Colorado Measures of Academic Success

Grade 6 Mathematics

Answer Key with Scoring Rubrics

Practice Resource for Students

ANSWER KEY: ITEM SET 1

Item Set 1 - Question 1 (Selected Response)

What is the value of this expression?

$$1{,}224 \div 16$$

- ○ A. 76.0
- ○ B. 76.2
- ● C. 76.5
- ○ D. 76.8

Item Information		
Answer:	C	
Colorado Academic Standards (CAS) Evidence Outcomes:	6.NS.B.2	Fluently divide multi-digit numbers using the standard algorithm.
Evidence Statement:	6.NS.2	Fluently divide multi-digit numbers using the standard algorithm. i) The given dividend and divisor are such as to require an efficient/standard algorithm (e.g., 40584 ÷ 76). Numbers in the task do not suggest any obvious ad hoc or mental strategy (as would be present for example in a case such as 40064 ÷ 16). ii) Tasks do not have a context. iii) Only the answer is required. iv) Tasks are not to exceed five-digit dividends and two-digit divisors, with or without remainder. v) Tasks may or may not have a remainder. Students understand that remainders can be written as fractions or decimals.
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:	0.424	

Which number is closest to zero on a number line?

○ A. $-\frac{3}{5}$

○ B. $-\frac{2}{5}$

● C. $\frac{1}{5}$

○ D. $\frac{4}{5}$

Item Information		
Answer:	C	
Colorado Academic Standards (CAS) Evidence Outcomes:	6.NS.C.7.c	Define the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars, write |-30|=30 to describe the size of the debt in dollars.
Evidence Statement:	6.NS.7c-1	Understand ordering and absolute value of rational numbers. c. Understand the absolute value of a rational number as its distance from 0 on the number line. i) Tasks do not have a context. ii) Tasks are not limited to integers.
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:	0.868	

Which question is a statistical question?

- ○ A. Which students in an elementary school class can speak another language?
- ◉ B. How many students in a middle school class like each type of food?
- ○ C. Which elementary classes is the principal visiting this week?
- ○ D. How many students are in a middle school?

Item Information		
Answer:	B	
Colorado Academic Standards (CAS) Evidence Outcomes:	6.SP.A.1	Identify a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.
Evidence Statement:	6.SP.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students" ages. i) Tasks do not assess mode and range.
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:	0.402	

A baker mixes 42.68 grams of flour and 19.125 grams of sugar in a bowl. The baker then uses 52.76 grams of the mixture in a cake.

How many grams of the mixture does the baker still have?

Enter your answer in the box.

9.045

Item Information	
Answer:	See Image
Colorado Academic Standards (CAS) Evidence Outcomes:	6.NS.B.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
Evidence Statement:	6.Int.1	Solve two-step word problems requiring operations on multi-digit whole numbers or decimals. i) Operations are no more complex than those specified for 6.NS.2, 6.NS.3-1, 6.NS.3-2, 6.NS.3-3, and 6.NS.3-4. ii) For purposes of assessment, the possibilities for multiplication are 1-digit x 2-digit, 1-digit x 3-digit, 2-digit x 3-digit, 2-digit x 4-digit, 2-digit x 5-digit, or 3-digit x 3-digit (For example, 7.68 x 15.3 or 0.35 x 18.241.)
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:	0.394	

Graph the inequality that shows all the possible values of $^-1 > x$.

Select a ray. Drag the point on the ray to the appropriate location on the number line.

Item Information		
Answer:	See Image	
Colorado Academic Standards (CAS) Evidence Outcomes:	6.EE.B.8	Write an inequality of the form x>c, x≥c, xc, x≥c, x
Evidence Statement:	6.EE.8	Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams. i) Constraint values (denoted c in standard 6.EE.8) are not limited to integers. ii) Tasks involve < and >, not "less than or equal to" or "greater than or equal to."
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	

A store sells cherries for $3.70 per pound.

Part A

A person buys x pounds of cherries for $7.56.

Which equation can be used to find the number of pounds of cherries the person buys?

○ A. $3.70 + x = 7.56$

○ B. $7.56 + x = 3.70$

◉ C. $3.70x = 7.56$

○ D. $7.56x = 3.70$

Part B

The store changes the price of the cherries. The equation $3.70 + p = 4.66$ represents the relationship between the old and new prices of cherries, where p is the change in the price per pound of cherries.

What is the value of p in this equation?

○ A. 0.81

○ B. 0.90

◉ C. 0.96

○ D. 1.23

Item Information	
Answer:	Part A = C, Part B = C
Colorado Academic Standards (CAS) Evidence Outcomes:	6.EE.B.7
	Solve real-world and mathematical problems by writing and solving equations of the form x±p=q and px=q for cases in which p, q and x are all nonnegative rational numbers.
Evidence Statement:	6.EE.7
	Solve real-world and mathematical problems by writing and solving equations of the form x +p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. i) Problem situations are of "algebraic" type, not "arithmetic" type. ii) 50% of tasks involve whole-number values of p, q, and/or x; 50% of tasks involve fraction or decimal values of p, q, and/or x. Fractions and decimals should not appear together in the same problem. (Cf. 7.EE.3.) iii) These tasks only involve equations with addition and multiplication. iv) A valid equation and the correct answer are both required for full credit.
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:	0.684

Item Set 1 - Question 7 (Fill in the Blank)

What is 45% of 320?

Enter your answer in the box.

144

Item Information	
Answer:	See image
Colorado Academic Standards (CAS) Evidence Outcomes:	6.RP.A.3.c
	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
Evidence Statement:	6.RP.3c-1
	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity). i) Pool should contain tasks with and without context. ii) Expectations for ratios in this grade are limited to ratios of non-complex fractions. The initial numerator and denominator should be whole 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.
P Value:	0.228

Part A

A playground has a sandbox in the shape of a right rectangular prism. The length of the sandbox is $4\frac{1}{2}$ feet, and the width is $5\frac{1}{3}$ feet. The height of the sandbox is $\frac{1}{2}$ foot.
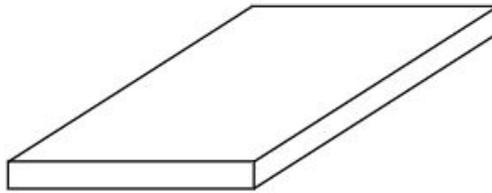
Playground Sandbox

What is the volume, in cubic feet, of the sandbox?

○ A. $4\frac{11}{12}$

○ B. $10\frac{1}{3}$

◉ C. 12

○ D. 24

Part B

Another area of the playground has a soft mat for safety. The area of the rectangular mat is $9\frac{1}{3}$ square feet. The mat is $\frac{1}{4}$-foot thick.

What is the volume, in cubic feet, of the mat?

◉ A. $2\frac{1}{3}$

○ B. $9\frac{7}{12}$

○ C. $21\frac{7}{9}$

○ D. $37\frac{1}{3}$

Item Information

Answer:	Part A = C, Part B = A	
Colorado Academic Standards (CAS) Evidence Outcomes:	6.G.A.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\,w\,h$ and $V = b\,h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
Evidence Statement:	6.G.2-2	Apply the formulas $V = l\,w\,h$ and $V = B\,h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. i) Tasks focus using the formulas in problem-solving contexts.
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:	0.29	

Item Set 1 - Question 9 (Constructed Response)

Two students are comparing the decimals 13.310, 13.28, and 13.301.

Student A makes an error. He says that $13.28 > 13.301$ because 8 is greater than 1.

Student B also makes an error. He says that $13.310 < 13.28$ because 13.310 has a 3 in the tenths place and $\frac{2}{10}$ is greater than $\frac{3}{10}$.

- Explain why the reasoning for Student A is incorrect.
- Explain why the reasoning for Student B is incorrect.
- Explain or show how to order the numbers from least to greatest.
- Find the sum of the three decimals rounded to the nearest tenth.

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:	5.NBT.A.4 — Use place value understanding to round decimals to any place.
	5.NBT.A.3.b — Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
Evidence Statement:	6.C.9 — 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 5.NBT, 5.MD.C. i) Tasks may have scaffolding if necessary in order to yield a degree of difficulty appropriate to Grade 6.
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:	5.5% of students earned 4 points. 9.8% of students earned 3 points. 16.8% of students earned 2 points. 23.2% of students earned 1 point. 44.8% 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 error in Student A's reasoning • **Reasoning component:** Valid explanation of the error in Student B's reasoning • **Reasoning component:** Valid explanation or work for how to order the decimal numbers from least to greatest • **Computation component**: Correct sum of the three decimals rounded to the nearest tenth, 39.9
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:	Student A is incorrect because, while 8 is greater than 1, 8 and 1 are not in the same decimal place. He should have looked at the tenths place when comparing them. 3 and 2 are both in the tenths place and can be compared correctly. 13.28 is less than 13.301 because the 3 in the tenths place is greater than the 2 in the tenths place. Student B is incorrect because $\frac{3}{10}$ is greater than $\frac{2}{10}$, making 13.28 less than 13.310. 13.310 is greater then 13.301 and 13.28, 13.301 is less than 13.310 but greater than 13.28, and 13.28 is less than both 13.310 and 13.301. The pattern least to greatest would go as follows: 13.28, 13.301, 13.310. The sum of the three decimals rounded to the nearest tenth is the same as 13.3 x 3, which is 39.9.

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:** Student A is incorrect . . . 8 and 1 are not in the same decimal place. He should have looked at the tenths place when comparing them. 3 and 2 are both in the tenths place and can be compared correctly. 13.28 is less than 13.301 because the 3 in the tenths place is greater than the 2 in the tenths place. **Rationale for Score:** The student provides a valid explanation of the error in Student A's reasoning (8 and 1 are not in the same decimal place. He should have looked at the tenths place when comparing them. 3 and 2 are both in the tenths place and can be compared correctly. 13.28 is less than 13.301 because the 3 in the tenths place is greater than the 2 in the tenths place). Student A's error of identifying numbers in the least place to determine which number is greater is correctly identified. **Reasoning Component:** **Student Response:** Student B is incorrect because $\frac{3}{10}$ is greater than $\frac{2}{10}$, making 13.28 less than 13.310. **Rationale for score:** The student provides a valid explanation of the error in Student B's reasoning (incorrect because $\frac{3}{10}$ is greater than $\frac{2}{10}$, making 13.28 less than 13.310). Student B's error of incorrectly comparing the values in the tenths place is correctly identified. **Reasoning Component:** **Student Response:** The pattern least to greatest would go as follows: 13.28, 13.301, 13.310. **Rationale for score:** The student correctly orders the three decimal numbers from least to greatest value (least to greatest . . . 13.28, 13.301, 13.310). **Computation Component:** **Student Response:** The sum of the three decimal numbers rounded to the nearest tenth is the same as 13.3 x 3, which is 39.9. **Rationale for score:** The correct sum of the three decimal numbers rounded to the nearest tenth is provided (39.9). **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.

Part A

An L-shaped pool is made of two right rectangular prisms. The figure shows a top view of this pool. The pool height is the same for the entire pool.

Top View
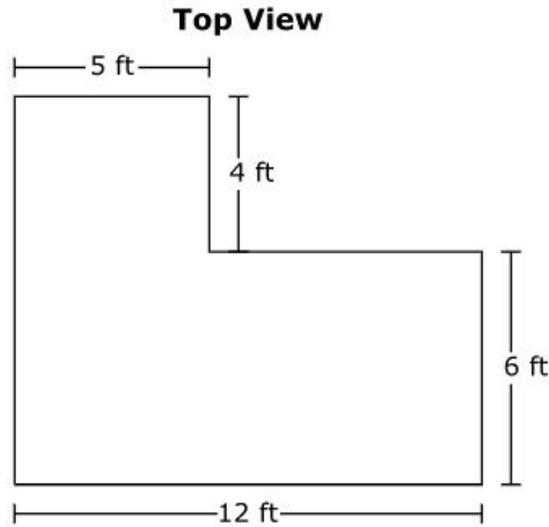
The pool is filled with water to a height of 4 feet.

- Create an equation or set of equations that can be used to find the volume, in cubic feet, of the pool.
- Explain how you created the equation or set of equations.
- Find the volume, in cubic feet, of the pool.

Enter your equation or set of equations, your explanation, and your answer in the space provided.

Part B

A different pool is in the shape of a right rectangular prism and has a volume of 192 cubic feet. The area of the base of the pool is 32 square feet.

- Create an equation to find the height, in feet, of the water in the pool.
- Find the height, in feet, of the water in the pool. Show your work.

Enter your equation, your answer, and your work in the space provided.

Equation: $192 \div 32 = height$

Height of water: 6 feet

Your Work: $192 \div 32 = 6 \, ft$

Item Information

Answer:	See Scoring Rubric and Sample Student Responses	
Colorado Academic Standards (CAS) Evidence Outcomes:	5.MD.C.5.b	Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems.
	5.MD.C.5.c	Use the additive nature of volume to find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems.
Evidence Statement:	6.D.2	Solve multi-step contextual problems with degree of difficulty appropriate to Grade 6, requiring application of knowledge and skills articulated in 5.NBT.B, 5.NF, 5.MD, and 5.G.A. i) Tasks may have scaffolding if necessary in order to yield a degree of difficulty appropriate to Grade 6.
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).
Score Point Distribution:	7.0% of students earned 6 points. 6.5% of students earned 5 points. 4.0% of students earned 4 points. 23.4% of students earned 3 points. 6.1% of students earned 2 points. 6.2% of students earned 1 point. 46.7% of students earned 0 points.	

Scoring Rubric – Part A

Points	Attributes
3	Student response includes each of the following 3 elements. • **Modeling component**: Valid equations or expressions to find the volume, in cubic feet, of the pool. • **Modeling component:** Valid explanation for how to create the equations or expressions to find the volume of the pool. • **Computation component**: Correct volume, in cubic feet, of the pool, 368.
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:	(4 x 5 + 6 x 12)4 = volume. I made this equation by cutting the shape into 2 shapes. A 5 by 4 rectangle and a 6 by 12 rectangle. If you add those together, you get the area, and I know area times height equals volume so in my equation made it so you multiply the area times the height for volume. 4 x 5 = 20 6 x 12 = 72 20 + 72 = 92 92 x 4 = 368 volume = 368 The volume of the pool is 368 feet cubed.
Annotation for Sample Student Response:	**Score Point 3** The response receives full credit. It includes each of the 3 required elements. **Modeling Component:** **Student Response:** (4 x 5 + 6 x 12)4 = volume. ○ **Rationale for Score:** The student provides a valid equation to find the volume of the pool [(4 x 5 + 6 x 12)4 = volume]. Expressions are provided for each rectangle that multiply the length times the width to find the area (4 x 5 + 6 x 12), added together, and then multiplied by the height (4) to find the volume of the pool. **Modeling Component:** **Student Response:** I made this equation by cutting the shape into 2 shapes. A 5 by 4 rectangle and a 6 by 12 rectangle. If you add those together, you get the area, and I know area times height equals volume so in my equation made it so you multiply the area times the height for volume. ○ **Rationale for score:** The student provides a detailed explanation of how the equation is created to find the volume of the pool (cutting the shape into 2 shapes. A 5 by 4 rectangle and a 6 by 12 rectangle . . . add those together, you get the area . . . area times height equals volume so in my equation made it so you multiply the area times the height for volume). **Computation Component:** **Student Response:** The volume of the pool is 368 feet cubed. ○ **Rationale for score:** The correct volume of the pool, in cubic feet, is provided (368). **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.

Scoring Rubric – Part B	
Points	**Attributes**
3	Student response includes each of the following 3 elements. **Modeling component**: Valid equation to find the height, in feet, of the water in the pool. **Computation component:** Correct height, in feet, of the water in the pool, 6 **Modeling component**: Valid work to find the height of water in the pool.
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:	**Equation:** 192 ÷ 32 = height **Height of water:** 6 **feet** **Your Work:** 192 ÷ 32 = 6 ft

Annotation for Sample Student Response:	**Score Point 3**
	The response receives full credit. It includes each of the 3 required elements.
	Modeling Component:
	• **Student Response: Equation:** 192 ÷ 32 = height
	    ○ **Rationale for Score:** The student provides a valid equation to find the height of the water in the pool (192 ÷ 32 = height).
	Computation Component:
	• **Student Response: Height of water:** 6 **feet**
	    ○ **Rationale for score:** The correct height, in feet, of the water in the pool is provided (6).
	Modeling Component:
	• **Student Response: Your Work:** 192 ÷ 32 = 6 ft
	    ○ **Rationale for score:** The student provides valid work to find the height of the water in the pool (192 ÷ 32 = 6 ft).
	
	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.