Pennsylvania PSSA 2024
Grade 4 Math

Reference Materials
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Grade 4 Formula Sheet

Formulas that you may need on this test are found below. 2024
You may refer back to this page at any time during the mathematics test. Grade 4

Standard Conversions

1 yard (yd) = 3 feet (ft)
1 foot = 12 inches (in.)

1 pound (lb) = 16 ounces (oz.)

1 gallon (gal) = 4 quarts (qt)
1 quart = 2 pints (pt)
1 pint = 2 cups (c)

Metric Conversions

1 kilometer (km) = 1,000 meters (m)
1 meter = 100 centimeters (cm)

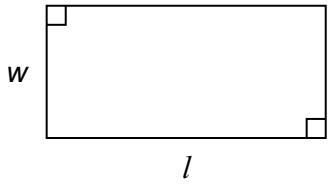
1 kilogram (kg) = 1,000 grams (g)

1 liter (L) = 1,000 milliliters (mL)

Time Conversions

1 year (yr) = 12 months (mo)
1 year = 52 weeks (wk)
1 year = 365 days
1 week = 7 days
1 day = 24 hours (hr)
1 hour = 60 minutes (min)
1 minute = 60 seconds (sec)

Rectangle



Area = length × width
$A = l \times w$

Perimeter = length + length + width + width
$P = l + l + w + w$

pennsylvania
DEPARTMENT OF EDUCATION

The Pennsylvania System of School Assessment

Mathematics
Item and Scoring Sampler

2024–2025
Grade 4

Pennsylvania Department of Education Bureau of Curriculum, Assessment and Instruction—August 2024

Question 1 in this Item and Scoring Sampler is to be solved without the use of a calculator.

Multiple-Choice Items

1. Which fraction is equal to 0.53?

Ⓐ $\frac{1}{53}$

Ⓑ $\frac{53}{100}$

Ⓒ $\frac{100}{53}$

Ⓓ $\frac{53}{10}$

Category	Item-Specific Information
Alignment	A-F.3.1.2
Answer Key	B
Depth of Knowledge	1
p-value A	15%
p-value B	71% (correct answer)
p-value C	4%
p-value D	10%
Option Annotations	A. uses 53 as the denominator of a unit fraction rather than as the numerator of a hundredths fraction B. Correct: recognizes that 0.53 represents 53 hundredths and writes this as a fraction with 53 in the numerator and 100 in the denominator C. recognizes that 0.53 represents 53 hundredths but inverts the fraction D. recognizes that 53 should be in the numerator but uses 10 in the denominator based on either 10 and 53 both being two-digit numbers OR the first nonzero digit being in the tenths place

A calculator is permitted for use in solving questions 2–16 in this Item and Scoring Sampler.

2. The depth of the deepest part of the ocean is 36,070 feet. What is the depth, in feet, of the deepest part of the ocean written in word form?

Ⓐ thirty-six thousand, seven

Ⓑ thirty-six thousand, seventy

Ⓒ three thousand, six hundred seven

Ⓓ three thousand, six hundred seventy

Category	Item-Specific Information
Alignment	A-T.1.1.2
Answer Key	B
Depth of Knowledge	1
p-value A	6%
p-value B	83% (correct answer)
p-value C	5%
p-value D	6%
Option Annotations	A. misreads the place value of the 7 as the ones place rather than the tens place B. Correct: recognizes that the 36 is in the thousands period, reading this period as “thirty-six thousand,” and then recognizes that 070 is 70, reading this period as “seventy” C. omits the last (rightmost) 0 and reads the place values of the digits as though the number were 3,607 D. omits the first (leftmost) 0 and reads the place values of the digits as though the number were 3,670

3. The areas, in acres, of Arches National Park and Great Basin National Park round to the same thousand and the same ten thousand. The area of Arches National Park is 76,519 acres. Which value could be the area, in acres, of Great Basin National Park?

Ⓐ 72,658

Ⓑ 76,419

Ⓒ 77,100

Ⓓ 80,933

Category	Item-Specific Information
Alignment	A-T.1.1.4
Answer Key	C
Depth of Knowledge	2
p-value A	9%
p-value B	37%
p-value C	38% (correct answer)
p-value D	16%
Option Annotations	A. selects the first number that has the same digit in the ten-thousands place (7) as 76,519 but does not consider that 72,658 rounds to 73,000 (thousand) and to 70,000 (ten thousand) whereas 76,519 rounds to 77,000 (thousand) and to 80,000 (ten thousand) B. selects a number that has the same thousands period (76,000) as 76,519 but does not consider that, when rounding to the thousand, 76,419 rounds down to 76,000 because of the 4 in the hundreds place whereas 76,519 rounds up to 77,000 because of the 5 in the hundreds place C. Correct: starts with 76,519, rounding this to 77,000 (thousand) because of the 5 in the hundreds place and to 80,000 (ten thousand) because of the 6 in the thousands place, and then identifies that 77,100 also rounds to 77,000 (thousand) because of the 1 in the hundreds place and to 80,000 (ten thousand) because of the 7 in the thousands place D. rounds 76,519 to the ten thousand, resulting in 80,000 because of the 6 in the thousands place, and then identifies a number with 80 in the thousands period without considering that, when rounding to the thousand, 80,933 rounds to 81,000 whereas 76,519 rounds to 77,000

4. A student correctly divides a four-digit number by 5. The quotient has a remainder of 2. Which number could be the digit in the ones place of the dividend?

Ⓐ 0

Ⓑ 3

Ⓒ 7

Ⓓ 8

Category	Item-Specific Information
Alignment	A-T.2
Answer Key	C
Depth of Knowledge	2
p-value A	12%
p-value B	30%
p-value C	41% (correct answer)
p-value D	17%
Option Annotations	A. determines the ones place when multiplying 5 by a number with a 2 in the ones place B. subtracts 2 from an odd multiple of 5 C. Correct: recognizes that every number that is divisible by 5 has either a 0 or a 5 in the ones place and concludes that, by adding 2 to each of these digits, any number with a 2 (0 + 2 = 2) or a 7 (5 + 2 = 7) in the ones place would have a remainder of 2 when divided by 5 D. subtracts 2 from an even multiple of 5

5. An office building has 32 floors. There are 98 light bulbs on each floor. The price to replace each light bulb is $2. What is the total price to replace all the light bulbs in the office building?

Ⓐ $6,242

Ⓑ $6,252

Ⓒ $6,262

Ⓓ $6,272

Category	Item-Specific Information
Alignment	A-T.2.1.2
Answer Key	D
Depth of Knowledge	1
p-value A	10%
p-value B	7%
p-value C	9%
p-value D	74% (correct answer)
Option Annotations	A. does not regroup when multiplying 32 by 98, resulting in an incorrect product of 3,126, and also does not regroup when multiplying 3,126 by 2 B. does not regroup when multiplying 32 by 98, resulting in an incorrect product of 3,126, but then correctly multiplies 3,126 by 2 C. multiplies 98 by 32, resulting in a product of 3,136, but does not regroup when multiplying 3,136 by 2 D. Correct: multiplies 98 by 32, resulting in a product of 3,136 light bulbs, and then multiplies the number of light bulbs (3,136) by $2, resulting in a product of $6,272

6. Carrie and D'Marco are reading copies of the same book. Carrie has read $\frac{3}{10}$ of the book. D'Marco has read $\frac{2}{3}$ of the book. Which sentence about the fractions of the book they have each read is true?

Ⓐ Because $10 > 3$, $\frac{3}{10} > \frac{2}{3}$.

Ⓑ Because $3 > 2$ and $10 > 3$, $\frac{3}{10} > \frac{2}{3}$.

Ⓒ Because the numerator of $\frac{3}{10}$ is equal to the denominator of $\frac{2}{3}$, $\frac{3}{10} = \frac{2}{3}$.

Ⓓ Because $\frac{3}{10}$ is less than half the book and $\frac{2}{3}$ is more than half the book, $\frac{3}{10} < \frac{2}{3}$.

Category	Item-Specific Information
Alignment	A-F.1.1.2
Answer Key	D
Depth of Knowledge	2
p-value A	14%
p-value B	18%
p-value C	12%
p-value D	56% (correct answer)
Option Annotations	A. compares the denominators but does not consider the numerators B. compares the numerators and denominators separately C. considers the fractions to be equal since the fractions share a common digit D. Correct: using a benchmark of $\frac{1}{2}$, recognizes that $\frac{3}{10}$ is less than $\frac{1}{2}$ since 3 is less than half of 10 (which is 5), recognizes that $\frac{2}{3}$ is more than $\frac{1}{2}$ since 2 is more than half of 3 (which is $\frac{3}{2}$), and concludes that $\frac{3}{10} < \frac{2}{3}$ since $\frac{3}{10} < \frac{1}{2} < \frac{2}{3}$ $\left(\text{i.e., } \frac{3}{10} < \frac{1}{2} \text{ and } \frac{1}{2} < \frac{2}{3}\right)$

7. Minh stretches for $\frac{1}{12}$ hour. She runs for 6 times as long as she stretches. Then she walks for 2 times as long as she stretches. What fraction of an hour does Minh spend stretching, running, and walking?

Ⓐ $\frac{8}{12}$

Ⓑ $\frac{9}{12}$

Ⓒ $\frac{10}{12}$

Ⓓ $\frac{11}{12}$

Category	Item-Specific Information
Alignment	A-F.2.1.5 A-F.2.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	33%
p-value B	39% (correct answer)
p-value C	10%
p-value D	18%
Option Annotations	A. determines the time spent running $\left(6 \times \frac{1}{12} = \frac{6}{12}\right)$ and the time spent walking $\left(2 \times \frac{1}{12} = \frac{2}{12}\right)$ but then finds the sum of $\frac{6}{12} + \frac{2}{12}$ without including the time spent stretching $\left(\frac{1}{12}\right)$ B. Correct: multiplies 6 by $\frac{1}{12}$ by multiplying the whole number (6) by the numerator (1), resulting in a product of $\frac{6}{12}$ hour, multiplies 2 by $\frac{1}{12}$ by multiplying the whole number (2) by the numerator (1), resulting in a product of $\frac{2}{12}$ hour, and then finds the sum of $\frac{1}{12} + \frac{6}{12} + \frac{2}{12}$ by adding the numerators (1 + 6 + 2 = 9) and leaving the common denominator (12) C. determines the time spent running by adding 6 to the numerator of $\frac{1}{12}$, determines the time spent walking by adding 2 to the numerator of $\frac{1}{12}$, and then finds the sum of $\frac{7}{12} + \frac{3}{12}$ without including the time spent stretching $\left(\frac{1}{12}\right)$ D. determines the time spent running by adding 6 to the numerator of $\frac{1}{12}$, determines the time spent walking by adding 2 to the numerator of $\frac{1}{12}$, and then finds the sum of $\frac{1}{12} + \frac{7}{12} + \frac{3}{12}$

8. One piece of meat has a mass of 1.06 kilograms, and another piece of meat has a mass of 1.5 kilograms. Which explanation correctly compares the masses, in kilograms, of the two pieces of meat and gives the correct reason for that comparison?

Ⓐ $1.06 < 1.5$ because $6 < 5$

Ⓑ $1.06 > 1.5$ because $6 > 5$

Ⓒ $1.06 < 1.5$ because $6 < 50$

Ⓓ $1.06 > 1.5$ because $60 > 5$

Category	Item-Specific Information
Alignment	A-F.3.1.3
Answer Key	C
Depth of Knowledge	1
p-value A	11%
p-value B	26%
p-value C	47% (correct answer)
p-value D	16%
Option Annotations	A. reverses the meaning of the inequality symbol (i.e., considers < to represent “greater than” rather than “less than”) B. does not consider the 0 as a placeholder and compares only the nonzero digits to the right of each decimal point C. Correct: recognizes that 1.5 is equivalent to 1.50 and then compares the two two-digit values to the right of the decimal point D. considers that .06 represents 60 tenths by starting with the rightmost digit reading back to the decimal point (i.e., thinks the place values to the right of the decimal point “mirror” the place values to the left of the decimal point)

9. Sofi and Evan are collecting pennies for school. Sofi has collected 141 pennies. She has collected 3 times as many pennies as Evan has collected. How many pennies has Evan collected?

Ⓐ 47

Ⓑ 138

Ⓒ 144

Ⓓ 423

Category	Item-Specific Information
Alignment	B-O.1.1.2
Answer Key	A
Depth of Knowledge	1
p-value A	54% (correct answer)
p-value B	7%
p-value C	8%
p-value D	31%
Option Annotations	A. Correct: sets up the equation as 141 = 3 × ? , rewrites the equation as 141 ÷ 3 = ? , and then divides 141 by 3 B. subtracts 3 from 141, which would mean Sofi has collected 3 more pennies than Evan has collected C. adds 3 to 141, which would mean Evan has collected 3 more pennies than Sofi has collected D. multiplies 141 by 3, which would mean Evan has collected 3 times as many pennies as Sofi has collected

10. A number sentence is shown below, but a symbol is missing.

$$16 \times 4 \div 2 \square 32$$

Which symbol should be placed into the $\square$ to make the number sentence true?

Ⓐ =

Ⓑ >

Ⓒ <

Ⓓ ×

Category	Item-Specific Information
Alignment	B-O.1.1.4
Answer Key	A
Depth of Knowledge	1
p-value A	82% (correct answer)
p-value B	5%
p-value C	6%
p-value D	7%
Option Annotations	A. Correct: recognizes that a comparison symbol is needed to complete the number sentence and then simplifies the expression to the left of the square by first multiplying 16 by 4, resulting in a product of 64, and then divides the product by 2, resulting in a quotient of 32, which is equal to the value to the right of the square (32) B. either compares 64 to 32 (i.e., does not consider the ÷ 2) OR compares 2 to 32 and reverses the meaning of the inequality symbol (i.e., considers > to represent “less than” rather than “greater than”) C. compares 2 to 32 and does not consider the “16 × 4 ÷” D. either selects another operation but does not consider that the result is an expression and not a number sentence OR selects the operation that would make 16 × 4 equal to 2 □ 32 without considering that the middle symbol is division (÷) rather than equals (=)

11. Eric picked 36 apples at an orchard. He packed all the apples he picked by putting 9 apples into each of 4 bags. What is another way Eric could have packed all the apples he picked?

Ⓐ by putting 6 apples into each of 6 bags

Ⓑ by putting 8 apples into each of 4 bags

Ⓒ by putting 11 apples into each of 2 bags

Ⓓ by putting 15 apples into each of 3 bags

Category	Item-Specific Information
Alignment	B-O.2.1
Answer Key	A
Depth of Knowledge	2
p-value A	69% (correct answer)
p-value B	15%
p-value C	8%
p-value D	8%
Option Annotations	A. Correct: recognizes that 6 × 6 = 36 B. confuses 8 × 4 and 9 × 4 C. adds 2 to the 9 apples and subtracts 2 from the 4 bags D. recognizes that 15 × 2 = 30 but then considers 1 more bag would equal 36

12. A number pattern starts with the number 7. The pattern follows the rule “add 10.” What digit is in the ones place of the twelfth number in the pattern?

Ⓐ 0

Ⓑ 2

Ⓒ 7

Ⓓ 9

Category	Item-Specific Information
Alignment	B-O.3.1.1
Answer Key	C
Depth of Knowledge	2
p-value A	10%
p-value B	14%
p-value C	62% (correct answer)
p-value D	14%
Option Annotations	A. uses the digit in the ones place of the rule “add 10” (i.e., does not consider that the pattern starts with 7) B. uses the digit in the ones place of 12 (i.e., considers the twelfth number of the pattern to be 12) C. Correct: recognizes that repeatedly adding 10 to a number does not affect the digit in the ones place D. adds 12 to 7 (i.e., considers the twelfth number of the pattern to be 12 more than 7) and identifies the digit in the ones place

13. A carpenter took some time to gather materials before building chairs. Each chair took the same amount of time to build. The table below shows more time to build the first chair because the time for gathering materials is included.

Chairs Built

Number of Hours	Number of Chairs
4	1
5	2
6	3

The pattern continues. How many chairs will the carpenter build in 10 hours since she began gathering materials?

Ⓐ 4

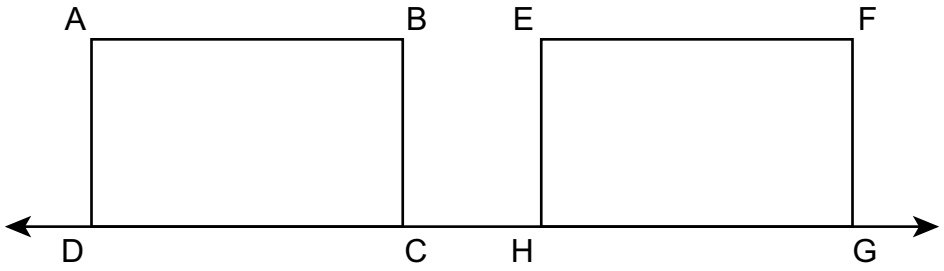
Ⓑ 5

Ⓒ 6

Ⓓ 7

Category	Item-Specific Information
Alignment	B-O.3.1.2
Answer Key	D
Depth of Knowledge	2
p-value A	13%
p-value B	10%
p-value C	13%
p-value D	64% (correct answer)
Option Annotations	A. either continues the pattern in the second column without considering the 10 OR uses the middle row to identify that 5 hours times 2 is 10 hours, so multiplies 2 chairs by 2 B. uses the bottom row to identify that 6 hours divided by 2 is 3, so divides 10 hours by 2 C. identifies that 3 is the sum of the numbers above it, so adds 1, 2, and 3 to determine the next number of chairs D. Correct: identifies that, after the first three hours, the number of chairs is increasing by 1 each hour and recognizes that 6 + 4 = 10 hours, so adds 4 to 3 to determine the number of chairs

14. In the picture shown below, the two rectangles have the same length and the same width.



Line segment BE will be added to the picture to create additional figures. Which statement about figure BEHC and figure BFGC is true?

Ⓐ Both figure BEHC and figure BFGC will be rectangles.

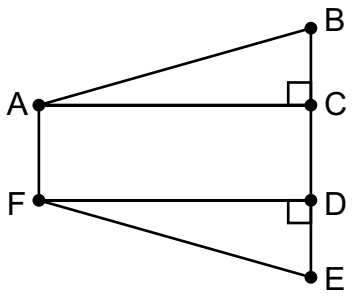
Ⓑ Neither figure BEHC nor figure BFGC will be a rectangle.

Ⓒ Figure BEHC will be a rectangle, but figure BFGC will not be a rectangle.

Ⓓ Figure BEHC will not be a rectangle, but figure BFGC will be a rectangle.

Category	Item-Specific Information
Alignment	C-G.1.1
Answer Key	A
Depth of Knowledge	2
p-value A	57% (correct answer)
p-value B	12%
p-value C	21%
p-value D	10%
Option Annotations	A. Correct: recognizes that angles BCH and EHC are right angles and determines that angles CBE and BEH will also be right angles, resulting in figures BEHC and BFGC both being rectangles since all four angles in each figure are right angles B. does not recognize that angles CBE and BEH will also be right angles C. does not consider that two rectangles sharing a side form a larger rectangle D. does not consider that angle BEH will be a right angle

15. In the diagram shown below, figure ABEF is a trapezoid and figures ACB and FDE are right triangles.



Based on the diagram, which statement is true?

Ⓐ Figure ACDF must be a rectangle.

Ⓑ Figure ACDF must be a trapezoid.

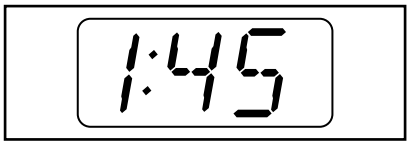
Ⓒ Figure ABDF has no parallel sides.

Ⓓ Figure ABDF has no obtuse angles.

Category	Item-Specific Information
Alignment	C-G.1.1
Answer Key	A
Depth of Knowledge	2
p-value A	58% (correct answer)
p-value B	14%
p-value C	13%
p-value D	15%
Option Annotations	A. Correct: recognizes that angles ACD and FDC are right angles, recognizes that figure ACDF is a parallelogram, and determines that figure ACDF is a rectangle since a rectangle is a parallelogram with at least one right angle identified B. recognizes that sides AF and CD are parallel but does not consider that angles ACD and FDC are right angles C. recognizes that sides AB and FD are not parallel but does not consider that sides AF and BD are parallel D. does not recognize that angle FAB is an obtuse angle

Open-Ended Item

16. Ms. Lowry has the rectangular clock shown below on her desk.



A. Describe the time shown on the clock as the amount of time before the hour.

The rectangular clock face is 6 inches wide. The area of the rectangular clock face is 12 square inches.

B. What is the height, in inches, of the rectangular clock face?

Go to the next page to finish question 16.

GO ON

16. ***Continued.*** Please refer to the previous page for task explanation.

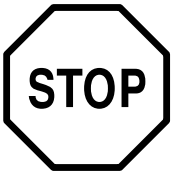
Ms. Lowry's clock weighs 3 **pounds**, 4 **ounces**.

C. Show or explain how to find the weight, in **ounces**, of the clock.

Ms. Lowry wants to find the mass of her desk using the smallest whole number possible.

D. Explain whether it would be better for Ms. Lowry to use **kilograms** or **grams** to describe the mass of her desk.

After you have finished your work, close this booklet so your teacher will know you are finished.



Item-Specific Scoring Guideline

#16 Item Information

Category	Item-Specific Information
Alignment	D-M.1
Depth of Knowledge	2
Mean Score	1.32

Assessment Anchor this item will be reported under:

M04.D-M.1 Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

Specific Anchor Descriptor addressed by this item:

M04.D-M.1.1 Solve problems involving length, weight (mass), liquid volume, time, area, and perimeter.

Item-Specific Scoring Guideline

Score	In this item, the student . . .
4	Demonstrates a thorough understanding of how to solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit by correctly solving problems and clearly explaining procedures.
3	Demonstrates a general understanding of how to solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
2	Demonstrates a partial understanding of how to solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit by correctly performing a significant portion of the required task.
1	Demonstrates minimal understanding of how to solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
0	The response has no correct answer and insufficient evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. Response may show only information copied from the question.

Top-Scoring Student Response and Training Notes

Score	Description
4	Student earns 4 points.
3	Student earns 3.0–3.5 points.
2	Student earns 2.0–2.5 points.
1	Student earns 0.5–1.5 points. OR Student demonstrates minimal understanding of how to solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Top-Scoring Response

Part A (1 point):

1 point for correct and complete response

OR 1/2 point for correct but incomplete response

What?

Sample Responses:

15 minutes before 2:00

OR

quarter before 2:00

OR equivalent

Part B (1 point):

1 point for correct answer

What?

2 (inches)

Part C (1 point):

1 point for correct and complete support

OR 1/2 point for correct but incomplete support

Why?

Sample Work:

3 × 16 + 4

[Note: Students do not have to simplify the expression, but they cannot receive full credit for just writing the answer (52).]

OR

Sample Explanation:

Multiply the number of pounds (3) by 16 and then add on the remaining ounces (4).

OR equivalent

Part D (1 point):

1 point for correct and complete explanation

OR 1/2 point for correct but incomplete explanation

Why?

Sample Explanation:

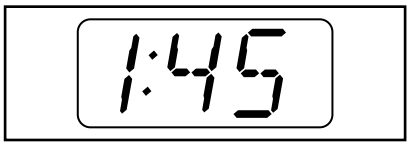
By using grams, Ms. Lowry would need to use a very large number (50,000 to 100,000) to describe the mass of the desk. By using kilograms, Ms. Lowry would be able to use a much smaller number (50 to 100) to describe the mass of the desk.

OR equivalent

STUDENT RESPONSE

Response Score: 4 points

16. Ms. Lowry has the rectangular clock shown below on her desk.



A. Describe the time shown on the clock as the amount of time before the hour.

The clock time is 15 min till 2:00 this means the time shown is 1:45.

The rectangular clock face is 6 inches wide. The area of the rectangular clock face is 12 square inches.

B. What is the height, in inches, of the rectangular clock face?

The height of the rectangular clock face is 2 inches I know this because 6 x 2 = 12 so the answer had to be 2 inches and that is how I got my answer of 2 inches tall

Go to the next page to finish question 16.

GO ON

Part A: The student provided a correct and complete response describing the time shown on the clock as the amount of time before the hour (*15 min till 2:00*). [1 point]

Part B: The student provided the correct answer (*2 inches*). The work shown is correct, though not required. The student provided a correct *"*check*"* of the answer (*6 × 2 = 12*). [1 point]

16. ***Continued.*** Please refer to the previous page for task explanation.

Ms. Lowry's clock weighs 3 **pounds**, 4 **ounces**.

C. Show or explain how to find the weight, in **ounces**, of the clock.

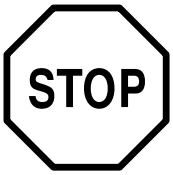
One way to find the weight of Mr. Lowy's clock in ounces is to do 3 x 16 and add 4 to your answer witch adds up to 52 ounces

Ms. Lowry wants to find the mass of her desk using the smallest whole number possible.

D. Explain whether it would be better for Ms. Lowry to use **kilograms** or **grams** to describe the mass of her desk.

It would be better to use Kilo grams because 1 kilogram is a 1,000 grams so Ms. Lowry should use kilograms to get the smallest whole number

After you have finished your work, close this booklet so your teacher will know you are finished.



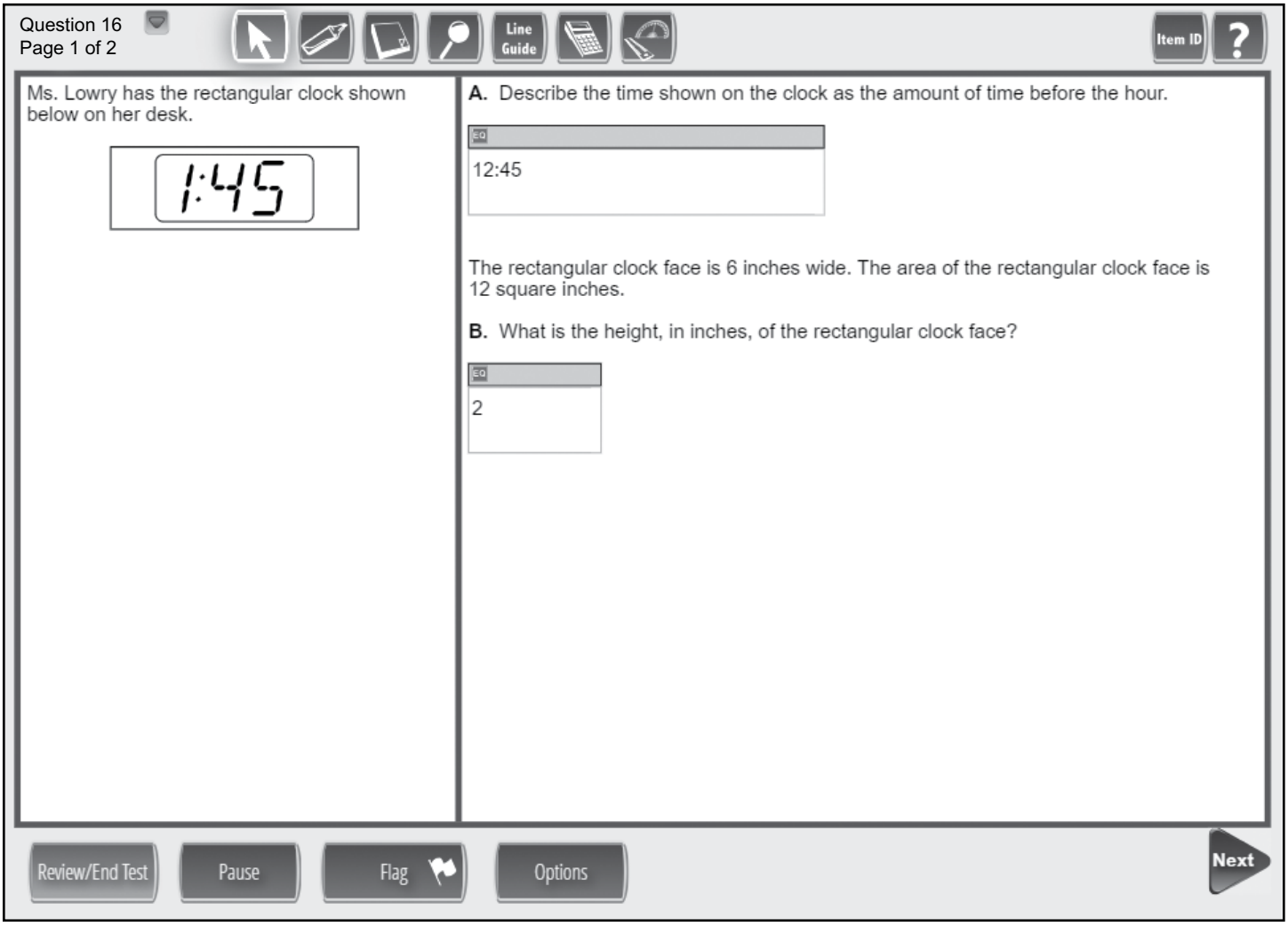
Part C: The student provided a correct and complete explanation of how to find the weight of the clock in ounces (*do 3 × 16 and add 4 to your answer witch adds up to 52 ounces*). [1 point]

Part D: The student provided a correct and complete explanation as to whether it would be better for Ms. Lowry to use kilograms or grams to describe the mass of her desk (*better to use kilo grams because 1 kilogram is a 1,000 grams so Ms. Lowry should use kilograms to get the smallest whole number*). [1 point]

STUDENT RESPONSE

Computer Response Score: 3 points

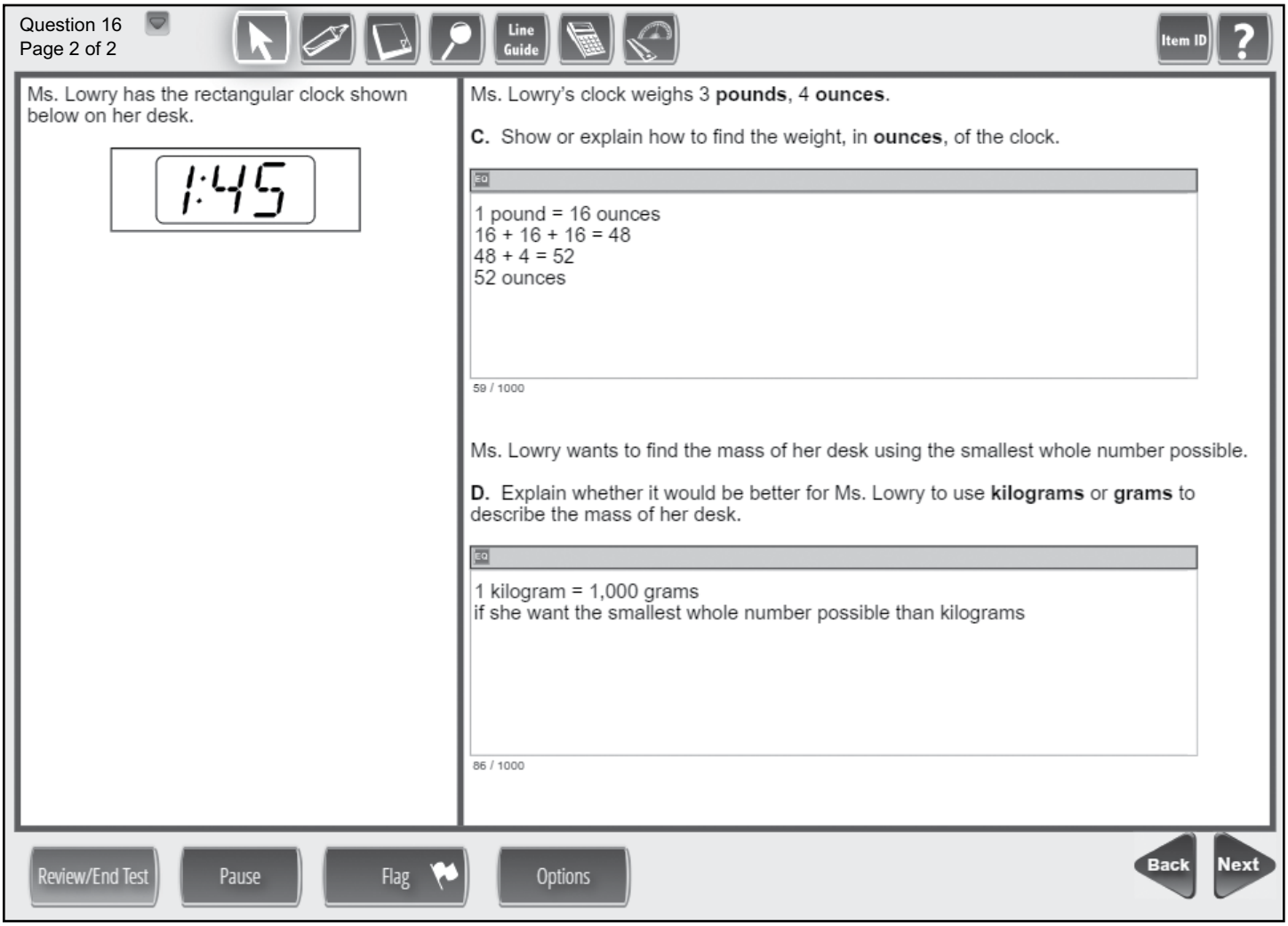
PARTS A and B



Part A: The student provided an incorrect response that did not describe in words the time shown on the clock as the amount of time before the hour (*12:45*). No support (work or explanation) is required, so it is unclear where an error was made. The student likely misinterpreted *"*amount of time before the hour*"* as subtracting 1 hour from the time shown on the clock. [0 points]

Part B: The student provided the correct answer (*2*). While support is not required for Part B, the student likely set up an equation using the area formula for a rectangle ($A = l \times w$), substituted 12 in for A and 6 in for w, resulting in $12 = l \times 6$, and then solved for the length using the 2-6-12 multiplication fact family. [1 point]

PARTS C and D



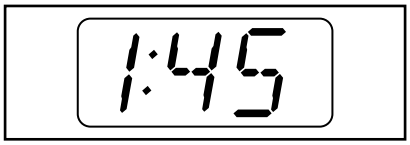
Part C: The student provided correct and complete support showing how to find the weight of the clock in ounces. The student started by writing the number of ounces in a pound (*1 pound = 16 ounces*), added to find the number of ounces in 3 pounds (*16 + 16 + 16 = 48*), and then added 4 ounces to 48 for a total of 52 (*48 + 4 = 52*). [1 point]

Part D: The student provided a correct and complete explanation as to whether it would be better for Ms. Lowry to use kilograms or grams to describe the mass of her desk (*1 kilogram = 1,000 grams*, *if she want the smallest whole number possible than kilograms*). [1 point]

STUDENT RESPONSE

Response Score: 2 points

16. Ms. Lowry has the rectangular clock shown below on her desk.



A. Describe the time shown on the clock as the amount of time before the hour.

1:45 or 15 min till 2:00

The rectangular clock face is 6 inches wide. The area of the rectangular clock face is 12 square inches.

B. What is the height, in inches, of the rectangular clock face?

5 in is the height

Go to the next page to finish question 16.

GO ON

Part A: The student provided a correct and complete response describing the time shown on the clock as the amount of time before the hour (*15 min till 2:00*). [1 point]

Part B: The student provided an incorrect answer (*5 in is the height*). No support (work or explanation) is required, so it is unclear where an error was made. [0 points]

16. ***Continued.*** Please refer to the previous page for task explanation.

Ms. Lowry's clock weighs 3 **pounds**, 4 **ounces**.

C. Show or explain how to find the weight, in **ounces**, of the clock.

16 (oz) = 1 pound 16 x 3 = 48

48 (oz) = 3 Pounds 48 + 4 = 52

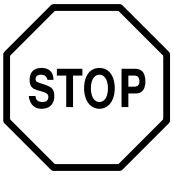
52 (oz)

Ms. Lowry wants to find the mass of her desk using the smallest whole number possible.

D. Explain whether it would be better for Ms. Lowry to use **kilograms** or **grams** to describe the mass of her desk.

grams, because it is less tha kilograms so you will get a smaller whole number.

After you have finished your work, close this booklet so your teacher will know you are finished.



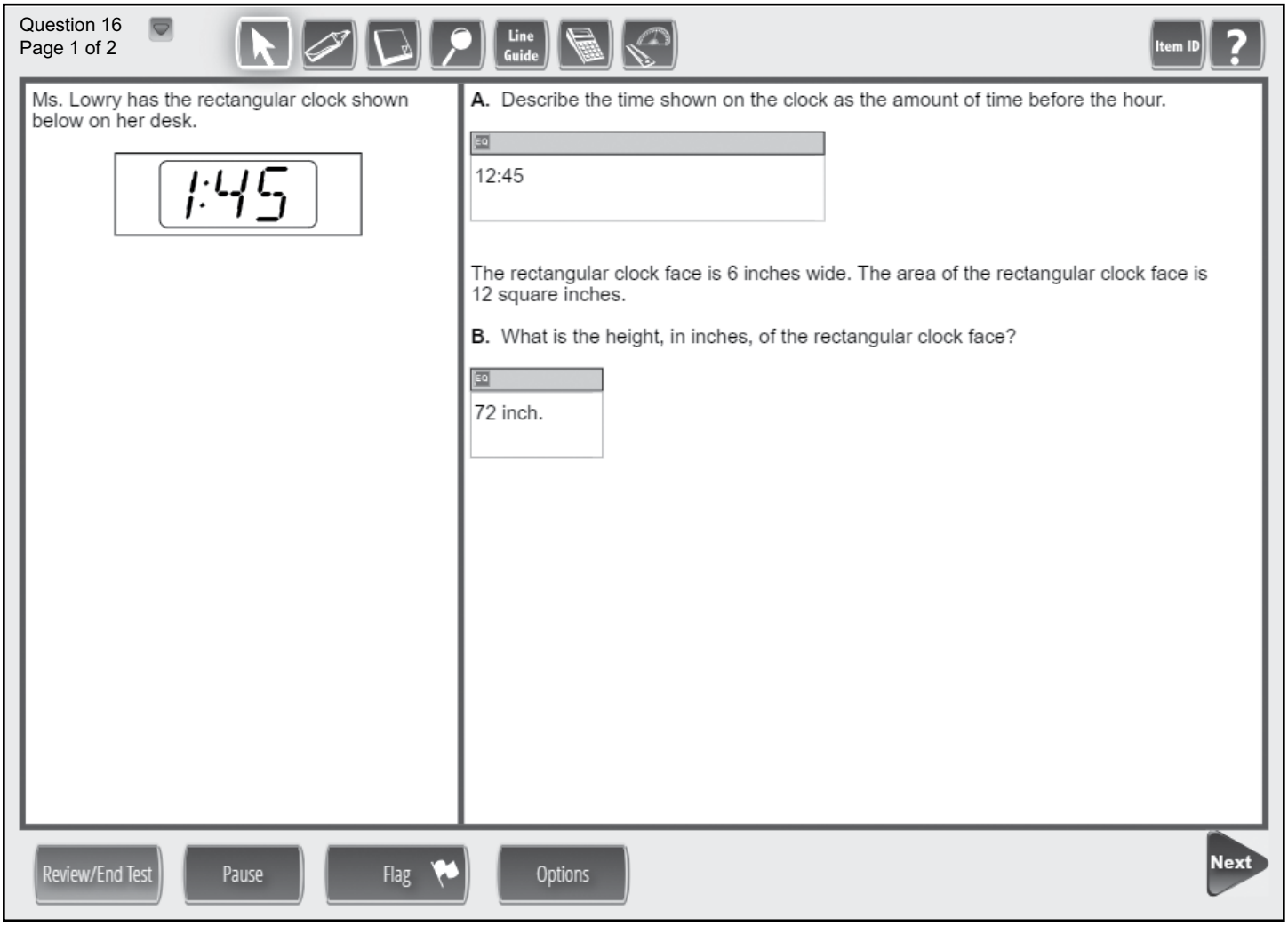
Part C: The student provided correct and complete support showing how to find the weight of the clock in ounces. The student started by writing the number of ounces in a pound [*16 (oz) = 1 pound*], multiplied 16 by 3 to find the number of ounces in 3 pounds (*16 × 3 = 48*), and then added 4 ounces to 48 for a total of 52 [*48 + 4 = 52*, *52 (oz)*]. [1 point]

Part D: The student provided an incorrect explanation as to whether it would be better for Ms. Lowry to use kilograms or grams to describe the mass of her desk (*grams, because it is less tha kilograms so you will get a smaller whole number*). The student incorrectly associated a smaller unit of measure with having smaller numbers. [0 points]

STUDENT RESPONSE

Computer Response Score: 1 point

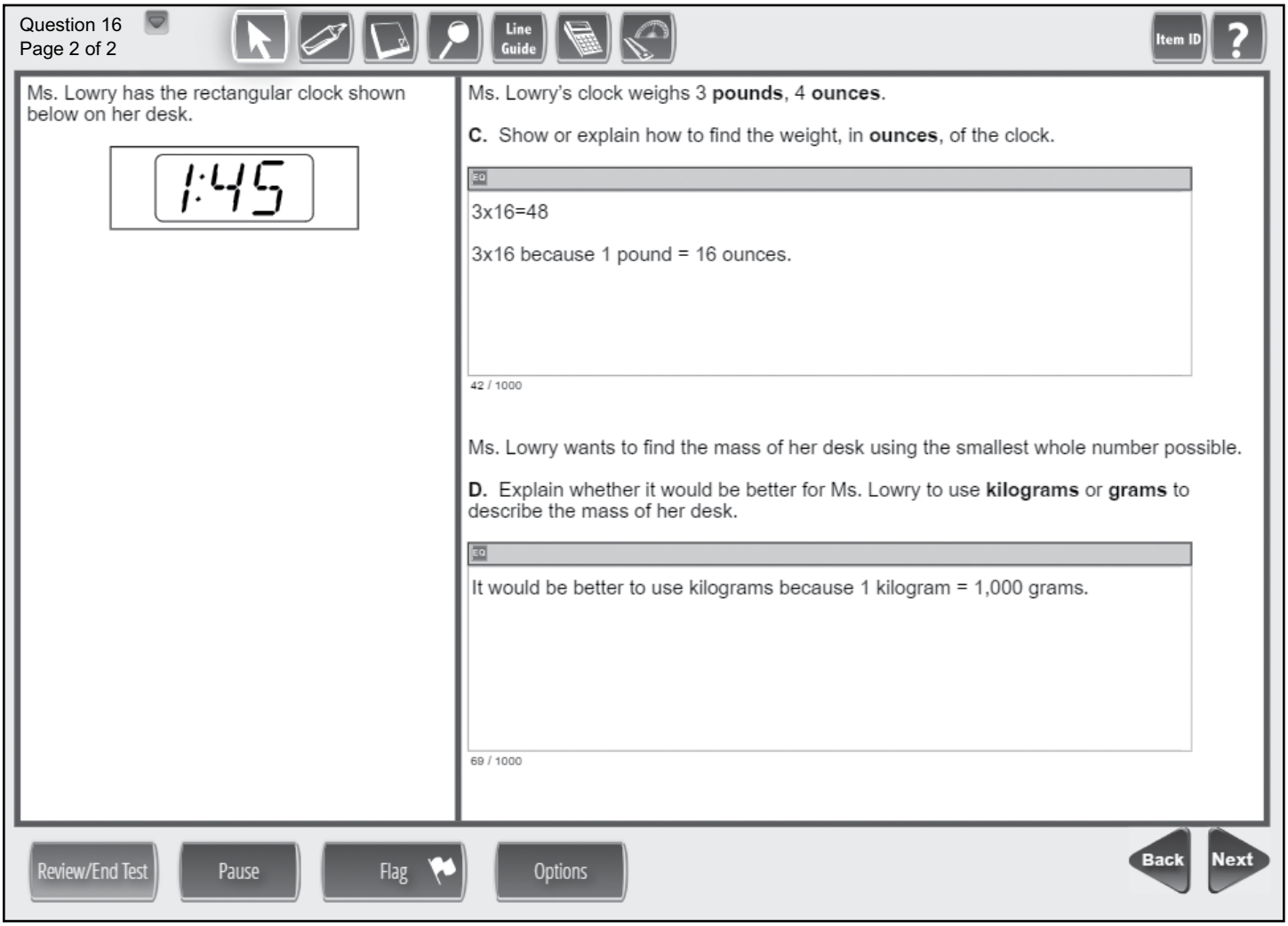
PARTS A and B



Part A: The student provided an incorrect response that did not describe in words the time shown on the clock as the amount of time before the hour (*12:45*). No support (work or explanation) is required, so it is unclear where an error was made. The student likely misinterpreted *"*amount of time before the hour*"* as subtracting 1 hour from the time shown on the clock. [0 points]

Part B: The student provided an incorrect answer (*72 inch*). No support (work or explanation) is required, so it is unclear where an error was made. The student may have incorrectly set up an equation using the area formula for a rectangle ($A = l \times w$) by substituting 12 in for l rather than for A and 6 in for w, resulting in $A = 12 \times 6$, and then multiplied 12 and 6 for a product of 72. [0 points]

PARTS C and D



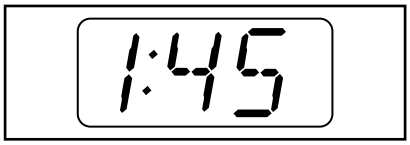
Part C: The student provided correct but incomplete support showing how to find the weight of the clock in ounces. The student calculated how many ounces were in 3 pounds (*3x16=48*, *3x16 because 1 pound = 16 ounces*) but then did not add on the additional 4 ounces from the given information of 3 **pounds**, 4 **ounces**. [0.5 points]

Part D: The student provided a correct but incomplete explanation as to whether it would be better for Ms. Lowry to use kilograms or grams to describe the mass of her desk (*better to use kilograms because 1 kilogram = 1,000 grams*). Citing the conversion formula from the Grade 4 formula sheet with no further explanation was not enough for full credit. [0.5 points]

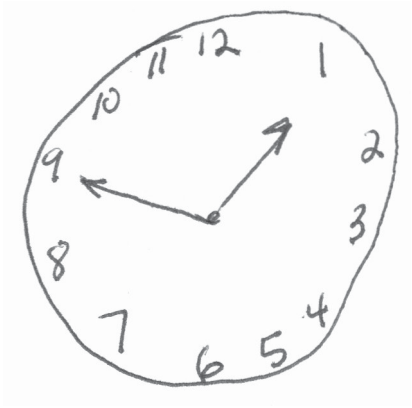
STUDENT RESPONSE

Response Score: 0 points

16. Ms. Lowry has the rectangular clock shown below on her desk.



A. Describe the time shown on the clock as the amount of time before the hour.



The rectangular clock face is 6 inches wide. The area of the rectangular clock face is 12 square inches.

B. What is the height, in inches, of the rectangular clock face?

72

Go to the next page to finish question 16.

GO ON

Part A: The student provided an incorrect response by drawing 1:45 on an analog clock rather than describing the time shown on the digital clock as the amount of time before the hour. [0 points]

Part B: The student provided an incorrect answer (*72*). No support (work or explanation) is required, so it is unclear where an error was made. The student may have incorrectly set up an equation using the area formula for a rectangle ($A = l \times w$) by substituting 12 in for l rather than for A and 6 in for w, resulting in $A = 12 \times 6$, and then multiplied 12 and 6 for a product of 72. [0 points]

16. ***Continued.*** Please refer to the previous page for task explanation.

Ms. Lowry's clock weighs 3 **pounds**, 4 **ounces**.

C. Show or explain how to find the weight, in **ounces**, of the clock.

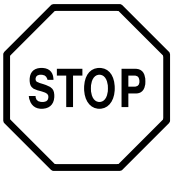
12

Ms. Lowry wants to find the mass of her desk using the smallest whole number possible.

D. Explain whether it would be better for Ms. Lowry to use **kilograms** or **grams** to describe the mass of her desk.

grams

After you have finished your work, close this booklet so your teacher will know you are finished.



Part C: The student provided an incorrect response for calculating the weight of the clock in ounces (*12*). Since no support (work or explanation) was provided, it is unclear where an error was made. The student may have multiplied the two numbers from the given information (3 × 4 = 12). [0 points]

Part D: The student did not provide an explanation as to whether it would be better for Ms. Lowry to use kilograms or grams to describe the mass of her desk; rather, the student provided only a unit of measure (*grams*). The student may have also incorrectly associated a smaller unit of measure with having smaller numbers. [0 points]

Mathematics—Summary Data

Multiple-Choice

An asterisk (*) indicates the key.

Sample Number	Alignment	Answer Key	Depth of Knowledge	*p*-value A	*p*-value B	*p*-value C	*p*-value D
1	A-F.3.1.2	B	1	15%	71%*	4%	10%
2	A-T.1.1.2	B	1	6%	83%*	5%	6%
3	A-T.1.1.4	C	2	9%	37%	38%*	16%
4	A-T.2	C	2	12%	30%	41%*	17%
5	A-T.2.1.2	D	1	10%	7%	9%	74%*
6	A-F.1.1.2	D	2	14%	18%	12%	56%*
7	A-F.2.1.5 A-F.2.1.1	B	2	33%	39%*	10%	18%
8	A-F.3.1.3	C	1	11%	26%	47%*	16%
9	B-O.1.1.2	A	1	54%*	7%	8%	31%
10	B-O.1.1.4	A	1	82%*	5%	6%	7%
11	B-O.2.1	A	2	69%*	15%	8%	8%
12	B-O.3.1.1	C	2	10%	14%	62%*	14%
13	B-O.3.1.2	D	2	13%	10%	13%	64%*
14	C-G.1.1	A	2	57%*	12%	21%	10%
15	C-G.1.1	A	2	58%*	14%	13%	15%

Open-Ended

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
16	D-M.1	4	2	1.32