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**New York State Testing Program
Grade 5 Common Core
Mathematics Test**

Released Questions with Annotations

August 2013



THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK /
ALBANY, NY 12234

New York State Testing Program Grade 5 Common Core Mathematics Test

Released Questions with Annotations

With the adoption of the New York P-12 Common Core Learning Standards (CCLS) in ELA/Literacy and Mathematics, the Board of Regents signaled a shift in both instruction and assessment. In Spring 2013, New York State administered the first set of tests designed to assess student performance in accordance with the instructional shifts and the rigor demanded by the Common Core State Standards (CCSS). To aid in the transition to new tests, New York State released a number of resources during the 2012-2013 year, including test blueprints and specifications, and criteria for writing test questions. These resources can be found at <http://www.engageny.org/common-core-assessments>.

New York State administered the first ELA/Literacy and Mathematics Common Core tests in April 2013 and is now making a portion of the questions from those tests available for review and use. These released questions will help students, families, educators, and the public better understand how tests have changed to assess the instructional shifts demanded by the Common Core and to assess the rigor required to ensure that all students are on track to college and career readiness.

Annotated Questions Are Teaching Tools

The released questions are intended to help students, families, educators, and the public understand how the Common Core is different. The annotated questions will demonstrate the way the Common Core should drive instruction and how tests have changed to better assess student performance in accordance with the instructional shifts demanded by the Common Core. They are also intended to help educators identify how the rigor of the State tests can inform classroom instruction and local assessment. The annotations will indicate common student misunderstandings related to content standards; educators should use these to help inform unit and lesson planning. In some cases, the annotations may offer insight into particular instructional elements (conceptual thinking, visual models) that align to the Common Core that may be used in curricular design. It should not be assumed, however, that a particular standard will be measured with an identical item in future assessments.

The annotated questions will include both multiple-choice and constructed-response questions. With each multiple-choice question released, a rationale will be available to demonstrate why the question measures the intended standards; why the correct answer is correct; and why each wrong answer is plausible but incorrect. The rationales describe why the wrong answer choices are plausible but incorrect and are based in common errors in computation. While these rationales will speak to a possible and likely reason for selection of the incorrect option by the student, these rationales do not contain definitive statements as to why the student chose the incorrect option or what we can infer about knowledge and skills of the student based on their selection of an incorrect response. These multiple-choice questions are designed to assess student proficiency, not to diagnose specific misconceptions/errors with each and every incorrect option.

Additionally, for each constructed-response question, there will be an explanation for why the question measures the intended standards and sample student responses representing each possible score point.

Questions from the upper grades may feature more detailed annotations, as the items tend to be more complex.

Understanding Math Annotated Questions

Multiple Choice

Multiple-choice questions are designed to assess CCLS for Mathematics. Mathematics multiple-choice questions will mainly be used to assess standard algorithms and conceptual standards. Multiple-choice questions incorporate both Standards and Standards for Mathematical Practices, some in real-world applications. Many multiple-choice questions require students to complete multiple steps. Likewise, many of these questions are linked to more than one standard, drawing on the simultaneous application of multiple skills and concepts. Within answer choices, distractors will all be based on plausible missteps.

Short and extended constructed-response questions may refer to the scoring rubric, which can be found at www.engageny.org/resource/test-guides-for-english-language-arts-and-mathematics.

Short Response

Short-response questions are similar to past 2-point questions, requiring students to complete a task and show their work. Like multiple-choice questions, short-response questions will often require multiple steps, the application of multiple mathematics skills, and real-world applications. Many of the short-response questions will cover conceptual and application Standards.

Extended Response

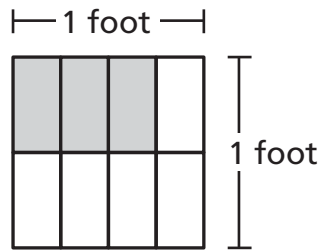
Extended-response questions are similar to past 3-point questions, asking students to show their work in completing two or more tasks or a more extensive problem. Extended-response questions allow students to show their understanding of mathematical procedures, conceptual understanding, and application. Extended-response questions may also assess student reasoning and the ability to critique the arguments of others.

Released Questions Do Not Comprise a Mini Test

This document is NOT intended to show how operational tests look or to provide information about how teachers should administer the test; rather, the purpose of the released questions is to provide an overview of how the new test reflects the demands of the Common Core.

The released questions do not represent the full spectrum of standards assessed on the State test, nor do they represent the full spectrum of how the Common Core should be taught and assessed in the classroom. Specific criteria for writing test questions as well as additional instruction and test information is available on www.engageny.org/common-core-assessments.

The shaded part of the square below has a length of $\frac{3}{4}$ foot and a width of $\frac{1}{2}$ foot.



What is the area, in square feet, of the shaded part of the square?

- A $\frac{1}{8}$
- B $\frac{3}{8}$
- C $\frac{4}{8}$
- D $\frac{5}{8}$

Key: B

Measured CCLS: 5.NF.4b

Commentary: The item measures 5.NF.4b because students are finding the area of a rectangular region by multiplying fractional side lengths or by tiling.

Answer Choice A: " $\frac{1}{8}$ " A student who selects this response may have misunderstood the question being asked and only found the value of one tile of the square.

Answer Choice B: " $\frac{3}{8}$ " The student has correctly identified the area of the shaded part of the square. The student may have recognized that the side lengths of the rectangle are $\frac{3}{4}$ and $\frac{1}{2}$, and found the area of the shaded region by multiplying the two fractions together. Students may also have recognized that the tiles of the square region were of equal size and determined by counting tiles that $\frac{3}{8}$ of the area of the square was shaded.

Answer Choice C: " $\frac{4}{8}$ " This response demonstrates an incorrect solution to the problem. A student who selects this response may have added the numerators of the two fractions while counting the total number of smaller rectangles within the square or by multiplying the denominators. The student may have realized that in order to find the area of the rectangle the two fractions needed to be multiplied, but lacked precision in the computation.

Answer Choice D: " $\frac{5}{8}$ ". A student who selects this response may have found the value of the unshaded region of the square rather than that of the shaded region, most likely by counting tiles.

Answer options A, C, and D are plausible but incorrect. They are based on procedural errors or conceptual misunderstandings that are made when a student is asked to determine the area of a region with fractional side lengths.

124050022_1

What is the value of the expression below?

$$24.5 - 15.75$$

- A** 8.75
- B** 8.85
- C** 9.25
- D** 9.75

Key: A

Measured CCLS: 5.NBT.7

Commentary: The item measures 5.NBT.7 because it calls on students to subtract decimals written to the hundredths place.

Answer Choice A: "8.75" The student has correctly identified the value of the expression. The student may have performed the traditional algorithm, correctly and repeatedly using regrouping (for example, rewriting the "5" of "24.5" as a 4 and placing those 10 units in the hundredths place allowing for a subtraction of "10 - 5" in the hundredths place, and continuing in this manner.) The student also may have simplified the problem to $20 - 15 = 5$, and then performed the simpler subtraction of .75 from 4.5 to get 3.75. Combining these two differences will also yield a correct result.

Answer Choice B: "8.85" This response demonstrates an incorrect subtraction of the two numbers. The student may have failed to adjust the value of 5 in 24.5 after regrouping, resulting in an 8 in the tenths place of the difference rather than a 7. A student who selects this response may have an understanding of subtracting decimals; however, the student made a procedural error in the process.

Answer Choice C: "9.25" This response demonstrates an incorrect subtraction of the two numbers, possibly by setting up a vertical subtraction of $15.75 - 24.5$. The student would therefore arrive at 0.25 in the tenths and hundredths place; they may have then continued by subtracting 15 from 24, to come up with the final response of 9.25. A student who selects this response may not yet have an understanding of how to translate a horizontal numerical expression into a vertical subtraction model or a firm understanding of the operation of subtraction more broadly.

Answer Choice D: "9.75" This response demonstrates an incorrect subtraction of the two numbers. The student may have failed to adjust the value of 4 in 24.5 when regrouping and thus ended up with a 9 in the ones place of the difference rather than 8. A student who selects this response may have an understanding of subtracting decimals, but made a procedural error in the process of regrouping.

Answer options B, C, and D are plausible but incorrect. They are based on procedural errors made when a student is subtracting decimals to hundredths.

Mr. Morris built a fence to enclose his yard. He put up $\frac{3}{4}$ of the fence on Monday. On Tuesday, he put up $\frac{1}{6}$ of the fence, and on Wednesday, he put up the rest of the fence.

What portion of the fence did he put up on Wednesday?

A $\frac{11}{12}$

B $\frac{3}{5}$

C $\frac{2}{5}$

D $\frac{1}{12}$

Key: D

Measured CCLS: 5.NF.2

Commentary: The item measures 5.NF.2 because students are required to add and subtract fractions with unlike denominators referring to the same whole in order to solve word problems.

Answer Choice A: " $\frac{11}{12}$ " This response may demonstrate a misunderstanding of the question being asked. A student who selects this response may have an understanding of the basic properties of adding fractions, but likely did not complete the necessary subtraction to find the portion of the fence that Mr. Morris built on Wednesday. The response " $\frac{11}{12}$ " reflects the portion of the fence completed on Monday and Tuesday.

Answer Choice B: " $\frac{3}{5}$ " This response demonstrates an error in the addition of two fractions with unlike denominators. A student who selects this response may have added the numerators together and added the denominators together to get $\frac{4}{10}$ which then simplifies to $\frac{2}{5}$. The student then subtracted this fraction from 1 to calculate the portion of the fence that was put up on Wednesday.

Answer Choice C: " $\frac{2}{5}$ " This response demonstrates an error in the addition of two fractions with unlike denominators, as well as a misunderstanding of the question being asked. To arrive at this response a student may have added the numerators together and added the denominators together to get $\frac{4}{10}$ which then simplifies to $\frac{2}{5}$. The student likely did not complete the necessary subtraction to find the portion of the fence that Mr. Morris built on Wednesday.

Answer Choice D: " $\frac{1}{12}$ " The student most likely added the two fractions with unlike denominators precisely and then subtracted that number from 1 to arrive at the correct response. Alternatively, the student may have found a common denominator of 12 for the two fractions and used a visual model to determine the missing value for Wednesday:

M	M	M	M	M	M	M	M	M	T	T	W
---	---	---	---	---	---	---	---	---	---	---	---

Answer options A, B, and C are plausible but incorrect. They are based on conceptual and/or procedural errors made when a student is adding and subtracting fractions with unlike denominators.

124050033_3

Which statement is true about the product of $\frac{5}{12} \times 7$?

- A** The product is greater than each factor.
- B** The product is less than each factor.
- C** The product is greater than $\frac{5}{12}$ but less than 7.
- D** The product is equal to one of the factors.

Key: C

Measured CCLS: 5.NF.5a

Commentary: The item measures 5.NF.5a because it asks the students to compare the size of a product to the size of the factors on the basis of the size of each factor, without asking the students to perform the indicated multiplication.

Answer Choice A: "The product is greater than each factor." This response is true when both factors are greater than one. A student who selects this response may have an understanding of the basic properties of multiplication when both factors are greater than one, but may not yet have made the connection that if one of the factors is less than one, the size of the product changes in relation to the factors.

Answer Choice B: "The product is less than each factor." This response is true when both factors are positive fractions less than one. A student who selects this response may have some understanding of the properties of multiplication when there are positive factors less than one. However, they have not made the connection that when only one of the factors is a positive number less than one, the product will be larger than the factor that is less than one, but less than the factor that is greater than one.

Answer Choice C: "The product is greater than $\frac{5}{12}$ but less than 7." The student has correctly identified that the size of the product of a fraction and number greater than one will be greater than the fraction, but less than the number greater than one.

Answer Choice D: "The product is equal to one of the factors." This response is only true when one of the factors is either zero or one. A student who selects this response may not understand how to compare the size of a product to the size of the factors based on the size of each factor involved.

Answer options A, B, and D are plausible but incorrect. They are dependant on the value of the two factors that are being multiplied to produce the product.

Which term can be put in the blank to make the statement below true?

$$3,000,000 = 30 \underline{\hspace{2cm}}$$

- A** thousands
- B** ten-thousands
- C** hundred-thousands
- D** millions

Key: C

Measured CCLS: 5.NBT.1

Commentary: The item measures 5.NBT.1 because it asks the students to recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left. In this case, the 3 in 3,000,000 represents 10 times what a 3 in the hundred thousands place would represent; equivalently, the 3 in 3,000,000 represents 30 hundred thousands.

Answer Choice A: "thousands" This response is incorrect and would result in the number to the right of the equal sign being 30×1000 or 30,000. A student who selects this response may not yet have a conceptual understanding that a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

Answer Choice B: "ten-thousands" This response is incorrect and would result in the number to the right of the equal sign being $30 \times 10,000$ or 300,000. A student who selected this response may not yet have a conceptual understanding that a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

Answer Choice C: "hundred-thousands" The student has correctly identified that 30 hundred thousands is equivalent to 3,000,000.

Answer Choice D: "millions" This response is incorrect. A student may have arrived at this response by naming the place value of the 3 in the number to the left of the equal sign. This response would result in the number to the right of the equal sign being $30 \times 1,000,000$ or 30,000,000. A student who selected this response may not yet have a conceptual understanding that a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

Answer options A, B, and D are plausible but incorrect. They are based on conceptual misunderstandings made when a student is recognizing the value of digits in a multi-digit number.

What is the value of the expression below?

$$738 \div 18$$

- A** 40
- B** 41
- C** 401
- D** 410

Key: B

Measured CCLS: 5.NBT.6

Commentary: This item measures 5.NBT.6 because it asks the students to find the whole-number quotient of a three-digit dividend and a two-digit divisor.

Answer Choice A: "40" This response is incorrect and may occur when a student is able to begin the computation by accurately identifying that 18 divides into 73 tens 40 times, but does no further work. A student using the traditional algorithm for long division may forget to "bring down" the 8 from the dividend after subtracting 72 from 73.

Answer Choice B: "41" The student has correctly identified the value of the expression. The student may have accurately identified that 18 divides into 73 tens 40 times, then also recognized that the remaining 10 and the 8 ones make another 18. The student may have correctly performed the traditional algorithm for division with precision. Students may have engaged in the more lengthy process of repeated subtraction. Finally, they may have used estimation to rule out options C and D and then used their understanding of the relationship between multiplication and division to verify whether 40 or 41 was the quotient.

Answer Choice C: "401" This response is incorrect and may occur when a student places an additional zero in the tens place of the quotient due to an error in the use of the traditional long division algorithm. The student may have been able to begin computation by accurately identifying that 18 divides into 73 tens 40 times, then also recognize that the remaining 10 and the 8 from the ones place make another 18, but misrepresent this result in the quotient. This error may be due to a misunderstanding of place value as well as the relationship between multiplication and division.

Answer Choice D: "410" This response is incorrect and may occur when a student places an additional zero in the ones place of the quotient due to an error in performing the traditional long division algorithm. The student may have been able to begin computation by accurately identifying that 18 divides into 73 tens 40 times, then also recognize that the remaining 10 and the 8 from the ones place make another 18, but misrepresent this result in the quotient. This error may be due to a misunderstanding of place value as well as the relationship between multiplication and division.

Answer options A, C, and D are plausible but incorrect. They are based on errors made when a student is determining the quotient of a three-digit dividend and a two-digit divisor.

Four hundred sixty-nine and eight hundredths can also be written as

- A** 460.908
- B** 460.98
- C** 469.08
- D** 469.800

Key: C

Measured CCLS: 5.NBT.3a

Commentary: The item measures 5.NBT.3a because students are reading the number names of a decimal number and asked to identify the corresponding base-ten numeral in standard form. Compare with the item on page 13, which also assesses 5.NBT.3a.

Answer Choice A: "460.908" This response demonstrates an incorrect translation of "sixty-nine" as 609 and therefore, an incorrect placement of the decimal. An additional zero is also added to the ones place, which may reflect a misunderstanding of the location of the hundredths place. A student who selects this response may not yet have an understanding of the basic properties of reading the number names of a decimal number and identifying the correct base-ten numeral.

Answer Choice B: "460.98" This response demonstrates an incorrect translation of "sixty-nine" as 609 and therefore an incorrect placement of the decimal. A student who selects this response may not yet have an understanding of the basic properties of reading the number names of a decimal number and identifying the correct base-ten numeral.

Answer Choice C: "469.08" The student has correctly identified the base-ten numeral. A student who selects this response has an understanding of the basic properties of reading the number names of a decimal number and identifying the correct base-ten numeral.

Answer Choice D: "469.800" This response demonstrates an incorrect translation of "eight hundredths" as 800, which leads to an incorrect placement of the "eight" in the base-ten numeral. A student who selects this response may have an understanding of the basic properties of reading and identifying whole numbers. However, they have not yet made the connection between reading the number names of a decimal number and identifying the correct base ten-numeral.

Answer options A, B, and D are plausible but incorrect. They are based on conceptual errors made when a student reads the number names of a decimal number and then identifies the base-ten numeral it is referencing.

Rich's fish tank is in the shape of a right rectangular prism. It has a length of 6 feet, a width of 2 feet, and a height of 4 feet. What is the volume, in cubic feet, of Rich's fish tank?

- A** 12
- B** 32
- C** 36
- D** 48

Key: D

Measured CCLS: 5.MD.5b

Commentary: The item measures 5.MD.5b because it asks the students to calculate the volume of a right rectangular prism with whole number edge lengths in the context of solving a real-world problem.

Answer Choice A: "12" This response indicates an incorrect approach to finding the volume of Rich's fish tank. A student who selects this response may have made a conceptual error in calculating the volume by adding the length, width, and height together rather than multiplying.

Answer Choice B: "32" This response indicates an incorrect approach to finding the volume of Rich's fish tank. A student who selects this response may have made a conceptual error in calculating the volume by adding the length and the width together to get 8. The student may have then multiplied 8 by the height, 4, for a final incorrect volume of 32.

Answer Choice C: "36" This response indicates an incorrect approach to finding the volume of Rich's fish tank. A student who selects this response may have made a conceptual error in calculating the volume by adding the width and the height together to get 6. The student may have then multiplied 6 by the length, 6, for a final incorrect volume of 36.

Answer Choice D: "48" The student has correctly applied the formula for finding the volume of Rich's fish tank by multiplying the given length, width, and height.

Answer options A, B, and C are plausible but incorrect. They are based on conceptual errors made when a student is calculating the volume of a right rectangular prism with whole number edge lengths.

124050614_1

Penelope made a paper chain that was 6 feet 10 inches long. What was the length, in inches, of the paper chain?

- A** 82
- B** 72
- C** 60
- D** 28

Key: A

Measured CCLS: 5.MD.1

Commentary: This item measures 5.MD.1 because it asks students to convert among different-sized standard measurement units within a given measurement system, specifically from feet to inches.

Answer Choice A: "82" This response demonstrates a correct conversion from feet to inches. The student calculated that 6 feet was equivalent to 72 inches and then added the remaining 10 inches to arrive at the correct response of 82 inches.

Answer Choice B: "72" This response may demonstrate some understanding of conversion from feet to inches. A student who selected this response may have calculated that 6 feet was equivalent to 72 inches without adding the remaining 10 inches of the paper chain.

Answer Choice C: "60" This may indicate that a student does not understand how to convert between different-sized measurements. To arrive at this response, a student may have multiplied the two given numbers in the stem together (6×10).

Answer Choice D: "28" A student who selects this response may not understand how to convert between different-sized measurements or recall the relevant conversion factors between standard units. To arrive at this response, a student may have confused the conversion of yards to feet and feet to inches, and assumed that one foot is equivalent to 3 inches. Therefore, they calculated $6 \times 3 = 18$ and then added the remaining 10 inches to arrive at an incorrect response of 28.

Answer options B, C, and D are plausible but incorrect. They are based on conceptual or procedural errors made when a student is converting from feet to inches.

Each lap around Eastern Park is $3\frac{3}{4}$ miles. Janet rode her bike $\frac{2}{3}$ of a lap before one of the tires on her bike went flat.

How many miles did Janet ride before one of the tires on her bike went flat?

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

B $2\frac{3}{4}$

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

D $3\frac{5}{7}$

Key: A

Measured CCLS: 5.NF.6

Commentary: The item measures 5.NF.6 because it asks the students to solve a real-world multiplication problem involving fractions and mixed numbers.

Answer Choice A: " $2\frac{1}{2}$ " The student has identified that multiplication should be used to calculate how many miles Janet rode before one of her tires on her bike went flat. The student likely then converted the mixed number into an improper fraction and proceeded to multiply the two fractions together either by using a visual fraction model or by multiplying fractions with the traditional algorithm.

Answer Choice B: " $2\frac{3}{4}$ " This response most likely demonstrates incorrect multiplication of the two fractions. A student who selects this response may have an understanding of the word problem and recognizes that multiplication must be used to solve the problem. However, the student may have made a computational error when multiplying. The student may have multiplied the whole number 3 by the fraction $\frac{2}{3}$ while ignoring the fraction part of the mixed number to come up with an incorrect response of $2\frac{3}{4}$.

Answer Choice C: " $3\frac{1}{2}$ " This response most likely demonstrates an incorrect multiplication of the two fractions. A student who selects this response may have an understanding of the word problem and recognizes that multiplication must be used to solve the problem. However, the student may have only multiplied $\frac{2}{3}$ by the fraction part of the mixed number, $\frac{3}{4}$, to come up with an incorrect response of $3\frac{1}{2}$.

Answer Choice D: " $3\frac{5}{7}$ " In choosing this response, the student may have attempted to add the two fractions together. Additionally, when adding the two fractions the student may have added the numerators to one another and added the denominators to one another. The result demonstrates a conceptual misunderstanding of the operation required to solve the problem as well as a computational error when adding the two fractions. Answer options B, C, and D are plausible but incorrect. They demonstrate either a lack of understanding in how to approach solving the word problem or conceptual errors in performing the necessary multiplication to arrive at the correct response.

Which expression shows 40.54 in expanded form?

A $(4 \times 10) + \left(5 \times \frac{1}{10}\right) + \left(4 \times \frac{1}{100}\right)$

B $(4 \times 1) + \left(5 \times \frac{1}{10}\right) + \left(4 \times \frac{1}{100}\right)$

C $(4 \times 10) + (5 \times 1) + \left(4 \times \frac{1}{100}\right)$

D $(4 \times 10) + (5 \times 1) + \left(4 \times \frac{1}{10}\right)$

Key: A

Measured CCLS: 5.NBT.3a

Commentary: The item measures 5.NBT.3a because students are asked to correctly identify the expanded form of a given base-ten numeral. Compare with the item on page 9, which also assesses 5.NBT.3a.

Answer Choice A: " $(4 \times 10) + \left(5 \times \frac{1}{10}\right) + \left(4 \times \frac{1}{100}\right)$ " This response correctly identifies the given base-ten decimal in expanded form.

Answer Choice B: " $(4 \times 1) + \left(5 \times \frac{1}{10}\right) + \left(4 \times \frac{1}{100}\right)$ " This response demonstrates an incorrect expansion of the numeral in the tens place. A student who selects this response may have confused the locations of the tens and ones places, reflecting a limited understanding of the basic properties of reading decimals in base-ten numeral form.

Answer Choice C: " $(4 \times 10) + (5 \times 1) + \left(4 \times \frac{1}{100}\right)$ " This response demonstrates an incorrect expansion of the numeral in the tenths place. A student who selects this response may have confused the locations of the ones and tenths places, reflecting a limited understanding of the basic properties of reading decimals in base-ten numeral form.

Answer Choice D: " $(4 \times 10) + (5 \times 1) + \left(4 \times \frac{1}{10}\right)$ " This response demonstrates an incorrect expansion of the numeral in the tenths place and hundredths place. A student who selects this response may have a limited understanding of the basic properties of reading decimals in base-ten numeral form and identifying the expanded form of the numeral.

Answer options B, C, and D are plausible but incorrect. They are based on conceptual or procedural errors made when identifying the expanded form of a given base-ten numeral.

What is the value of the expression below?

$$[24 + 9 - (4 \times 2) + 11] \div 2$$

Show your work.

Answer _____

Measured CCLS: 5.OA.1

Commentary: The item measures 5.OA.1 because it asks the students to evaluate a numerical expression which includes parentheses and brackets.

Extended Rationale: The correct answer may be arrived at by first simplifying the numerical expressions within the parentheses:

$$4 \times 2 = 8$$

Following this strategy, the student may then calculate the numbers within the brackets.

$$[24 + 9 - 8 + 11] = 36$$

The student will then complete the evaluation of the expression.

$$36 \div 2 = 18$$

Another possible way students may arrive at the correct answer is by adding the first two numbers.

$$24 + 9 = 33$$

Following this strategy, the student may then calculate the numbers within the parentheses and then continue with the computations within the brackets.

$$4 \times 2 = 8$$

$$[33 - 8 + 11] = 36$$

The student will then complete the evaluation of the expression.

$$36 \div 2 = 18$$

SAMPLE STUDENT RESPONSES AND SCORES APPEAR ON THE FOLLOWING PAGES:

What is the value of the expression below?

$$[24 - 9 - (4 \times 2) + 11] \div 2$$

Show your work.

Handwritten work showing the order of operations (PEMDAS) and calculations:

PEMDAS

Parenttheses $[24 + 9 - (4 \times 2) + 11] \div 2$

Exponents $[24 + 9 - 8 + 11] \div 2$

Multiply $[33 - 8 + 11] \div 2$

Divide $[25 + 11] \div 2$

Add $36 \div 2$

Subtract 18

Order of Operations:

P = () or []

E = P^{\ominus}

M = \times

D = \div

A = +

S = -

Calculations:

$$\begin{array}{r} 1 \\ 24 \\ + 9 \\ \hline 33 \end{array}$$
$$\begin{array}{r} 2 \ 13 \\ \cancel{18} \\ \hline 25 \\ + 11 \\ \hline 36 \end{array}$$
$$\begin{array}{r} \times 18 \\ 2 \overline{)36} \\ \underline{-24} \\ 16 \\ \underline{-16} \\ 0 \end{array}$$

Answer 18

Score Point 2 (out of 2 points)

This response answers the question correctly (18) and demonstrates a thorough understanding of the mathematical concepts in the task. The response correctly follows the order of operations and all calculations are accurate.

What is the value of the expression below?

$$[24 + 9 - (4 \times 2) - 11] \div 2$$

Show your work.

Handwritten work showing the solution to the expression:

1. $4 \times 2 = 8$

2.
$$\begin{array}{r} 24 \\ + 9 \\ \hline 33 \end{array}$$

3.
$$\begin{array}{r} 213 \\ - 8 \\ \hline 25 \\ + 11 \\ \hline 36 \end{array}$$

4.
$$\begin{array}{r} 18 \\ \hline 2 \overline{)36} \\ - 2\downarrow \\ \hline 16 \\ - 16 \\ \hline 00 \end{array}$$

Answer 18

Score Point 2 (out of 2 points)

This response answers the question correctly (18) and demonstrates a thorough understanding of the mathematical concepts in the task. The response correctly follows the order of operations and all calculations are accurate.

What is the value of the expression below?

$$[24 + 9 - (4 \times 2) + 11] \div 2$$

Show your work.

$$\begin{array}{r} 33 - 8 \\ \hline 25 \\ + 11 \\ \hline 36 \end{array}$$

$$\begin{array}{r} 33 \\ - 8 \\ \hline 25 \\ + 11 \\ \hline 36 \end{array}$$

$$2 \overline{)36} \begin{array}{r} 18 \\ \hline \end{array}$$

Answer 18

Score Point 2 (out of 2 points)

This response answers the question correctly (18) and demonstrates a thorough understanding of the mathematical concepts in the task. The response correctly follows the order of operations and all calculations are accurate.

What is the value of the expression below?

$$[24 + 9 - (4 \times 2) + 11] \div 2$$

Show your work.

$$(24 + 9 - (4 \times 2) + 11) \div 2$$

$$(24 + 9 - 8 + 11) \div 2$$

$$(33 - 8 + 11) \div 2$$

$$(25 + 11) \div 2$$

$$36 \div 2$$

$$16$$

$$\begin{array}{r} 2313 \\ - 8 \\ \hline 25 \end{array}$$

$$\begin{array}{r} 25 \\ + 11 \\ \hline 36 \end{array}$$

Answer 16

Score Point 1 (out of 2 points)

This response is only partially correct. The response contains an incorrect solution (16) but applies a mathematically appropriate process. The response correctly follows the order of operations. However, a calculation error in the final step ($36 \div 2 = 16$) results in an incorrect answer.

What is the value of the expression below?

$$[24 - 9 - (4 \times 2) + 11] \div 2$$

Show your work.

$$[24 + 9 + (4 \times 2) + 11] \div 2$$

$$[24 + 9 + 8 + 11] \div 2$$

$$[33 + 8 + 11] \div 2$$

$$[41 + 11] \div 2$$

$$52 \div 2 =$$

$$\begin{array}{r} 1 \\ 24 \\ + 9 \\ \hline 33 \end{array}$$

Answer 26

Score Point 1 (out of 2 points)

This response is only partially correct. The response contains an incorrect solution (26) but applies a mathematically appropriate process. The response follows the order of operations. However, a calculation error in the third step results in an incorrect answer.

What is the value of the expression below?

$$[24 - 9 - (4 \times 2) + 11] \div 2$$

$$[24 + 9 - 8 + 11]$$

Show your work.

$$[24 + 9 - (4 \times 2) + 11] \div 2$$

$$[24 + 9 - 8 + 11] \div 2$$

$$33 + 9 - 19 = 22$$

$$14 \div 2$$

$$(7)$$

Parentheses
Exponents
Multiplication
Division
Add
Subtract

Answer

(7)

Score Point 1 (out of 2 points)

This response is only partially correct. The response correctly addresses some elements of the task. The response correctly shows all operations inside the brackets performed before the operation outside of the brackets. The initial steps in the order of operations are correct. However, instead of subtracting 8 from 33, 8 is added to 11, resulting in an incorrect answer (7).

What is the value of the expression below?

$$[24 + 9 - (4 \times 2) - 11] \div 2$$

Show your work.

$$\begin{aligned} & [24 + 9 - (4 \times 2) + 1] \div 2 \\ & [24 + 9 - 8 + 1] \div 2 \\ & [24 + 9 - 8 + 5] \\ & [33 - 8 + 5] \\ & 33 - 13 \\ & 20 \end{aligned}$$

KEY
Please
P. Parentheses
M. Make
D. Divide
A. Add
S. Subtract

$$\begin{array}{r} 2 \overline{) 33} \\ \underline{11} \\ 20 \end{array}$$

$$\begin{array}{r} 33 \\ -13 \\ \hline 20 \end{array}$$

Answer 20

Score Point 0 (out of 2 points)

This response is incorrect. The response correctly shows the first and second steps (4×2 and $24 + 9$). However, holistically the mathematical procedures are not sufficient to demonstrate even a limited understanding of the mathematical concepts embodied in the task. All operations inside brackets must be completed before performing other operations outside of the brackets.

What is the value of the expression below?

$$[24 + 9 - (4 \times 2) + 11] \div 2$$

Show your work.

Pemdas

$$\begin{array}{r} 24 + 9 - (4 \times 2) + 11 \div 2 \\ \quad \checkmark \quad \quad \quad \checkmark \\ \quad 13 \quad \quad 8 \div 2 = 4 + 11 = 15 \\ \quad \checkmark \\ 23 \\ - 15 \\ \hline 18 \end{array}$$

Answer 18

Score Point 0 (out of 2 points)

This response contains a correct answer (18) obtained using an obviously incorrect procedure. Although some parts contain correct mathematical procedures, holistically they are not sufficient to demonstrate even a limited understanding of the mathematical concepts embodied in the task. The response correctly shows two initial steps for finding the value of the expression (4×2 and $24 + 9$). However, omission of the brackets contributes to inaccurately applying the correct order of operations.

Sophia asked the students in her class to name their favorite sport. She made this list to display the results.

- $\frac{1}{3}$ of the students named basketball
- $\frac{1}{8}$ of the students named soccer
- $\frac{5}{12}$ of the students named football
- The rest of the students in the class named baseball.

What fraction of the students in the class named baseball as their favorite sport?

Show your work.

Answer _____

Measured CCLS: 5.NF.2

Commentary: The item measures 5.NF.2 because students are required to add and subtract fractions with unlike denominators.

Extended Rationale: As indicated in the rubric, student responses will be rated on whether the student provides evidence of a strong understanding of addition and subtraction of fractions. The response should contain an appropriate solution using mathematically sound procedures.

The correct answer may be arrived at by adding the 3 fractions that Sophia listed in the results of her survey.

$$\frac{1}{3} + \frac{1}{8} + \frac{5}{12}$$

The student would need to find a common denominator for the 3 fractions, which is 24, and create equivalent fractions using 24 as the denominator. At this point the student can now add the three fractions together.

$$\frac{8}{24} + \frac{3}{24} + \frac{10}{24} = \frac{21}{24} \text{ or } \frac{7}{8}$$

To find the remaining students in the class who selected baseball as their favorite sport the student may then use subtraction.

$$\frac{8}{8} - \frac{7}{8} = \frac{1}{8}$$

Students may have found a common denominator of 24 and then used a visual fraction model as shown below, counting the remaining fractional parts as the number of students ($\frac{3}{24}$) who chose baseball.

Basketball	Basketball	Basketball	Basketball	Basketball	Basketball	Basketball	Basketball
Soccer	Soccer	Soccer	Football	Football	Football	Football	Football
Football	Football	Football	Football	Football	Baseball	Baseball	Baseball

SAMPLE STUDENT RESPONSES AND SCORES APPEAR ON THE FOLLOWING PAGES:

Sophia asked the students in her class to name their favorite sport. She made this list to display the results.

- $\frac{1}{3}$ of the students named basketball
- $\frac{1}{8}$ of the students named soccer
- $\frac{5}{12}$ of the students named football
- The rest of the students in the class named baseball.

What fraction of the students in the class named baseball as their favorite sport?

Show your work.

Basketball	Tennis	Football
$\frac{1}{3} = \frac{8}{24}$	$\frac{1}{8} = \frac{3}{24}$	$\frac{5}{12} = \frac{10}{24}$

$$\begin{aligned} \text{Baseball: } & 1 - \frac{8}{24} - \frac{3}{24} - \frac{10}{24} \\ & = \frac{24-8-3-10}{24} \\ & = \frac{16-3-10}{24} \\ & = \frac{3}{24} \\ & = \frac{1}{8} \end{aligned}$$

Answer: $\frac{1}{8}$

Score Point 2 (out of 2 points)

This response correctly answers the question ($\frac{1}{8}$) and demonstrates a thorough understanding of the mathematical concepts embodied in the task. The response shows mathematically sound procedures by demonstrating equivalent fractions with the lowest common denominator, which are subtracted from the class total ($1 - \frac{8}{24} - \frac{3}{24} - \frac{10}{24}$).

Additional

Sophia asked the students in her class to name their favorite sport. She made this list to display the results.

- $\frac{1}{3}$ of the students named basketball
- $\frac{1}{8}$ of the students named soccer
- $\frac{5}{12}$ of the students named football
- The rest of the students in the class named baseball.

What fraction of the students in the class named baseball as their favorite sport?

Show your work.

$$\begin{array}{r} \frac{1}{3} = \frac{8}{24} \\ + \frac{3}{24} \\ \hline \frac{1}{8} = \frac{3}{24} \quad \frac{11}{24} \\ + \frac{10}{24} \\ \hline \frac{5}{12} = \frac{10}{24} \quad \frac{21}{24} = \frac{7}{8} \\ \frac{8}{8} - \frac{7}{8} = \frac{1}{8} \\ \downarrow \\ \frac{1}{8} \text{ chose baseball} \end{array}$$

Answer $\frac{1}{8}$

Score Point 2 (out of 2 points)

This response correctly answers the question ($\frac{1}{8}$) and demonstrates a thorough understanding of the mathematical concepts embodied in the task. The response shows mathematically sound procedures by demonstrating equivalent fractions with the lowest common denominator, which are added together ($\frac{8}{24} + \frac{3}{24} + \dots + \frac{10}{24} = \frac{21}{24} = \frac{7}{8}$) before subtracting from the class total ($\frac{8}{8} - \frac{7}{8} = \frac{1}{8}$).

Sophia asked the students in her class to name their favorite sport. She made this list to display the results.

- $\frac{1}{3}$ of the students named basketball
- $\frac{1}{8}$ of the students named soccer
- $\frac{5}{12}$ of the students named football
- The rest of the students in the class named baseball.

What fraction of the students in the class named baseball as their favorite sport?

Show your work.

$$\begin{array}{r} \cancel{1} \overline{) 8} \\ 3 \overline{) 24} \\ \underline{12} \\ 5 \overline{) 24} \\ \underline{52} \\ + 12 \overline{) 24} \\ \hline 21 \\ \underline{24} \end{array}$$

Answer: $\frac{3}{24}$

Score Point 2 (out of 2 points)

This response correctly answers the question ($\frac{3}{24}$) and demonstrates a thorough understanding of the mathematical concepts embodied in the task. This response shows mathematically sound procedures using addition to demonstrate the sum of equivalent fractions with the lowest common denominator ($\frac{21}{24}$). It is not necessary to show the subtraction of the sum from the whole or the simplification of the fraction to its simplest form in order to demonstrate a thorough understanding.

Additional

Sophia asked the students in her class to name their favorite sport. She made this list to display the results.

- $\frac{1}{3}$ of the students named basketball
- $\frac{1}{8}$ of the students named soccer
- $\frac{5}{12}$ of the students named football
- The rest of the students in the class named baseball.

What fraction of the students in the class named baseball as their favorite sport?

Show your work.

$$\begin{array}{l} \frac{1}{3} \times 8 = \frac{8}{24} \\ \frac{1}{8} \times 3 = \frac{3}{24} \\ \frac{5}{12} \times 2 = \frac{10}{24} \end{array}$$
$$8 + 3 = 12 + 10 = 22 = \frac{22}{24}$$
$$\frac{22}{24} - \frac{22}{24} = \frac{2}{24} = \frac{1}{12}$$

Answer: $\frac{2}{24}$ / $\frac{1}{12}$

Score Point 1 (out of 2 points)

This response is only partially correct. The response applies a mathematically appropriate process. The fractions are rewritten as equivalent fractions with the lowest common denominator, which are added together. However, a calculation error results in an incorrect sum ($8 + 3 = 12 + 10 = 22 = \frac{22}{24}$), which when subtracted from the whole produces an incorrect answer ($\frac{2}{24}$ / $\frac{1}{12}$).

Sophia asked the students in her class to name their favorite sport. She made this list to display the results.

- $\frac{1}{3}$ of the students named basketball
- $\frac{1}{8}$ of the students named soccer
- $\frac{5}{12}$ of the students named football
- The rest of the students in the class named baseball.

What fraction of the students in the class named baseball as their favorite sport?

Show your work.

$$\frac{1}{3} + \frac{1}{8} + \frac{5}{12}$$

Handwritten work showing the fractions $\frac{1}{3}$, $\frac{1}{8}$, and $\frac{5}{12}$ being converted to equivalent fractions with a denominator of 24. The numerators 6, 9, 12, 15, 18, and 21 are listed vertically next to their respective denominators (3, 8, 12, 16, 24, 24). A large bracket groups these conversions.

$$\frac{1 \times 8}{3 \times 8} = \frac{8}{24}$$

$$\frac{1 \times 3}{8 \times 3} = \frac{3}{24}$$

$$\frac{5 \times 2}{12 \times 2} = \frac{10}{24}$$

Handwritten work showing the addition of the equivalent fractions: $\frac{8}{24} + \frac{3}{24} + \frac{10}{24} = \frac{21}{24}$. The sum $\frac{21}{24}$ is written with a circled 3 in the numerator and a circled 3 in the denominator. Below this, the factors of 24 are listed: 1, 2, 3, 4, 6, 8, 12, 24.

$$\frac{21 \div 3}{24 \div 3} = \frac{7}{8}$$

Handwritten work showing the simplification of the fraction $\frac{21}{24}$ to $\frac{7}{8}$ by dividing both the numerator and denominator by 3. The final answer $\frac{7}{8}$ is enclosed in a box.

Answer $\frac{7}{8}$

Score Point 1 (out of 2 points)

This response is only partially correct. The response applies a mathematically appropriate process. The fractions are rewritten as equivalent fractions with the lowest common denominator, which are added together. However, the sum is not subtracted from the whole, resulting in an incorrect answer ($\frac{7}{8}$).

Sophia asked the students in her class to name their favorite sport. She made this list to display the results.

- $\frac{1}{3}$ of the students named basketball
- $\frac{1}{8}$ of the students named soccer
- $\frac{5}{12}$ of the students named football
- The rest of the students in the class named baseball.

What fraction of the students in the class named baseball as their favorite sport?

Show your work.

$$\frac{5}{12} - \frac{1}{8} - \frac{1}{3} = \frac{11}{24}$$

Handwritten work showing the calculation of the fraction of students who named baseball as their favorite sport. The student starts with the equation $\frac{5}{12} - \frac{1}{8} - \frac{1}{3} = \frac{11}{24}$. They show the conversion of $\frac{1}{3}$ to $\frac{8}{24}$ and $\frac{1}{8}$ to $\frac{3}{24}$. The work is crossed out with a large 'X'.

Answer $\frac{7}{12} \frac{11}{24}$

Score Point 0 (out of 2 points)

This response is incorrect. Although the response shows two of the fractions rewritten as equivalent fractions, holistically, the mathematical procedures are not sufficient to demonstrate even a limited understanding of the mathematical concepts embodied in the task.

Sophia asked the students in her class to name their favorite sport. She made this list to display the results.

- $\frac{1}{3}$ of the students named basketball
- $\frac{1}{8}$ of the students named soccer
- $\frac{5}{12}$ of the students named football
- The rest of the students in the class named baseball.

What fraction of the students in the class named baseball as their favorite sport?

Show your work.

$$\begin{array}{r} 8 \\ + 13 \\ \hline 21 \\ \hline 23 \end{array}$$

$$\begin{array}{r} 5 \\ + 1 \\ \hline 6 \\ \hline 7 \end{array}$$

$$\frac{7}{23}$$

Answer.

$$\frac{7}{23}$$

Score Point 0 (out of 2 points)

This response is incorrect. Holistically, the mathematical procedures shown in the response are not sufficient to demonstrate even a limited understanding of the mathematical concepts embodied in the task.

Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.

Answer _____ cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

- packing carton A: 11 inches long, 10 inches wide, and 8 inches high
- packing carton B: 16 inches long, 10 inches wide, and 5 inches high
- packing carton C: 17 inches long, 11 inches wide, and 7 inches high

Which packing carton can Mr. Chang use?

Show your work.

Answer packing carton _____

Measured CCLS: 5.MD.5b

Commentary: The item measures 5.MD.5b because students are required to find the volume of right rectangular prisms with whole number edge lengths in the context of solving a real world problem.

Extended Rationale: The correct answer may be arrived at by first finding the volume of a single box of cookies.

$$V = l \times w \times h$$

$$V = 8 \times 5 \times 3$$

$$V = 120$$

The volume of one box of cookies is 120 cubic inches.

In the second part of the problem students are required to select a packing carton that Mr.Chang can use to pack 8 boxes of cookies.

The student may then calculate the total volume of 8 boxes of cookies.

$$120 \times 8 = 960 \text{ cubic inches}$$

The packing carton that the student selects must be at least 960 cubic inches and be able to fit 8 whole boxes. The student may then find the volume of the three packing cartons, in cubic inches, in order to determine which carton Mr. Chang could use.

Packing carton A:

$$V = l \times w \times h$$

$$V = 11 \times 10 \times 8$$

$$V = 880$$

Packing carton B:

$$V = l \times w \times h$$

$$V = 16 \times 10 \times 5$$

$$V = 800$$

Packing carton C:

$$V = l \times w \times h$$

$$V = 17 \times 11 \times 7$$

$$V = 1309$$

The student will then determine that packing carton C is the carton Mr. Chang can use to pack 8 boxes of cookies, since it is the only carton with a volume greater than 960 cubic inches and able to fit 8 whole boxes.

SAMPLE STUDENT RESPONSES AND SCORES APPEAR ON THE FOLLOWING PAGES:

Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.

Handwritten work for the first problem:

- A diagram of a right rectangular prism with dimensions 8 (length), 5 (width), and 3 (height).
- Calculations: $8 \times 5 = 40$, $40 \times 3 = 120$; and $3 \times 5 = 15$, $15 \times 8 = 120$.
- A vertical multiplication problem: $\begin{array}{r} 45 \\ \times 8 \\ \hline 120 \end{array}$

Answer 120 cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

Handwritten work for the second problem:

- Options:
 - packing carton A: 11 inches long, 10 inches wide, and 8 inches high
 - packing carton B: 16 inches long, 10 inches wide, and 5 inches high
 - packing carton C: 17 inches long, 11 inches wide, and 7 inches high
- Question: Which packing carton can Mr. Chang use?
- Calculations for each option:
 - Carton A: $11 \times 10 = 110$, $110 \times 8 = 880$
 - Carton B: $16 \times 10 = 160$, $160 \times 5 = 800$
 - Carton C: $17 \times 11 = 187$, $187 \times 7 = 1309$
- Vertical multiplication for Carton A: $\begin{array}{r} 110 \\ \times 8 \\ \hline 880 \end{array}$
- Vertical multiplication for Carton C: $\begin{array}{r} 187 \\ \times 7 \\ \hline 1309 \end{array}$

Which packing carton can Mr. Chang use?

Show your work.

Handwritten work for the second problem (continued):

- Calculation for total volume of 8 boxes: $120 \text{ each box} \times 8 = 960$
- Vertical multiplication for total volume: $\begin{array}{r} 120 \\ \times 8 \\ \hline 960 \\ \text{Total} \end{array}$
- Comparison: 880 (Carton A) is $+60$ small; 800 (Carton B) is $+60$ small; 1309 (Carton C) is $+49$ small.

Answer packing carton C

Score Point 3 (out of 3 points)

This response answers the questions correctly and demonstrates a thorough understanding of the mathematical concepts. The first part of the problem is solved correctly ($8 \times 5 = 40 \times 3 = 120$; 120 in^3). The second part of the problem is also solved correctly ($120 \times 8 = 960$, $11 \times 10 \times 8 = 880$, $16 \times 10 \times 5 = 800$, $17 \times 11 \times 7 = 1309$; C). For the response to be awarded full credit, the second part of the problem must solve for the total volume of eight boxes, and the volume for packing carton C.

Additional

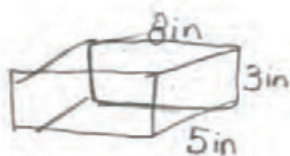
Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.

$$V = l \times w \times h$$

$$V = 8 \times 5 \times 3 \text{ in.}$$

$$V = 120 \text{ in}^3$$



$$\begin{array}{r} 120 \\ \times 5 \\ \hline 600 \\ \times 3 \\ \hline 1200 \end{array}$$

Answer 120 cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

- * • packing carton A: 11 inches long, 10 inches wide, and 8 inches high
- * • packing carton B: 16 inches long, 10 inches wide, and 5 inches high
- * • packing carton C: 17 inches long, 11 inches wide, and 7 inches high

Which packing carton can Mr. Chang use?

Show your work.

$$\begin{array}{r} 120 \\ \times 8 \\ \hline 960 \end{array}$$

$$\begin{array}{r} 11 \\ \times 10 \\ \hline 00 \\ + 110 \\ \hline 110 \\ \times 8 \\ \hline 880 \end{array}$$

$$\begin{array}{r} 16 \\ \times 10 \\ \hline 00 \\ + 160 \\ \hline 160 \\ \times 5 \\ \hline 800 \end{array}$$

$$\begin{array}{r} 17 \\ \times 11 \\ \hline 17 \\ + 170 \\ \hline 187 \\ \times 7 \\ \hline 1309 \end{array}$$

Answer packing carton C

Score Point 3 (out of 3 points)

This response answers the questions correctly and demonstrates a thorough understanding of the mathematical concepts. The first answer is correct (120 in³). The second answer is correct (C). The work shown for both parts of the problem utilizes mathematically sound procedures.

Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.

$$\begin{array}{r} 8 \\ 5 \\ \times 3 \\ \hline 120 \end{array}$$

Answer 120 cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

- packing carton A: 11 inches long, 10 inches wide, and 8 inches high
- packing carton B: 16 inches long, 10 inches wide, and 5 inches high
- packing carton C: 17 inches long, 11 inches wide, and 7 inches high

Which packing carton can Mr. Chang use?

Show your work.

$$\begin{array}{r} 120 \\ \times 8 \\ \hline 960 \end{array}$$

$$\begin{array}{r} 17 \\ 11 \\ \times 7 \\ \hline 1309 \end{array}$$

$$\begin{array}{r} 11 \\ 10 \\ \times 8 \\ \hline 880 \end{array}$$

$$\begin{array}{r} 16 \\ 10 \\ \times 5 \\ \hline 800 \end{array}$$

Answer packing carton C

Score Point 3 (out of 3 points)

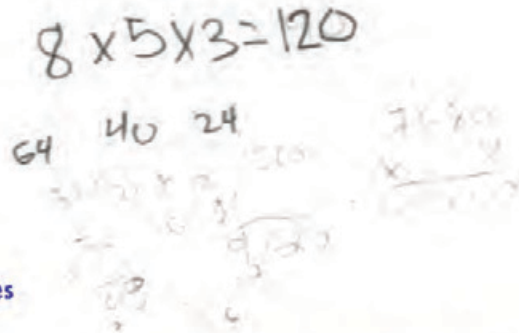
This response answers the questions correctly and demonstrates a thorough understanding of the mathematical concepts. The first answer is correct (120 in³). The second answer is correct (C). The work shown for both parts of the problem utilizes mathematically sound procedures.

Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.

$$8 \times 5 \times 3 = 120$$

64 40 24



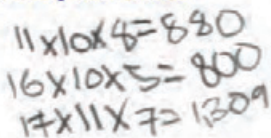
Answer 120 cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

- packing carton A: 11 inches long, 10 inches wide, and 8 inches high
- packing carton B: 16 inches long, 10 inches wide, and 5 inches high
- packing carton C: 17 inches long, 11 inches wide, and 7 inches high

Which packing carton can Mr. Chang use?

Show your work.

$$11 \times 10 \times 8 = 880$$
$$16 \times 10 \times 5 = 800$$
$$17 \times 11 \times 7 = 1309$$


Answer packing carton B

Score Point 2 (out of 3 points)

This response is partially correct. The first part of the problem is solved correctly (120 in^3) utilizing mathematically sound procedures. The second part of the problem contains an incorrect answer (B), and the work shown does not solve for the volume of space required to ship eight boxes ($120 \times 8 = 960$).

Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.

$$\begin{array}{r} (8 \times 5) \times 3 \\ 40 \times 3 \\ 120 \end{array}$$

Answer 120 cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

- packing carton A: 11 inches long, 10 inches wide, and 8 inches high
- packing carton B: 16 inches long, 10 inches wide, and 5 inches high
- packing carton C: 17 inches long, 11 inches wide, and 7 inches high

Which packing carton can Mr. Chang use?

Show your work.

$$\begin{array}{r} 11 \\ \times 10 \\ \hline 110 \\ 110 \\ \hline 1100 \\ \times 8 \\ \hline 880 \end{array}$$

$$\begin{array}{r} 16 \\ \times 10 \\ \hline 160 \\ 160 \\ \hline 1600 \\ \times 5 \\ \hline 8000 \end{array}$$

$$\begin{array}{r} 17 \\ \times 11 \\ \hline 170 \\ 187 \\ \hline 1870 \\ \times 7 \\ \hline 13090 \end{array}$$

Answer packing carton A

Score Point 1 (out of 3 points)

This response is incomplete and exhibits many flaws but is not completely incorrect. The first part of the problem is solved correctly (120 in^3) utilizing mathematically sound procedures. The second part of the problem contains an incorrect answer (A), the work shown does not solve for the volume of space required to ship eight boxes, and the volume for packing carton C is incorrect (869), due to a calculation error.

Additional

Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.

$$8 \times 5 = 40 \times 3 = 120$$

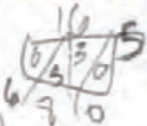
Answer 120 cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

- packing carton A: 11 inches long, 10 inches wide, and 8 inches high
- packing carton B: 16 inches long, 10 inches wide, and 5 inches high
- packing carton C: 17 inches long, 11 inches wide, and 7 inches high

Which packing carton can Mr. Chang use?

Show your work.

$$16 \times 10 = 160 \times 5 = 800$$


Answer packing carton B

Score Point 1 (out of 3 points)

This response is incomplete and exhibits many flaws but is not completely incorrect. The first part of the problem is solved correctly (120 in^3) utilizing mathematically sound procedures. The second part of the problem contains an incorrect answer (B), and the work shown is incorrect and insufficient.

Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.

$$\begin{array}{r} 8 \\ \times 5 \\ \hline 40 \\ \times 3 \\ \hline 120 \end{array}$$

Answer 120 cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

- packing carton A: 11 inches long, 10 inches wide, and 8 inches high
- packing carton B: 16 inches long, 10 inches wide, and 5 inches high
- packing carton C: 17 inches long, 11 inches wide, and 7 inches high

Which packing carton can Mr. Chang use?

Show your work.

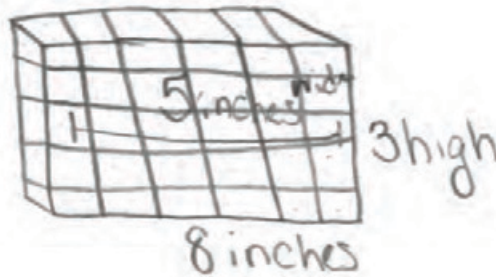
Answer packing carton C

Score Point 1 (out of 3 points)

This response is incomplete and exhibits many flaws but is not completely incorrect. The first part of the problem is solved correctly (120 in^3) utilizing mathematically sound procedures. The second part of the problem contains a correct answer (C); however, the required work is not provided.

Mr. Chang needs to ship 8 boxes of cookies in a packing carton. Each box is a right rectangular prism 8 inches long, 5 inches wide, and 3 inches high. What is the volume, in cubic inches, of each box?

Show your work.



Answer 41 cubic inches

Mr. Chang wants to ship all 8 boxes in one packing carton. He has a choice of three different sizes of packing cartons that are right rectangular prisms of the following sizes.

- packing carton A: 11 inches long, 10 inches wide, and 8 inches high
- packing carton B: 16 inches long, 10 inches wide, and 5 inches high
- packing carton C: 17 inches long, 11 inches wide, and 7 inches high

Which packing carton can Mr. Chang use?

Show your work.

$$\begin{aligned} 11 + 10 + 8 &= 29 \\ 16 + 10 + 5 &= 31 \\ 17 + 11 + 7 &= 35 \end{aligned}$$

Answer packing carton C

Score Point 0 (out of 3 points)

This response is incorrect. The first part of the problem contains an incorrect solution (41 in^3) and provides insufficient work. The second part of the problem contains a correct answer (C); however, the work shown provides faulty mathematical reasoning.