13

Look at the addition patterns below.

$1 + 3 = 4$
$1 + 3 + 5 = 9$
$1 + 3 + 5 + 7 = 16$
$1 + 3 + 5 + 7 + 9 = 25$

How many consecutive odd integers starting with 1 must be added to produce 64?

6	7	8	9
A	**B**	**C**	**D**

14

Which expression satisfies the pattern below?

n	?
0	0
1	1
2	4
3	9
4	16

A $4n^2 - 3$ **C** n^3
B $3n^2$ **D** n^2

15

Which is equivalent to the expression below?

$$\frac{x}{2} - 1$$

A $\dfrac{x-1}{2}$ **C** $x - 1$

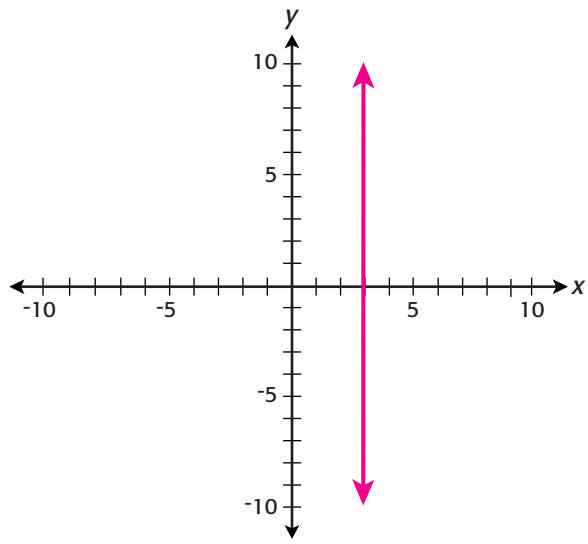**B** $\dfrac{x-2}{2}$ **D** $x - 2$

3406717_1

16

Which of the following is equivalent to the expression shown?

$$4x - 5 - 2x - 3$$

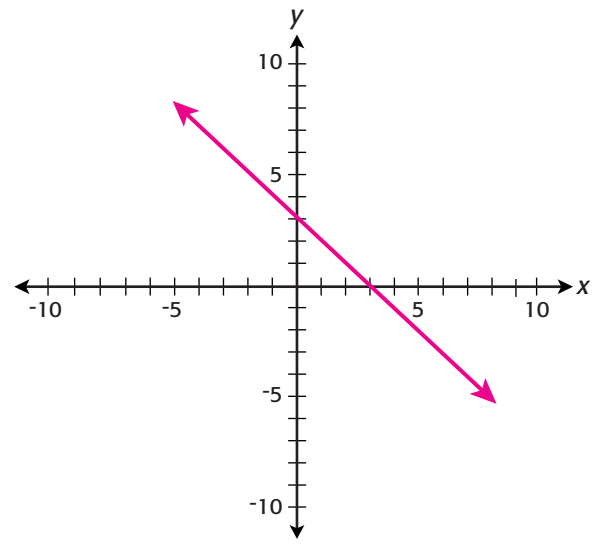**A** $2x - 8$ **C** $2x + 2$
B $6x + 2$ **D** $6x - 8$

GO ON ▶

17
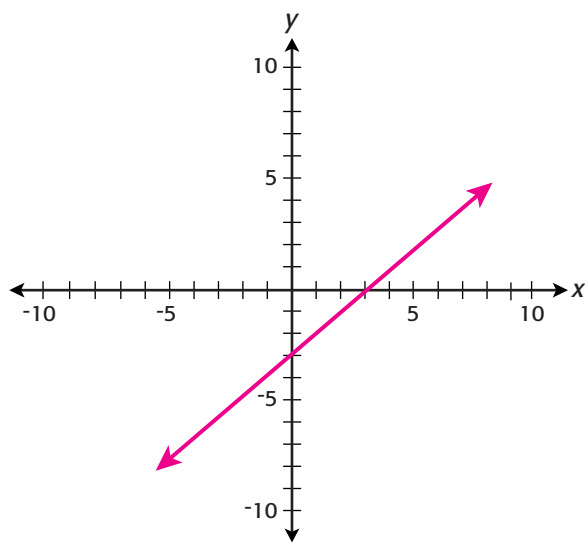
Which represents the graph of $y = 3$?
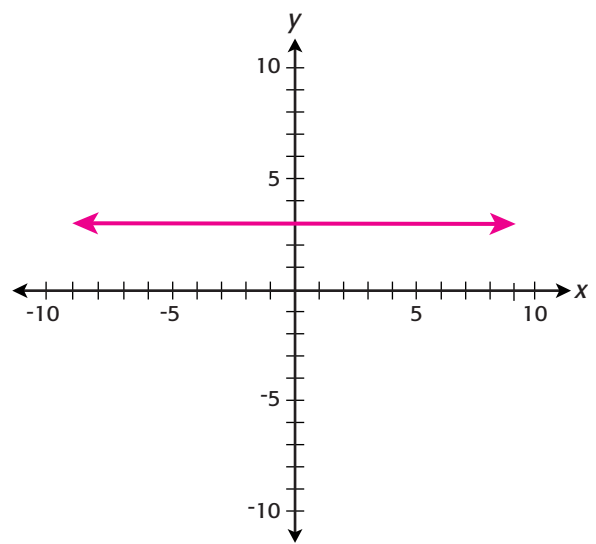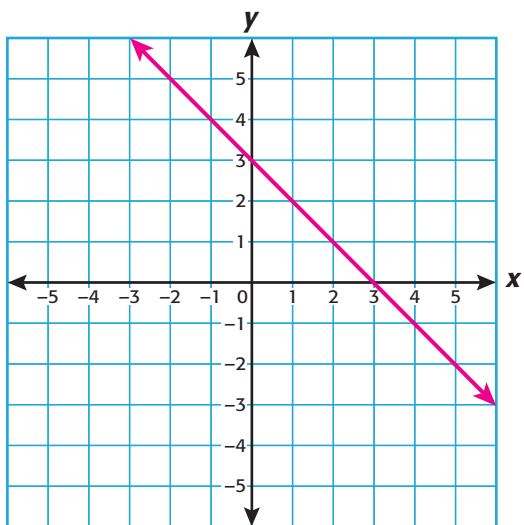

A

C

B

D

GO ON▶

18

3349222_2

Which equation best represents the line shown on this graph?

A $y = x + 3$
B $y = {}^-x + 3$
C $y = 3x$
D $y = {}^-3x$

19

Which of the following equations represents the relationship between x and y in the table?

x	y
0	2
1	5
2	8
3	11
4	14

A $y = 2x$
B $y = x + 2$
C $y = 5x$
D $y = 3x + 2$

20

The graph of a line contains the points (5, 3) and (5, ⁻1).

Which of the following *must* be true about the graph of this line?

A The line intersects the x-axis.
B The slope of the line is negative.
C The line intersects the y-axis.
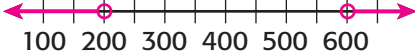D The slope of the line is positive.

21

3535468_3

A single round-trip plane ticket from Illinois to Florida costs between $200 and $600, depending on the time of year and the flight chosen.

Which number line best represents this cost?

A

B

C

D

22

The inequality $70° < x < 80°$ represents the range of the ideal water temperature, in degrees Fahrenheit, for Sammy's fish.

Which statement is true about the situation?

A   The ideal water temperature is less than 70 °F.
B   The ideal water temperature is greater than 80 °F.
C   The ideal water temperature is between 70 °F and 80 °F.
D   The ideal water temperature is less than 70 °F or greater than 80 °F.

23

3400040_1

Juan had a checking account with a balance of x dollars. After he withdrew y dollars, he had a balance of $100.

Which of the following shows the correct relationship between x, y, and $100?

A $x - y = \$100$
B $\$100 < x - y$
C $x + y = \$100$
D $x - y > \$100$

GO ON ▶

24

Which graph best represents the solution to the inequality below?

$$^-4x + 10 < ^-6$$

A

B

C

D

25

3356108_3

Malia has $1\frac{1}{2}$ times as many tennis balls as Jolie. Together they have 20 tennis balls. How many tennis balls does Malia have?

8	10	12	15
A	**B**	**C**	**D**

26

What is the value of x in the triangle shown?

70°

56° $(x - 5)°$

24	49	54	59
A	**B**	**C**	**D**

27
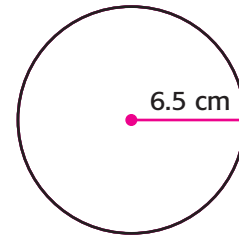
6.5 cm

What is the circumference of this circle in terms of π?

A	65π cm	**C**	13π cm
B	42.25π cm	**D**	6.5π cm

GO ON ▶

28   3400125_2

Which of the following ordered pairs is located in Quadrant II?

A   (⁻3, ⁻6)   **C**   (3, 6)
B   (⁻3, 6)   **D**   (3, ⁻6)

29

Line *l* intersects parallel lines *m* and *n* as shown.
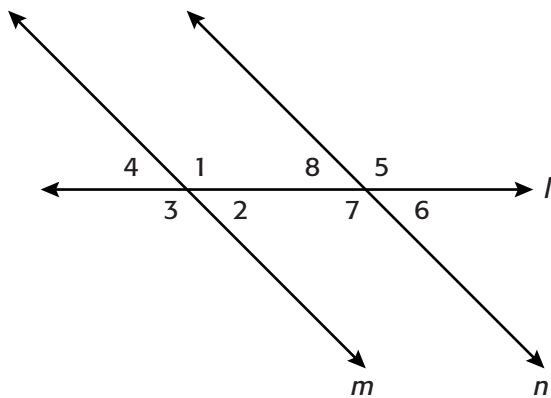
Which list contains all the angles that are congruent to ∠1?

A   ∠3, ∠5, ∠7
B   ∠3, ∠6, ∠8
C   ∠2, ∠3, ∠4
D   ∠2, ∠7, ∠8

30   100000091419_3

The diagram shows $\overleftrightarrow{PN}$ and $\overleftrightarrow{KM}$ intersecting at point *L*.
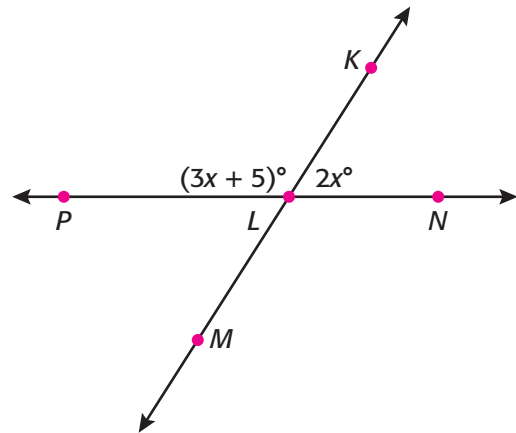
What is the measure of ∠*KLN*?

17°	35°	70°	110°
A	**B**	**C**	**D**

GO ON▶

31
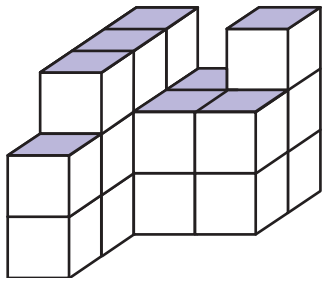
Which drawing represents the top view of this solid?

A

B

C

D

32
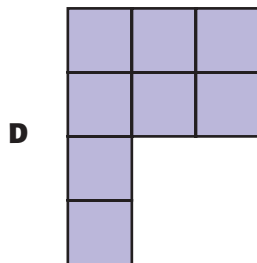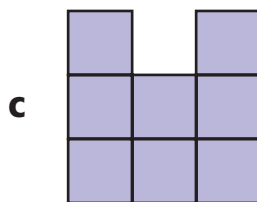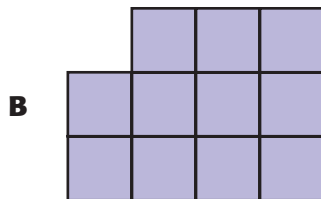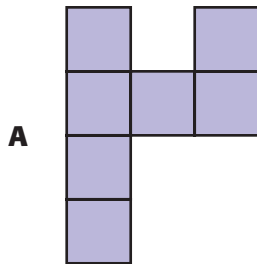
ΔXYZ is similar to ΔRST.
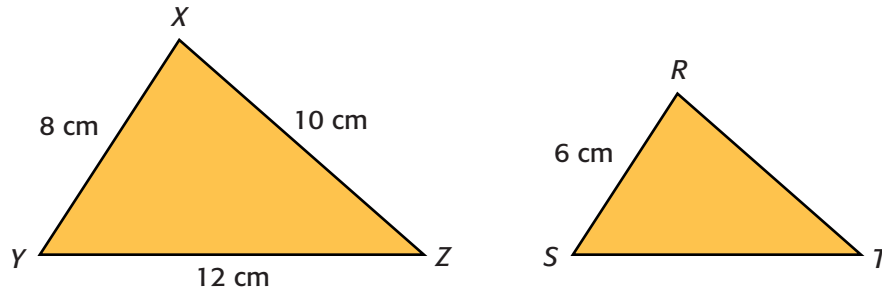
What is the length of $\overline{ST}$?

10 cm	9 cm	8.5 cm	7.5 cm
A	**B**	**C**	**D**

33
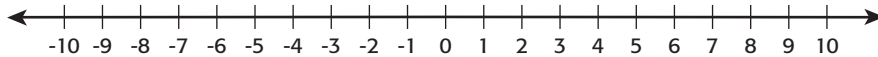
The following pairs of numbers can be graphed on this number line.

Which numbers have the same absolute value?

A   ⁻3 and 3
B   5 and 10
C   4 and ⁻8
D   ⁻2 and ⁻4

GO ON ▶

34

The circle graph below represents a total of 240 animals at a zoo. The shaded sector represents the number of monkeys at this zoo.

240 Animals at a Zoo
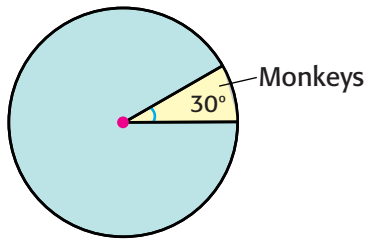
How many monkeys are at this zoo?

8	20	30	72
A	**B**	**C**	**D**

35

Which scatter plot shows the line that best fits the data points given?

A

C

B

D

36
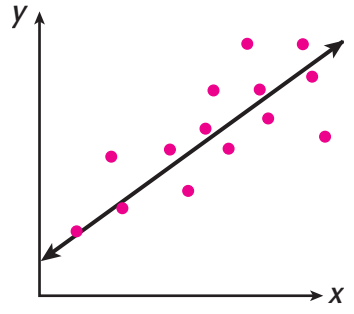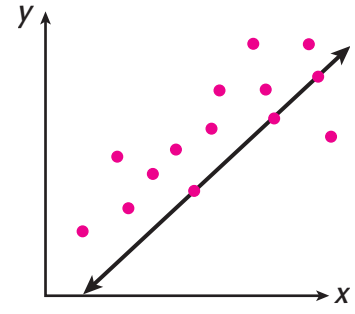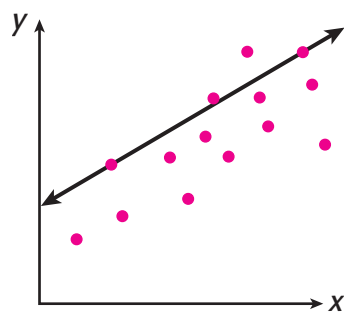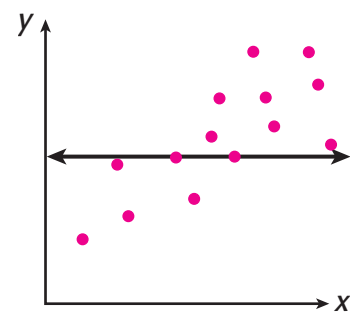
100000091368_4

The scatter plot shows the math and reading test scores of nine students.

Reading and Math Test Scores
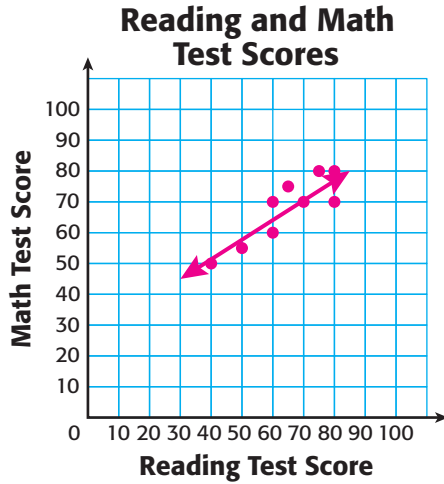
Based on the line of best fit, which is the best prediction for a reading test score when a student's math test score is 90?

85	90	95	100
A	**B**	**C**	**D**

37

Mike has only 2 red apples and 3 green apples in a bowl. Without looking he chooses an apple and gives it to his sister. Then he chooses an apple for himself.

What is the probability that he and his sister will each get a red apple?

10%	30%	40%	60%
A	**B**	**C**	**D**

38

100000128903_1

The picture below shows both sides of a nickel when landing heads up or tails up.

Heads Up   Tails Up

If Billy tosses the nickel three times, what is the probability of the nickel landing tails up on all three tosses?

$\frac{1}{8}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{2}$
A	**B**	**C**	**D**

GO ON ▶

39

The square letter tiles shown below are placed in an empty box. The tiles are equal in size.

N B R N O R N N R B
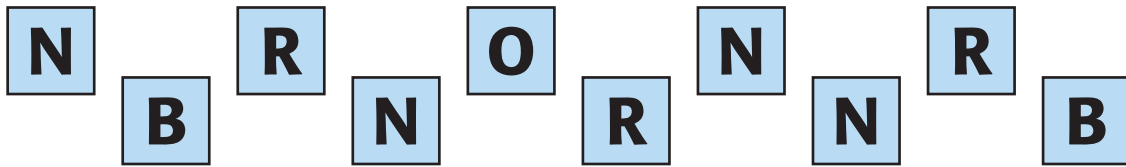
If two tiles are randomly selected *without replacement*, what is the probability that the first tile will be the letter R and the second tile will be the letter N?

$\frac{3}{25}$

A

$\frac{2}{15}$

B

$\frac{7}{15}$

C

$\frac{7}{10}$

D

GO ON▶

40

The student council is making snack bags for a class trip. Each snack bag will contain:

- 1 type of drink
- 1 type of cookie
- 1 type of fruit

To make each snack bag, they will choose from 2 types of drinks, 4 types of cookies, and 2 types of fruit.

> How many combinations of 1 type of drink, 1 type of cookie, and 1 type of fruit are possible?

A 3
B 8
C 16
D 48

STOP ■

Answer Key with Assessment Objectives Identified

Item Number	Correct Answer	Assessment Objective
1	B	**6.8.04** Use scientific notation to represent numbers and solve problems.
2	C	**6.8.07** Identify and locate rational and irrational numbers (e.g., π, $\sqrt{2}$, $\sqrt{5}$) on a number line.
3	B	**6.8.09** Solve problems and number sentences involving addition, subtraction, multiplication, and division using rational numbers, exponents, and roots.
4	A	**6.8.12** Describe the effect of multiplying and dividing by numbers, including the effect of multiplying or dividing a rational number by: • a number less than zero; • zero; • a number between zero and one; and • a number greater than one.
5	A	**6.8.14** Estimate the square or cube root of a number less than 1,000 between two whole numbers (e.g., $\sqrt[3]{200}$ is between 5 and 6).
6	C	**6.8.18** Solve number sentences and problems involving fractions, decimals, and percents (e.g., percent increase and decrease, interest rates, tax, discounts, tips).
7	C	**7.8.02** Solve problems involving perimeter/circumference and area of polygons, circles, and composite figures using diagrams, models, and grids or by measuring or using given formulas (may include sketching a figure from its description).
8	A	**7.8.02** Solve problems involving perimeter/circumference and area of polygons, circles, and composite figures using diagrams, models, and grids or by measuring or using given formulas (may include sketching a figure from its description).
9	D	**7.8.04** Solve problems involving the volume or surface area of a right rectangular prism, right circular cylinder, or composite shape using an appropriate formula or strategy.
10	D	**7.8.04** Solve problems involving the volume or surface area of a right rectangular prism, right circular cylinder, or composite shape using an appropriate formula or strategy.
11	D	**7.8.05** Solve problems involving unit conversions within the same measurement system for length, weight/mass, capacity, square units, and measures expressed as rates (e.g., converting feet/second to yards/minute).
12	C	**7.8.06** Solve problems involving scale drawings, maps, and indirect measurement (e.g., determining the height of a building by comparing its known shadow length to the known height and shadow length of another object).
13	C	**8.8.01** Analyze, extend, and create sequences or linear functions, and determine algebraic expressions to describe the nth term of a sequence.

Item Number	Correct Answer	Assessment Objective
14	D	**8.8.01** Analyze, extend, and create sequences or linear functions, and determine algebraic expressions to describe the nth term of a sequence.
15	B	**8.8.04** Recognize and generate equivalent forms of algebraic expressions.
16	A	**8.8.04** Recognize and generate equivalent forms of algebraic expressions.
17	D	**8.8.07** Represent linear equations and quantitative relationships on a rectangular coordinate system, and interpret the meaning of a specific part of a graph.
18	B	**8.8.07** Represent linear equations and quantitative relationships on a rectangular coordinate system, and interpret the meaning of a specific part of a graph.
19	D	**8.8.08** Translate between different representations (table, written, graphical, or pictorial) of whole number relationships and linear expressions.
20	A	**8.8.09** Interpret the meaning of slope and intercepts in linear situations.
21	C	**8.8.10** Identify, graph, and interpret up to two inequalities with a single variable (including the intersection or union of these inequalities) on a number line.
22	C	**8.8.11** Represent and analyze problems with linear equations and inequalities.
23	A	**8.8.11** Represent and analyze problems with linear equations and inequalities.
24	D	**8.8.12** Solve linear equations and inequalities in one variable over the rational numbers (e.g., $5x+7=-13$, $4x-3=-7x+8$, $-2x+3>-5$).
25	C	**8.8.13** Solve word problems involving unknown quantities.
26	D	**9.8.02** Solve problems that require knowledge of triangle and quadrilateral properties (e.g., triangle inequality).
27	C	**9.8.04** Identify, describe, and determine the radius, diameter, and circumference of a circle and their relationship to each other and to pi.
28	B	**9.8.05** Graph points and identify coordinates of points on the Cartesian coordinate plane (all four quadrants).
29	A	**9.8.08** Identify or analyze relationships of angles formed by intersecting lines (including parallel lines cut by a transversal) and angles formed by radii of a circle.
30	C	**9.8.09** Solve problems involving vertical, complementary, and supplementary angles.
31	D	**9.8.10** Identify front, side, and top views of a three–dimensional solid built with cubes.
32	B	**9.8.11** Solve problems involving congruent and similar figures.

Item Number	Correct Answer	Assessment Objective
33	A	**9.8.12** Relate absolute value to distance on the number line.
34	B	**10.8.01** Read, interpret (including possible misleading characteristics), and make predictions from data represented in a bar graph, line (dot) plot, Venn diagram (with two or three circles), chart/table, line graph, scatter plot, circle graph, stem–and–leaf plot, or histogram.
35	A	**10.8.04** Identify or draw a reasonable approximation of the line of best fit from a set of data or a scatter plot, and use the line to make predictions.
36	D	**10.8.04** Identify or draw a reasonable approximation of the line of best fit from a set of data or a scatter plot, and use the line to make predictions.
37	A	**10.8.06** Solve problems involving the probability of an event composed of repeated trials, compound events (including independent events), or future events with or without replacement.
38	A	**10.8.06** Solve problems involving the probability of an event composed of repeated trials, compound events (including independent events), or future events with or without replacement.
39	B	**10.8.06** Solve problems involving the probability of an event composed of repeated trials, compound events (including independent events), or future events with or without replacement.
40	C	**10.8.08** Solve simple problems involving the number of ways objects can be arranged (permutations and combinations).

To view all the mathematics assessment objectives, download the *Illinois Mathematics Assessment Framework* for Grades 3–8 online at www.isbe.net/assessment/IAFindex.htm.

Mathematics Short-Response
Scoring Rubric
Followed by Student Samples

Mathematics Short-Response Scoring Rubric

The following rubric is used to score the short-response items for all grade levels.

SCORE LEVEL	DESCRIPTION
2	Completely correct response, including correct work shown and/or correct labels/units if called for in the item
1	Partially correct response
0	No response, or the response is incorrect

Using Short-Response Samples

Beginning with the spring 2008 ISAT, the sample short-response question and answer (shown below) that appeared in the 2006 and 2007 ISAT test directions will no longer be included in the directions immediately prior to session 2. ISBE encourages educators to practice these types of items with students during the course of the school year so they are familiar with them prior to ISAT testing.

SAMPLE SHORT-RESPONSE QUESTION

Sam can buy his lunch at school. Each day, he wants to buy juice that costs 50¢, a sandwich that costs 90¢, and fruit that costs 35¢.

Exactly how much money does Sam need to buy lunch for 5 days?

Show your work and label your answer.

SAMPLE SHORT-RESPONSE ANSWER

50¢ + 90¢ + 35¢ = $1.75
for each day

My answer
$8.75

3 2
1.75
1.75
1.75
1.75
+ 1.75
$8.75 for five days

Please refer to the 2008 and 2009 ISAT sample books for additional short-response items and student samples (online at www.isbe.net/assessment/htmls/sample_books.htm).

Blank Short-Response Template

Mathematics - Session 2   Question 1

Write your response to question 1 on this page. Only what you write on this page will be scored.

Mathematics Short-Response Sample Item 1

Below is a short-response sample item, followed by 3 samples of student responses.

This short-response sample item is classified to assessment objective 10.8.05, "Analyze and apply measures of central tendency (mode, range, median, and mean) in problem-solving situations."

1

List *one* set of 5 whole numbers for which the following is true:

• The mode is 8 and the mean is 6.

Show your work.

Short-Response Student Sample 1A

```
8 8 7 5 2

mode = most often
mean = + then ÷ by how many numbers

          mean – 6
          mode – 8

8 + 8 + 7 + 5 + 2 = 30 ÷ 5 = 6
                      mode = 8
```

Short-Response Student Sample 1A

Rubric Score Point = 2

Note: The student identifies a set of five whole numbers (*8, 8, 7, 5, 2*) with a mean of "*6*" and a single mode of "*8*" and includes appropriate supporting work by showing that the five numbers add up to 30 (*8 + 8 + 7 + 5 + 2 = 30*).

Short-Response Student Sample 1B

5 6 7 8 8 doesn't work

8 needs to appear more than any other number.

6
×5
―――
30 ← numbers add up to 30.

3, 4, 7, 8, 8

Short-Response Student Sample 1B

Rubric Score Point = 2

Note: The student identifies a set of five whole numbers with a mean of "*6*" and a single mode of "*8*" and includes appropriate supporting work by showing that the sum of the five numbers will be 30 if the mean is to be 6 (*6 x 5 = 30…3, 4, 7, 8, 8*).

Short-Response Student Sample 1C

set: 88077

mode: 8

mean: (average) 8+8=16 +0=16+7=23+7=30

$\frac{30}{5}$ (30÷5)=6

Answer:
88077

Short-Response Student Sample 1C

Rubric Score Point = 1

Note: The student identifies a set of five whole numbers with a mean of "*6*" and a mode of "*8*" and includes appropriate supporting work by showing that the five numbers add up to 30 (*8 + 8 = 16 + 0 = 16 + 7 = 23 + 7 = 30*). The student fails to provide a single mode by including an additional mode of 7 in the set (*8 8 0 7 7*).

Mathematics Short-Response Sample Item 2

Below is a short-response sample item, followed by 3 samples of student responses.

This short-response sample item is classified to assessment objective 10.8.07, "Represent all possible outcomes (sample space) for simple or compound events (e.g., tables, grids, tree diagrams)."

2

A pizza restaurant offers the following types of crusts, toppings, and cheeses.

- **Crust:** regular, thin
- **Topping:** sausage, pepperoni, bacon
- **Cheese:** mozzarella, cheddar

List *all* the possible combinations of pizzas that can be made using 1 type of crust, 1 topping, and 1 type of cheese.

Short-Response Student Sample 2A

Crust —regular, thin
Topping — sasuge, pepperoni, bacon
Cheese — mozzarella, cheddar

1	2	3	4
regular sasuge mozzarella	regular peperroni mozzarella	regular bacon mozzarella	thin sasuge cheddar
5	6	7	8
thin pepperoni cheddar	thin bacon cheddar	regular bacon cheddar	regular sasuge cheddar
9	10	11	12
regular pepperoni cheddar	thin bacon mozzarella	thin pepperoni mozzarella	thin sasuge mozzarella

2
*3
X2
12

These are the different possible combinations that can be made.

Short-Response Student Sample 2A

Rubric Score Point = 2

Note: The student correctly lists all twelve possible combinations of pizzas that can be made. All combinations of pizza provided are unique.

Short-Response Student Sample 2B

crust = 2 choices = CR1 & CR2
Toppings = 3 choices = T1 & T2 & T3
Cheese = 2 choices = C1 & C2

CR1
C1   C2
T1)   T1)
T2)   T2)
T3   T3

CR2
C1   C2
T1)   T1)
T2)   T2)
T3   T3

There are 12 possible ways to combine the toppings the cheese, & the crust.
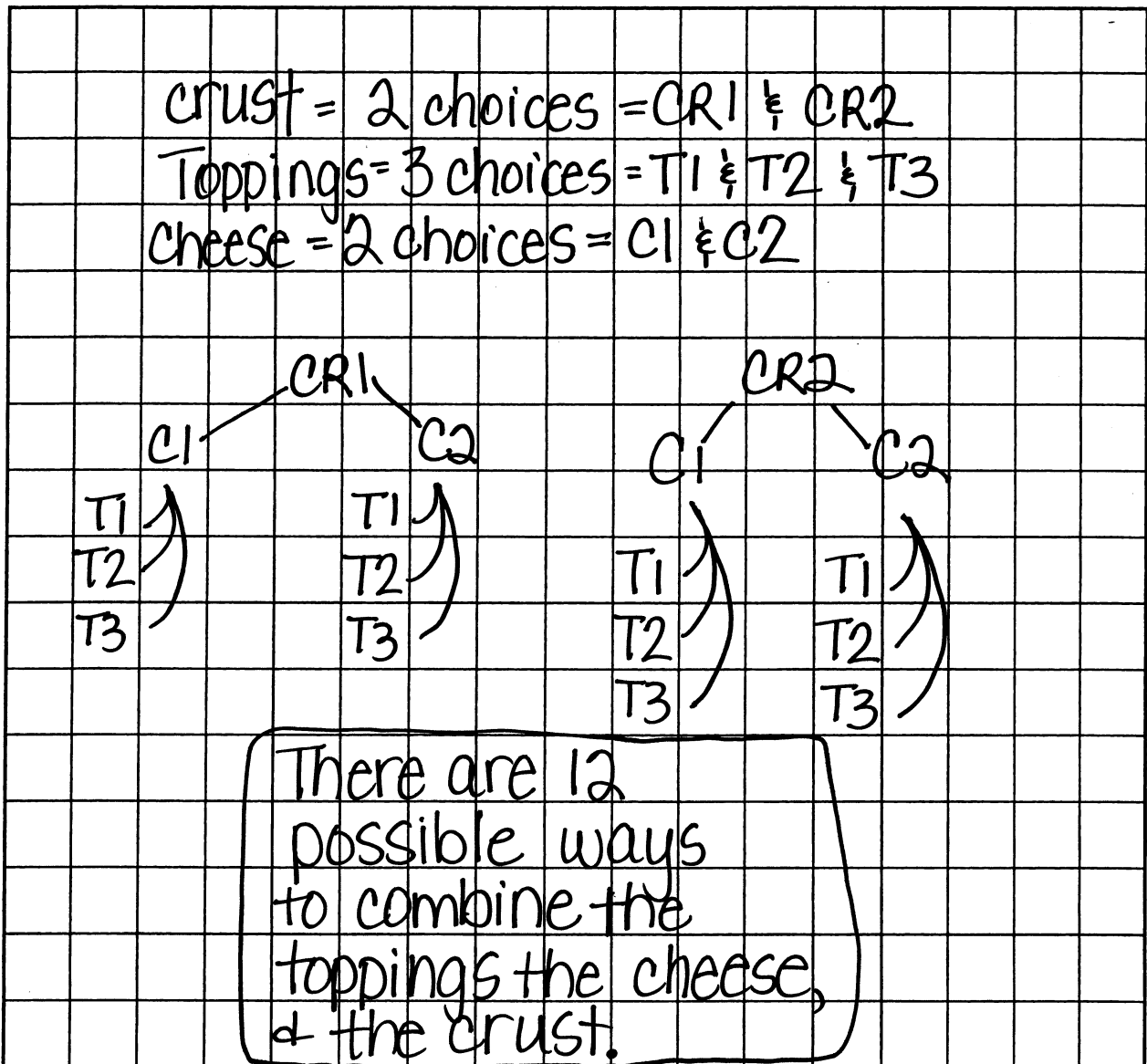
Short-Response Student Sample 2B

Rubric Score Point = 2

Note: The student uses a diagram to correctly show all twelve possible combinations of pizzas that can be made. The strategy links each type of crust to a type of cheese and a topping to produce all twelve unique combinations.

Short-Response Student Sample 2C

Crust : regular, thin
topping: sausage, pepperoni, bacon
cheese : mozzarella, cheddar

— regular, + sausage, + mozarella
— regular + sausage + cheddar
— regular + pepperoni + mozz
— regular + peperoni + chedd
— reg + bacon + mozz
— reg + bacon + chedd

This is 6 different ways. Then
I times 6 by 2 because I also have
to do that with the thin crust.
Answer : 12

Short-Response Student Sample 2C

Rubric Score Point = 1

Note: The student correctly lists the six combinations of pizza that include the regular crust, but fails to provide any combinations using the thin crust. The student identifies that there are twelve combinations of pizza, but does not follow through with listing the other six combinations (*…I also have to do that with the thin crust.*) and simply indicates the answer is "*12*".

Mathematics Extended-Response Scoring Rubric
Followed by Student Samples

Mathematics Extended-Response Scoring Rubric

The following rubric is used to score the extended-response items for all grade levels. A student-friendly version of this extended-response scoring rubric is available online at www.isbe.net/assessment/math.htm.

SCORE LEVEL	MATHEMATICAL KNOWLEDGE: Knowledge of mathematical principles and concepts which result in a correct solution to a problem.	STRATEGIC KNOWLEDGE: Identification and use of important elements of the problem that represent and integrate concepts which yield the solution (e.g., models, diagrams, symbols, algorithms).	EXPLANATION: Written explanation of the rationales and steps of the solution process. A justification of each step is provided. Though important, the length of the response, grammar, and syntax are not the critical elements of this dimension.
4	• shows complete understanding of the problem's mathematical concepts and principles • uses appropriate mathematical terminology and notations including labeling answer if appropriate • executes algorithms and computations completely and correctly	• identifies all important elements of the problem <u>and</u> shows complete understanding of the relationships among elements • shows complete evidence of an appropriate strategy that would correctly solve the problem	• gives a complete written explanation of the solution process; clearly explains <u>what</u> was done and <u>why</u> it was done • may include a diagram with a complete explanation of all its elements
3	• shows nearly complete understanding of the problem's mathematical concepts and principles • uses mostly correct mathematical terminology and notations • executes algorithms completely; computations are generally correct but may contain minor errors	• identifies most of the important elements of the problem and shows a general understanding of the relationships among them • shows nearly complete evidence of an appropriate strategy for solving the problem	• gives a nearly complete written explanation of the solution process; clearly explains <u>what</u> was done and begins to address <u>why</u> it was done • may include a diagram with most of its elements explained
2	• shows some understanding of the problem's mathematical concepts and principles • uses some correct mathematical terminology and notations • may contain major algorithmic or computational errors	• identifies some important elements of the problem but shows only limited understanding of the relationships among them • shows some evidence of a strategy for solving the problem	• gives some written explanation of the solution process; either explains <u>what</u> was done or addresses <u>why</u> it was done • explanation is vague, difficult to interpret, or does not completely match the solution process • may include a diagram with some of its elements explained
1	• shows limited to no understanding of the problem's mathematical concepts and principles • may misuse or fail to use mathematical terminology and notations • attempts an answer	• fails to identify important elements or places too much emphasis on unrelated elements • reflects an inappropriate strategy for solving the problem; strategy may be difficult to identify	• gives minimal written explanation of the solution process; may fail to explain <u>what</u> was done and <u>why</u> it was done • explanation does not match presented solution process • may include minimal discussion of the elements in a diagram; explanation of significant elements is unclear
0	• no answer attempted	• no apparent strategy	• no written explanation of the solution process is provided

Using Extended-Response Samples

Beginning with the spring 2008 ISAT, the sample extended-response problem and solution (shown below) that appeared in the 2006 and 2007 ISAT test directions will no longer be included in the directions immediately prior to session 3. ISBE encourages educators to practice these types of items with students during the course of the school year so they are familiar with them prior to ISAT testing.

SAMPLE EXTENDED-RESPONSE PROBLEM

Mrs. Martin wants to put tiles on the floor by the front door of her house. She wants to use 3 different colors of tiles in her design.
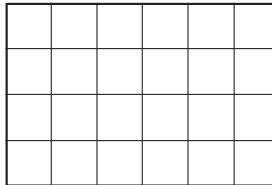
She also wants

$\frac{1}{2}$ of the tiles to be blue,

$\frac{1}{4}$ of the tiles to be gray, and

$\frac{1}{4}$ of the tiles to be red.

> Use the grid below to design a floor for Mrs. Martin. Label each tile with the first letter of the color that should be placed there.
>
> Show all your work. Explain in words how you found your answer. Tell why you took the steps you did to solve the problem.

SAMPLE EXTENDED-RESPONSE SOLUTION

B	B	B	B	B	B
B	B	B	B	B	B
G	G	G	G	G	G
R	R	R	R	R	R

$\frac{1}{2}$ blue

$\frac{1}{4}$ gray

$\frac{1}{4}$ red

First, I know that there are 4 equal rows, so 2 rows is half and 1 row is $\frac{1}{4}$. So I made 2 rows B for blue because she wants half the tiles blue. Then I made 1 row G for gray because she wants $\frac{1}{4}$ of the tiles to be gray. Since she wants gray and red to be the same amount of tiles, I made the last row R for red.

Please refer to the 2008 and 2009 ISAT sample books for additional extended-response items and student samples (online at www.isbe.net/assessment/htmls/sample_books.htm).

Blank Extended-Response Template

DIRECTIONS

Make sure you
– show all your work in solving the problem,
– clearly label your answer,
– write in words how you solved the problem,
– write in words why you took the steps you did to solve the problem, and
– write as clearly as you can.

Mathematics Extended-Response Sample Item 1

Below is an extended-response sample item, followed by 3 student samples.

This extended-response sample item is classified to assessment objective 8.8.13, "Solve word problems involving unknown quantities."

1
3577751

Mr. Mason's yard is 10,000 square feet. One bag of grass seed covers approximately 2,400 square feet and costs $8.99 per bag before tax. The sales tax is 7.25%.
(Note: Mr. Mason must buy full bags of grass seed.)

What is the minimum cost for the grass seed Mr. Mason needs to cover his entire yard, including sales tax?

Show all your work. Explain in words how you found your answer. Write why you took the steps you did to solve the problem.
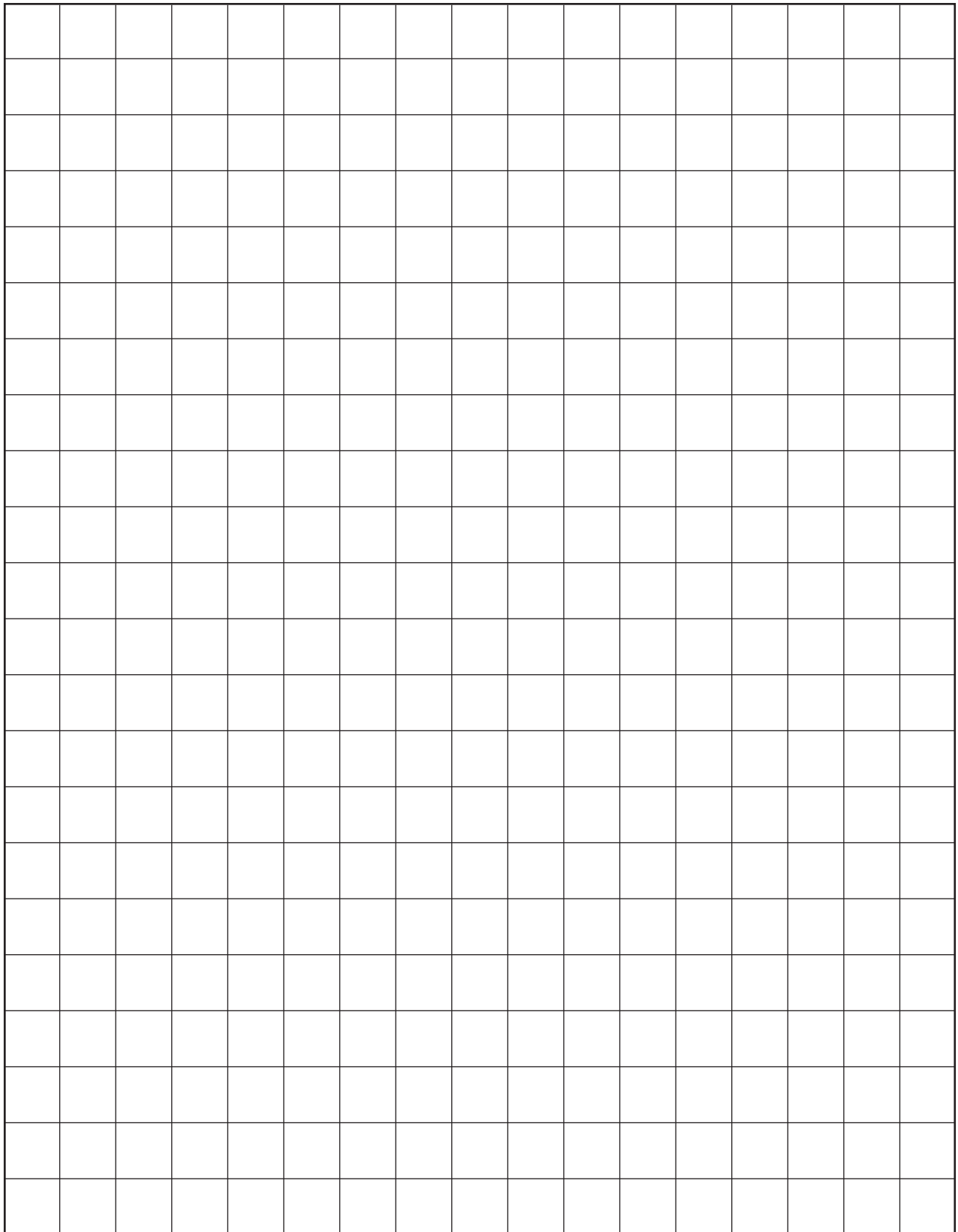
Extended-Response Student Sample 1A

DIRECTIONS

Make sure you
– show all your work in solving the problem,
– clearly label your answer,
– write in words how you solved the problem,
– write in words why you took the steps you did to solve the problem, and
– write as clearly as you can.

$8.99 \times .0725 = .651775$
$+ 8.99$
$\$ 9.64$

$\overset{3.2}{9.64}$
$\times \ 5$
$\$48.20$

$10,000 \div 2400 = 4.1\bar{6} = 5$

$\boxed{\$48.20 \text{ for } 5 \text{ bags of grass seed}}$

First I took 8.99 × .0725 and got .651775, I added That To 8.99 To get the cost per bag of grass seed plus sales Tax and I came up with $9.64. Next I took 10,000 ÷ 2400 To find how many bags of grass seed I would need because one bag covered 2,400 square feet of yard and his yard is 10,000 square feet. I came up with 4.16 and since I could only buy full bags I would need 5 bags. Then I Took $9.64 × 5 bags and got $48.20. I did that To find the minimum cost for the grass seed Mr. Mason needs To cover his entire yard including sales Tax.
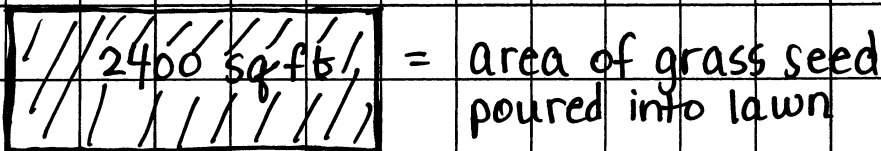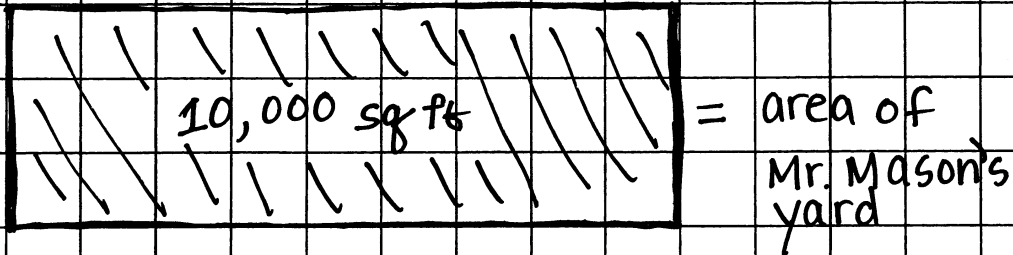
Extended-Response Student Sample 1A Continued

DIRECTIONS

Make sure you
– show all your work in solving the problem,
– clearly label your answer,
– write in words how you solved the problem,
– write in words why you took the steps you did to solve the problem, and
– write as clearly as you can.

My first step was to see how many bags of grass seed would fit in Mr. Mason's yard. I did this by dividing 10,000. the total area of the yard, by 2,400, the total coverage of the grass seed. My answer was 4.16, but since Mr. Mason could not buy a fraction of a seed bag, he would need at least 5 bags of seed to cover his whole lawn.

My next step was to calculate the cost of 5 bags of seed, so I did 5 × 8.99 and got $44.95. Then I calculated the tax, which was 7.25% by doing 44.95 × 1.0725 and got 48.2088, which I rounded to $48.21.

Extended-Response Student Sample 1B Continued

10,000 sq ft = area of Mr. Mason's yard

2400 sq ft = area of grass seed poured into lawn

what	why
1. $10,000/2400 =$ $4.1\overline{6}$ $4.1\overline{6} \uparrow 5$	I divided the area of the yard by the area of the grass seed to find out how many bags of seed are needed. I got a decimal, but grass seed bags only comes in wholes so I rounded up.
$5 \times 8.99 = \$44.95$	I calculated the cost of 5 bags
$44.95 \times 1.0725 =$ $48.2088 \uparrow 48.21$ $\$48.21$	I calculated sales tax which was 7.25% and got 48.2088. I rounded this number to 48.21, which was my final answer.

Extended-Response Student Sample 1C

DIRECTIONS

Make sure you
– show all your work in solving the problem,
– clearly label your answer,
– write in words how you solved the problem,
– write in words why you took the steps you did to solve the problem, and
– write as clearly as you can.

It will cost $45.24 to cover his entire yard
I got my answer by dividing 2400 by 10 thousand.
and I got 4.16 that rounded off to 5.

$$4.16 = 5$$
$$2400 \overline{)10,000}$$

After that I added
$8.99 + 7.25 × 5
and got $45.24.
and that is how
I got my
answer.

$8.99 + $7.25 × 5 =

$$\boxed{45.24}$$

Extended-Response Student Sample 1C Continued

Scoring Guide for "Mr. Mason's Yard"

To solve this problem, students are asked to determine the minimum cost needed to cover a yard with grass seed.

Extended-Response Student Sample 1A

MATHEMATICAL KNOWLEDGE	STRATEGIC KNOWLEDGE	EXPLANATION
4	**4**	**4**
The response shows complete understanding of the problem's mathematical concepts and principles. The student provides work to find the cost of one bag of seed, including tax (*8.99 x .0725 = .651775 + 8.99 = $9.64*), the number of bags needed (*10,000 ÷ 2,400 = 4.1$\overline{6}$ = 5*), and the final cost of multiple bags of grass seed (*9.64 x 5 = $48.20*).	The response identifies all important elements of the problem, shows complete understanding of the relationships among these elements, and uses an appropriate strategy to correctly solve the problem. The student shows work to find the number of bags needed (*10,000 ÷ 2,400 = 4.1$\overline{6}$ = 5*), calculates the tax (*x .0725*), adds tax (*.651775 + 8.99 = $9.64*), and finds the final cost of multiple bags of seed (*9.64 x 5 = $48.20*).	The response gives a complete written explanation of the solution process. The student explains why 5 bags were needed (*I came up with 4.1$\overline{6}$ and since I could only buy full bags I would need 5 bags*), why 8.99 was multiplied by .0725 and that product was added to 8.99 (*to get the cost per bag of grass seed plus sales tax*), and why 9.64 was multiplied by 5 (*to find the minimum cost for the grass seed*).

Extended-Response Student Sample 1B

MATHEMATICAL KNOWLEDGE	STRATEGIC KNOWLEDGE	EXPLANATION
4	**4**	**4**
The response shows complete understanding of the problem's mathematical concepts and principles. The student provides work to find the number of bags of seed needed (*10,000/2400 = 4.1$\overline{6}$; 4.1$\overline{6}$↑5*), work to find the total cost of the 5 bags before tax (*5 x 8.99 = $44.95*), and work to find the final cost of the five bags of seed, including the correct tax (*44.95 x 1.0725 = 48.2088↑48.21*).	The response identifies all important elements of the problem, shows complete understanding of the relationships among elements, and uses an appropriate strategy to correctly solve the problem. The student provides evidence of finding the number of bags of seed needed (*10,000/2400 = 4.1$\overline{6}$; 4.1$\overline{6}$↑5*) and evidence of calculating and adding tax to the total cost of the bags of seed to calculate a final cost of multiple bags of seed (*5 x 8.99 = $44.95, 44.95 x 1.0725 = 48.2088↑48.21*).	The response gives a complete written explanation of the solution process. The student explains why 10,000 was divided by 2400 (*to find out how many bags of seed are needed*), why 4.1$\overline{6}$ was rounded up to 5 (*grass seed bags only comes in wholes*), and why 5 was multiplied by 8.99 (*the cost of 5 bags*).

Extended-Response Student Sample 1C

MATHEMATICAL KNOWLEDGE	STRATEGIC KNOWLEDGE	EXPLANATION
2	**3**	**2**
The response shows some understanding of the problem's mathematical concepts and principles. The student shows work to find the correct number of bags of seed needed (*10,000 ÷ 2400 = 4.16; 4.16 = 5*). The student applies the tax incorrectly, using tax as dollars instead of percent.	The response identifies most important elements of the problem and shows a general understanding of the relationships among them. The response shows nearly complete evidence of an appropriate strategy for solving the problem. The student provides evidence of finding the correct number of bags of seed needed (*10,000 ÷ 2400 = 4.16; 4.16 = 5*), adding the tax (*I added $8.99 + $7.25 x 5*). The final cost (*45.24*) does not indicate the cost of 5 bags, but the cost of one bag, with incorrect tax for 5 bags.	The response gives some written explanation of the solution process, explaining what was done in the solution process (*got my answer by dividing 2400 by 10 thousand…that rounded off to 5…I added $8.99 + 7.25 x 5 and got $45.24*), but no attempt to explain why these steps were taken is provided.