pieces is less than 6 pieces, so $\frac{1}{3}$ is less than $\frac{6}{12}$. $\frac{1}{3} < \frac{6}{12}$
Annotation for Sample Student Response:	<p>Score Point 2</p> <p>The response receives full credit. It includes the two required elements.</p> <p>Reasoning Component:</p> <ul style="list-style-type: none"> • Student Response: $\frac{1}{3} < \frac{6}{12}$ <ul style="list-style-type: none"> ○ Rationale for Score: The student provides a correct comparison between the two fractions using the appropriate inequality symbol ($\frac{1}{3} < \frac{6}{12}$). <p>Reasoning Component:</p> <ul style="list-style-type: none"> • Student Response: Using the model to compare the fractions I see that $\frac{1}{3}$ is 4 out of 12 pieces, and $\frac{6}{12}$ is 6 out of 12 pieces. 4 pieces is less than 6 pieces, so $\frac{1}{3}$ is less than $\frac{6}{12}$. <ul style="list-style-type: none"> ○ Rationale for Score: The model is used to give a valid explanation of how to compare the two fractions. Each fraction is compared to the 12 total pieces in the model ($\frac{1}{3}$ is 4 out of 12 pieces, and $\frac{6}{12}$ is 6 out of 12 pieces). The number of pieces or numerators are then compared to see which is a greater or less part of the whole (4 pieces is less than 6 pieces, so $\frac{1}{3}$ is less than $\frac{6}{12}$). <p>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.</p>

Item Set 3 - Question 10 (Multiple Select)

For each figure pictured in the table, select the box for any statement that describes the figure. You may select more than one box for each figure.

	Appears to have at least 2 parallel sides	Has at least 2 perpendicular sides
	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Item Information		
Answer:	See image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.4.2.c	Classify and identify two-dimensional figures according to attributes of line relationships or angle size.
Evidence Statement:	4.G.2	Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
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.

Item Set 3 - Question 11 (Fill in the Blank)

The Amazon River is about 6,516 kilometers long.

The Mississippi River is about 3,775 kilometers long.

What is the difference, in kilometers, between these two lengths?

Enter your answer in the box.

kilometers

Item Information		
Answer:	2,741	
Colorado Academic Standards (CAS) Evidence Outcomes:	3.1.1.a.ii	Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
Evidence Statement:	4.Int.7	Solve one-step word problems involving adding or subtracting two four-digit numbers.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 3 - Question 12 (TEI Bar Graph/Histogram/Slider)

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:	4.4.1.a.iii	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.
	4.4.1.a.iv	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.
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.

Item Set 3 - Question 13 (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.

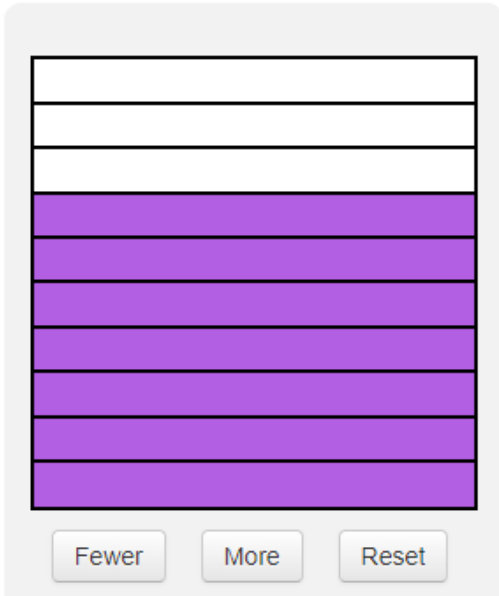
The image shows a number line from 0 to 6. There are 20 tick marks in total, representing intervals of 1/3. The integers 0, 1, 2, 3, 4, 5, and 6 are labeled. A blue dot is placed at the second tick mark after 1, which represents the fraction 2/3.

Item Information		
Answer:	See image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.2.b.ii.1	Express a fraction a/b as a multiple of $1/b$.
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 $5/4$ as the product $5 \times (1/4)$, recording the conclusion by the equation $5/4 = 5 \times (1/4)$.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Item Set 3 - Question 14 (TEI Bar Graph/Histogram/Slider)

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.



Item Information		
Answer:	See image	
Colorado Academic Standards (CAS) Evidence Outcomes:	4.1.2.a.ii	Use the principle of fraction equivalence to recognize and generate equivalent fractions.
Evidence Statement:	4.NF.1-2	Use the principle $a/b = (n \times a)/(n \times b)$ to recognize and generate equivalent fractions.
Subclaim:	A - Major Content	The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

SCORING DECISIONS

Scoring decisions are overarching decisions that describe issues that arise when scoring student responses. Scoring decisions are made so common issues, like an incorrect label, are treated the same way across all grades and items. Scoring decisions inform how to apply scoring criteria to common errors seen in student responses.

Scoring Decision 1	
Scoring Issue:	A student makes an error early in the problem (Part A) and gets everything correct afterwards.
Decision and Solution:	<p>The general scoring decision is that bullets in an item rubric, or parts of an item, are independent of each other. If a student makes a mistake early on in the problem and their work correctly follows that single mistake, they will not have further points deducted.</p> <p>A rubric may specify a certain response type, such as: Part A requires a cubic equation and the student writes a linear equation and Part B of the item then asks the student to “use your equation”, the student will lose an additional score point because solving a linear equation is a different content task than solving a cubic equation. In these cases, the rubric will supersede this decision, especially if the student’s error in Part A significantly changes the content being measured in the task.</p>
Rationale:	A student who provides an incorrect answer early in the problem does not earn credit for that Part. However, if the student then answers subsequent Parts correctly, based on the incorrect answer given in Part A, they do not lose any additional points since the student has already lost credit for the original mistake.

Scoring Decision 2	
Scoring Issue:	Student provides only a correct answer as the response.
Decision and Solution:	<p>If a correct answer is given in response to one of the rubric elements, then the student will receive credit for that answer.</p> <p>Note: If only a correct answer is given, but the rubric states that the student must show or demonstrate work for that score point, the student will not receive credit.</p>

Scoring Decision 3	
Scoring Issue:	A response uses a wrong variable or a different symbol than the item indicates the student is to use.
Decision and Solution:	<p>Students that use a different variable or symbol, than the one the item directs them to use, must define the variable to receive full credit for the element.</p> <p>If an item only has one variable, then the student does not have to define the variable in order to receive credit, but if the item has multiple variables the student must define the variables.</p> <p>If the variable(s) are defined in the item, the student does not have to define them in order to receive credit, but if the student switches variables, the student must then define the variable to receive credit.</p> <p>This is a precision point deduction and will only be applied to a top score point response. For example: in a 0-3 score point item, if a student receives a score point 3, but does not use the correct variable and fails to define the variable, then a precision point would be deducted for the imprecise math, and the response would receive a score point 2. However, if they only show understanding of 2 of the 3 elements (a score point 2 response), this is not a top score point response and no precision point would be deducted.</p>

Scoring Decision 4	
Scoring Issue:	Application of Precision Point deductions taken for imprecise math in student responses.
Decision and Solution:	<p>The Common Core State Standards for mathematical practice outline the expertise that educators should be working to develop in students of all ages and academic abilities. One of the 8 standards of mathematical practice is named, “Attend to Precision,” and is defined as follows: Good mathematical practice involves the ability to communicate what one has learned. Students must be able to use mathematical definitions to clearly and accurately explain their reasoning. In addition, they should be precise about units of measure and labeling axes.</p> <p>One point will be deducted from responses which would otherwise receive a top score if any of the following mathematical precision errors are made:</p> <p>Imprecise mathematical language: A precision point will be deducted for imprecise use of mathematical language that reflects content that is at or below the grade that the item will be assessed as, as defined by the CCSSM. For example, referring to an inequality as an equation. An above grade level word or phrase that is relevant to the content of the item and is not key to the student’s response will not lose the precision point if the response remains complete and accurate when that word or phrase is removed. o If a word or phrase is above grade level, used correctly and completely answers the prompt, the response will receive full credit. If a word or phrase is above grade level and is used incorrectly, a precision point will be deducted.</p> <p>Imprecise labels, e.g., feet, centimeters, quarts, etc.: If the item specifies the unit for the answer or the item uses only one unit, no label is required on the student answer.</p>

Scoring Decision 4 (cont'd)	
Decision and Solution:	<p>If the item does not specify a unit for the answer and the item uses more than one unit, the student must label correctly or a precision point will be deducted.</p> <p>If the student uses an incorrect label, even if the prompt does specify a unit or the item only uses one unit, a precision point will be deducted.</p> <p>Imprecise (run-on) equations:</p> <p>If a run-on equation is given in a response, a precision point can be deducted. For example, $24 \times 16 = 384 \div 4 = 96$</p> <p>Monetary values:</p> <p>If students are asked to round to the nearest dollar or round to the nearest whole dollar both \$56 and \$56.00 should be scored as correct answers. If students use trailing zeros on monetary values, the zeros must be correct place value for monetary values. Entries such as \$56.0 and \$56.000 should not be counted as correct.</p> <p>When considering the top score point for a precision point deduction, only the hand scoring portion(s) will be involved. The student only loses one point from the top score point for precision error(s).</p> <p>When considering the top score point for a precision point deduction, if the item is a 3-point item, with 1 point machine scored, the precision point will only be deducted if the student receives credit for the machine scored part. If the student does not receive credit for the machine-scored part, then no further deduction of a precision point is taken, since this response is now receiving a total of 2 out of 3 score points and is not a top score response.</p> <p>For items with only one part, the precision point will only be deducted from a top score point response.</p> <p>For items with more than one part, the precision point will only be deducted if the student would have otherwise scored the top score on all parts combined.</p>

Scoring Decision 5	
Scoring Issue:	When an item requires students to show or explain their reasoning, a student must provide mathematical work or written explanation. It is not sufficient to only refer to work done on a calculator.
Decision and Solution:	A student response of "I plugged it into my calculator" or an equivalent response will not earn credit for reasoning elements. To receive credit for reasoning elements, a student must explain how the calculator was used, either by indicating key entries or by describing the calculation or solutions process in enough details that it could be duplicated. However, the student may receive the computation point if the answer is correct.

Scoring Decision 6	
Scoring Issue:	The use of a guess and check method to solve items is considered a valid strategy.
Decision and Solution:	In order to earn a reasoning point for a guess and check method, a student must show or explain at least one correct guess and check and one incorrect guess and check attempt.

Scoring Decision 7

Scoring Issue:	Student provides an equation written using words instead of numbers and operational symbols. For example, “I multiplied three times five and it equals fifteen.”
Decision and Solution:	<p>At all grade levels, the student will receive credit for a correct equation written in words that uses valid operational language.</p> <p>Equations must show the relationship between two quantities and must include an equal sign (or state “equals”) between the two quantities. For example, the statement “I multiplied three times five and I got fifteen” would not receive credit since “got” is not valid operational language. Operation language could include words such as: add, multiply (or times), equals, determined the square root, etc.”</p> <p>Note: Vertical algorithms are not the same as an equation and do not receive the credit for an equation.</p> <p>Example: $\begin{array}{r} 3 \\ \times 5 \\ \hline 15 \end{array}$</p> <p>Note: If the rubric states that an equation must include a variable, then the written equation must also include that variable. For example, “I multiplied three times x, and that equals 3x.”</p>

Scoring Decision 8

Scoring Issue:	If an item requires the student to complete a chart or table with a set of numbers or values and does not require work to be shown, how is incorrect work assessed?
Decision and Solution:	Incorrect work provided can be overlooked and will not detract from the response since the item did not ask for the student to show their work. In all cases, the item-specific rubric will supersede this scoring decision.

Scoring Decision 9

Scoring Issue:	If an item does not require a specific method of solution and students provide an alternate valid strategy that is not included in the rubric, exemplar, or training set, responses can receive credit.
Decision and Solution:	Students will receive credit for an alternate valid strategy that demonstrates understanding using appropriate mathematical reasoning or work.