

Illinois Standards Achievement Test
Mathematics Samples

Structure of the Grade 5 Mathematics ISAT

ISAT Mathematics testing in spring 2008 will consist of 30 norm-referenced items, as well as 45 criterion-referenced items, some of which will be used for developmental purposes. The 30 norm-referenced items are an abbreviated form of the *Stanford 10 Mathematics Problem Solving* assessment, developed by Harcourt, Inc. The 45 criterion-referenced items are all written by Illinois educators and pilot tested with Illinois students.

Item Formats

All 75 items are aligned to the *Illinois Mathematics Assessment Framework*, which defines the elements of the Illinois Learning Standards that are suitable for state testing.

Multiple-choice items require students to read, reflect, or compute and then to select the alternative that best expresses what they believe the answer to be. This format is appropriate for quickly determining whether students have achieved certain knowledge and skills. Well-designed multiple-choice items can measure student knowledge and understanding, as well as students' selection and application of problem-solving strategies. A carefully constructed multiple-choice item can assess any of the levels of mathematical complexity from simple procedures to sophisticated concepts. They can be designed to reach beyond the ability of students to "plug-in" alternatives or eliminate choices to determine a correct answer. Such items are limited in the extent to which they can provide evidence of the depth of students' thinking.

Short-response items pose similar questions as multiple-choice items and provide a reliable and valid basis for extrapolating about students' approaches to problems. These items reduce the concern about guessing that accompanies multiple-choice items. The short-response items are scored with a rubric and count as 5% of the scale score of the test.

Extended-response items require students to consider a situation that demands more than a numerical response. These items require students to model, as much as possible, real problem solving in a large scale assessment context. When an extended-response item poses a problem to solve, the student must determine what is required to "solve" the problem, choose a plan, carry out the plan, and interpret the solution in terms of the original situation. Students are expected to clearly communicate their decision-making processes in the context of the task proposed by the item (e.g., through writing, pictures, diagrams, or well-ordered steps). The extended-response items are scored with a rubric and count as 10% of the scale score of the test.

Scoring Extended- and Short-Response Items

Extended- and short-response items are evaluated according to an established scoring scale, called a rubric, developed from a combination of expectations and a sample of actual student responses. Such rubrics must be particularized by expected work and further developed by examples of student work in developing a guide for scorers. Illinois educators play a substantial role in developing these guides used for the scoring of the short- and extended-response items. Committees of mathematics educators from throughout the state attend a validation meeting, during which they use the mathematics scoring rubrics to establish task-specific criteria that are used to score all short- and extended-response items consistently and systematically.

Answer Document for Grade 5 Mathematics ISAT

Students in grade 5 respond to all test items in a separate answer document. Test administrators should monitor students carefully during testing to make sure students are using the appropriate pages of the answer document, especially for the short- and extended-response items.

Mathematics Sessions

All standard time administration test sessions are a minimum of 45 minutes in length. Any student who is still actively engaged in testing when the 45 minutes have elapsed will be allowed up to an additional 10 minutes to complete that test session. More details about how to administer this extra time will appear in the *ISAT Test Administration Manual*. This policy does not affect students who already receive extended time as determined by their IEP.

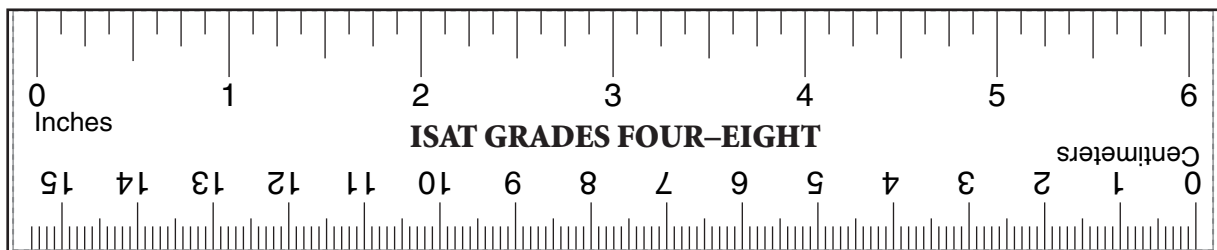
Mathematics ISAT Grade 5	
Session 1 45 minutes	40 multiple-choice items (30 of these are an abbreviated form of the <i>Stanford 10</i> .)
Session 2 45 minutes	30 multiple-choice items 3 short-response items
Session 3 45 minutes	2 extended-response items
(Some items will be pilot items.)	

Calculator Use for Grade 5 Mathematics ISAT

All students in grade 5 are allowed to use a calculator during all sessions of the mathematics assessment. Students are allowed to use any calculator they normally use in their mathematics classes. Schools, teachers, and parents should be advised that when students attempt to use calculators with which they are unfamiliar, their performance may suffer. In a like manner, students who are not taught when and how to use a calculator as part of their regular mathematics instructional program are also at risk.

Rulers for Grade 5 Mathematics ISAT

All students in grade 5 will be provided with a ruler to use during all sessions of the mathematics assessment. This ruler will allow students to measure in both inches and centimeters.



Scratch Paper for Grade 5 Mathematics ISAT

Students must be provided with blank scratch paper to use during only session 1. Only session 1 contains norm-referenced items, which were normed under such conditions. Students may not use scratch paper during session 2 or session 3, but they may use the test booklet itself as scratch paper. However, students must show their work, when required, for each short-response item in session 2 on the appropriate page in the answer document. Students must show their work for each extended-response item in session 3 on the appropriate pages in the answer document.



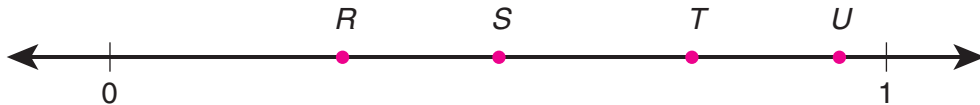
1

In the 1988 Olympic Games, Florence Griffith Joyner of the United States set an Olympic record for the women's 100-meter dash. Her time was ten and sixty-two hundredths seconds. How is this time written as a number?

- A 1.62 seconds
- B 10.62 seconds
- C 100.62 seconds
- D 1062.00 seconds

2

Which letter on the number line below best represents the location of $\frac{3}{4}$?



A R

B S

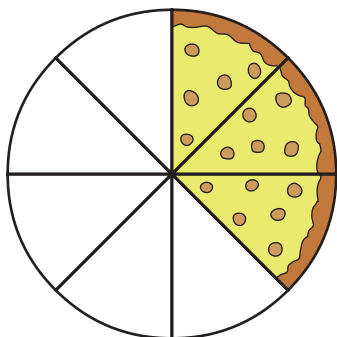
C T

D U



3

A pizza was cut into 8 equal pieces. Ben ate 2 pieces, and Sam ate 3 pieces.



What fractional part of the pizza did Ben and Sam eat?

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

4

All items listed below are on sale for 50% off the regular price.

Items on Sale

Item	Regular Price (including tax)
Hat	\$ 10.95
Shirt	\$ 21.05
CD	\$ 15.95
Coat	\$ 21.92

Which is closest to the amount of money needed to buy 1 of each item listed, at the sale price?

- \$30 \$35 \$60 \$70
A **B** **C** **D**

5

Six out of every ten fifth-grade students in a school have a pet. There are 50 fifth-grade students in this school.

What is the total number of fifth-grade students in this school who have a pet?

- A** 6 students
B 10 students
C 30 students
D 66 students



6

Anish went to sleep at 9:00 P.M. and woke up at 6:30 A.M.

What is the total number of hours Anish slept?

- A $3\frac{1}{2}$ hours
- B $7\frac{1}{2}$ hours
- C $8\frac{1}{2}$ hours
- D $9\frac{1}{2}$ hours

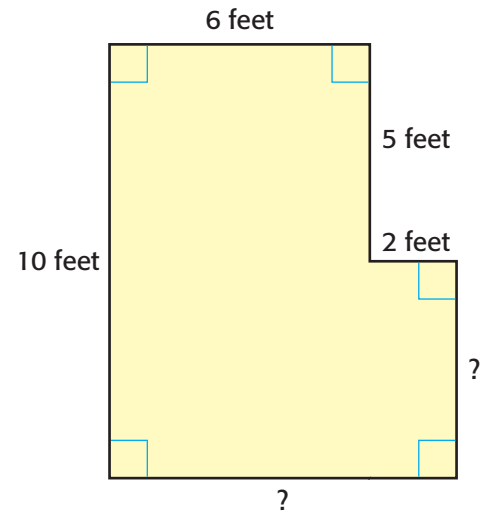
7

Field Day begins at 8:45 A.M. and ends at 2:20 P.M. How long is Field Day?

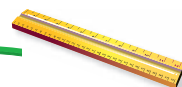
- A 5 hours and 25 minutes
- B 5 hours and 35 minutes
- C 6 hours and 25 minutes
- D 6 hours and 35 minutes

8

What is the perimeter of the figure below?

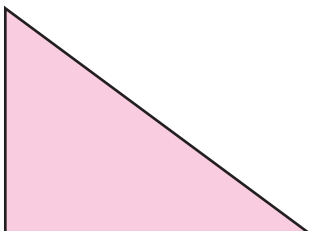


- A 36 feet
- B 28 feet
- C 23 feet
- D 13 feet



9

Use your centimeter ruler to help you answer this question.



Which is closest to the perimeter in centimeters of this triangle?

- A 5 cm
- B 7 cm
- C 12 cm
- D 15 cm

10

The scale on Todd's map is 1 inch = 200 miles. The distance from his house to his friend's house on the map is $5\frac{1}{4}$ inches.

What is the distance in miles from Todd's house to his friend's house?

- A 1,000 miles
- B 1,050 miles
- C 1,500 miles
- D 24,000 miles

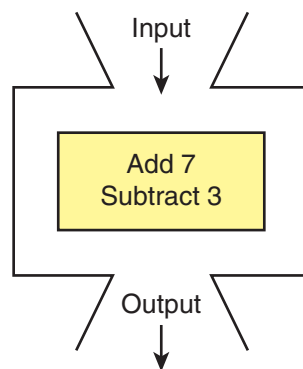
11

What is the value of $m + m - 3$ when $m = 4$?

- 1 5 11 13
- A** **B** **C** **D**

12

The drawing below is an input-output machine.



Using this machine, when the input is 5, what is the output?

- 2 4 9 12
- A** **B** **C** **D**



13

Mr. Jackson is 36 years old. His son is 8 years old. Let n represent the age of Mr. Jackson's wife. The ages of Mr. Jackson, his wife, and their son total 77.

Which correctly represents this information?

- A $77 + 36 + 8 = n$
- B $36 - n + 8 = 77$
- C $77 - 36 + 8 = n$
- D $36 + n + 8 = 77$

14

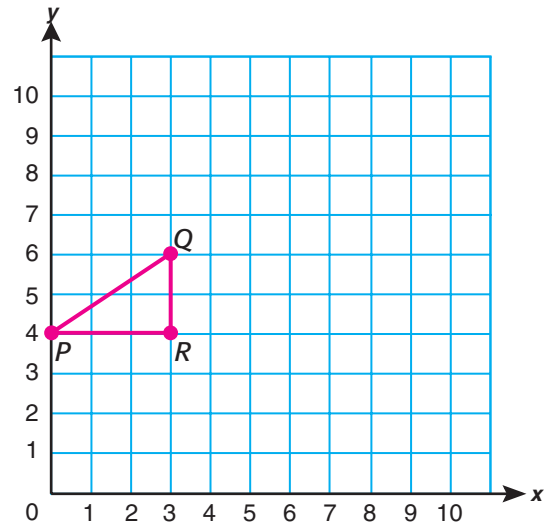
What is the value of n ?

$$50 \div n = 10$$

- | | | | |
|----------|----------|----------|----------|
| 5 | 10 | 40 | 50 |
| A | B | C | D |

15

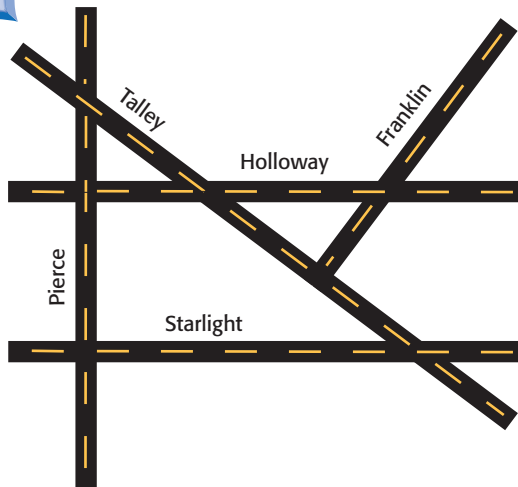
What are the new coordinates of point P if $\triangle PQR$ is translated 3 units to the right and 2 units up?



- | | |
|-----------------|-----------------|
| A (2, 7) | C (6, 3) |
| B (3, 6) | D (6, 6) |



16



Which streets on this map appear to never intersect?

- A Talley and Franklin
- B Starlight and Pierce
- C Franklin and Holloway
- D Holloway and Starlight

17

Which best describes the type of angle made by the hands on the clock shown below?

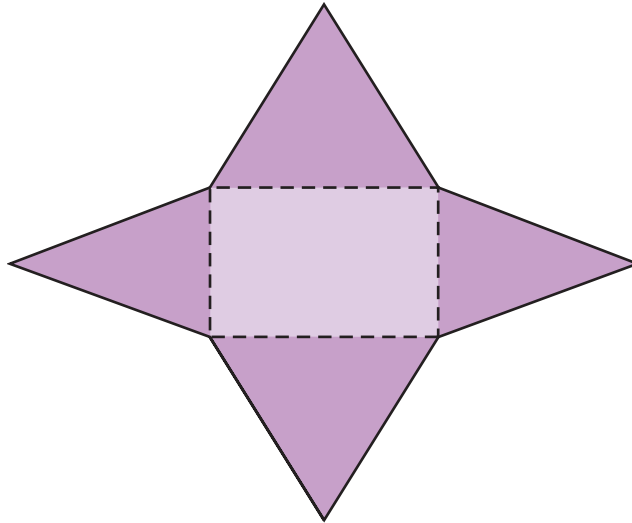


- A Obtuse
- B Right
- C Acute
- D Straight



18

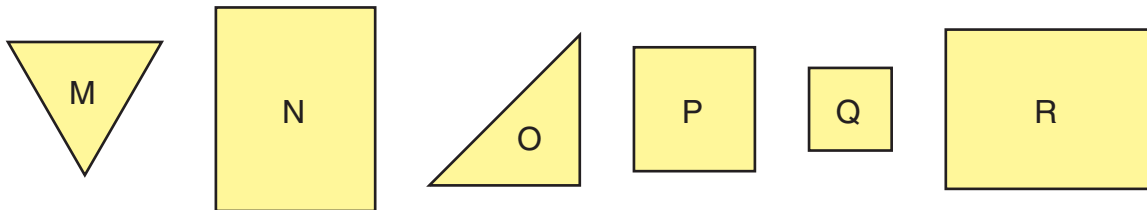
What three-dimensional figure could be made by folding the pattern along the dashed line segments?



- A Cube
- B Rectangular prism
- C Triangular pyramid
- D Rectangular pyramid

19

Which figures appear to be congruent?



O and M

A

N and P

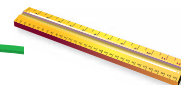
B

N and R

C

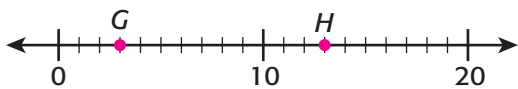
P and Q

D



20

Which is closest to the distance from point *G* to point *H* on the number line below?

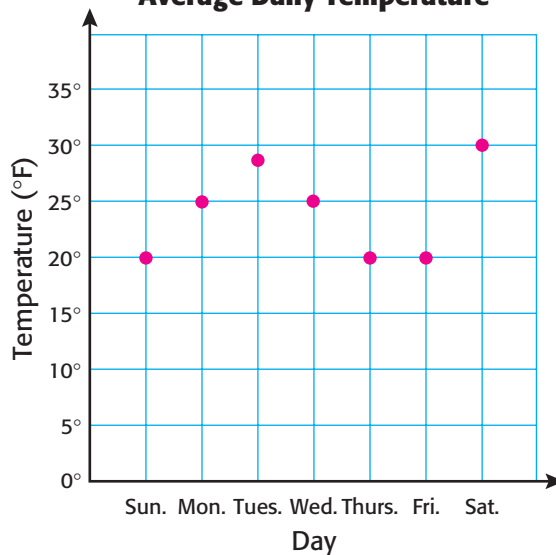


- A 3 units
- B 10 units
- C 13 units
- D 26 units

21

The graph below shows the average daily temperatures for the town of Jonesboro during a seven-day period.

Average Daily Temperature



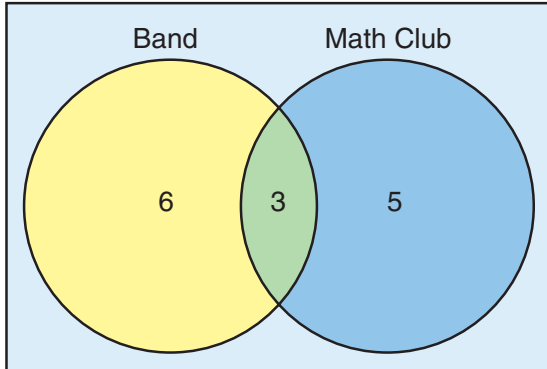
Which is closest to the difference in the average daily temperatures for Monday and Wednesday?

- A 0 °F
- B 5 °F
- C 10 °F
- D 25 °F



22

The Venn diagram below shows student participation in Band and Math Club.



Exactly how many students participate in Math Club?

- A 14
- B 8
- C 5
- D 3

23

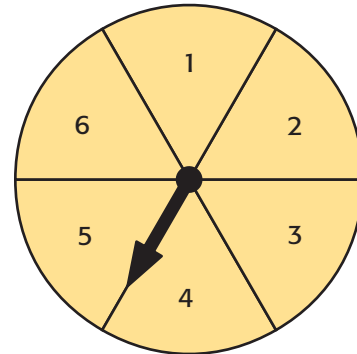
The high temperatures each day during the first week of August were 90° , 87° , 95° , 96° , 93° , 88° , and 88° .

What was the mean (average) high temperature for the week?

- 88° 90° 91° 96°
- A** **B** **C** **D**

24

The spinner below is divided into six sections of equal size.



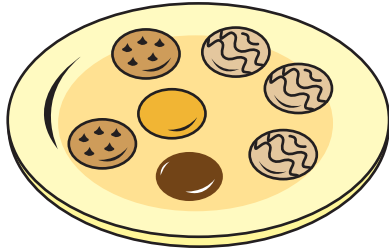
What is the probability that the arrow will land in a space labeled with an odd number?

- $\frac{1}{6}$ $\frac{2}{6}$ $\frac{3}{6}$ $\frac{4}{6}$
- A** **B** **C** **D**



25

Tim's mother put these cookies on a plate.



Which kind of cookie would Tim most likely get if he takes one without looking?



A



C



B



D

Answer Key with Assessment Objectives Identified

Item Number	Correct Answer	Assessment Objective
1	B	6.5.05 Read, write, recognize, and model decimals and their place values through thousandths.
2	C	6.5.10 Identify and locate whole numbers, halves, fourths, and thirds on a number line.
3	C	6.5.14 Model situations involving addition and subtraction of fractions.
4	B	6.5.16 Make estimates appropriate to a given situation with whole numbers, fractions, and decimals.
5	C	6.5.18 Solve problems involving proportional relationships, including unit pricing (e.g., one apple costs 20¢, so four apples cost 80¢).
6	D	7.5.01 Solve problems involving elapsed time in compound units.
7	B	7.5.01 Solve problems involving elapsed time in compound units.
8	A	7.5.03 Solve problems involving the perimeter and area of a triangle, rectangle, or irregular shape using diagrams, models, and grids or by measuring or using given formulas (may include sketching a figure from its description).
9	C	7.5.03 Solve problems involving the perimeter and area of a triangle, rectangle, or irregular shape using diagrams, models, and grids or by measuring or using given formulas (may include sketching a figure from its description).
10	B	7.5.07 Solve problems involving map interpretation (e.g., one inch represents five miles, so two inches represent ten miles).
11	B	8.5.04 Evaluate algebraic expressions with a whole number variable value (e.g., evaluate $m + m + 3$ when $m = 4$)
12	C	8.5.05 Demonstrate, in simple situations, how a change in one quantity results in a change in another quantity (e.g., input–output tables).
13	D	8.5.07 Represent problems with equations and inequalities.
14	A	8.5.08 Solve for the unknown in an equation with one operation (e.g., $2 + n = 20$, $n \div 2 = 6$).
15	B	9.5.07 Identify, describe, and predict results of reflections, translations, and rotations of two–dimensional shapes.
16	D	9.5.08 Identify and sketch parallel, perpendicular, and intersecting lines.

Item Number	Correct Answer	Assessment Objective
17	A	9.5.09 Identify and sketch acute, right, and obtuse angles.
18	D	9.5.11 Identify a three-dimensional object from its net.
19	C	9.5.13 Identify congruent and similar figures by visual inspection.
20	B	9.5.15 Determine the distance between two points on a horizontal or vertical number line in whole numbers.
21	A	10.5.01 Read, interpret, and make predictions from data represented in a pictograph, bar graph, line (dot) plot, Venn diagram (with two circles), chart/table, line graph, or circle graph.
22	B	10.5.01 Read, interpret, and make predictions from data represented in a pictograph, bar graph, line (dot) plot, Venn diagram (with two circles), chart/table, line graph, or circle graph.
23	C	10.5.03 Determine the mode, range, median (with an odd number of data points), and mean given a set of data or a graph.
24	C	10.5.04 Solve problems involving the probability of a simple event, including representing the probability as a fraction between zero and one.
25	C	10.5.04 Solve problems involving the probability of a simple event, including representing the probability as a fraction between zero and one.

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

Handwritten student work on grid paper:

$50¢ + 90¢ + 35¢ = \$1.75$
 for each day

My answer
 \$8.75

$$\begin{array}{r}
 \overset{3}{1}.75 \\
 1.75 \\
 1.75 \\
 1.75 \\
 1.75 \\
 + 1.75 \\
 \hline
 \$8.75 \text{ for five days}
 \end{array}$$

Please refer to the 2006 and 2007 ISAT sample books for additional short-response items and student samples (online at www.isbe.net/assessment/htmls/sample_books.htm).

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 8.5.02, “Construct and identify a rule that can generate the terms of a given sequence.”

1

The first two numbers in a pattern are 1 and 3.

1, 3, ____, ____, ____

- Explain a rule you could use to continue the pattern.
- Use your rule to find the next three numbers in the pattern.

Short-Response Student Sample 1A

My rule is multiply by 2
and add 1

1 , 3 , 7 , 15 , 31

My Answer

My next three numbers
were 7, 15 and 31 because
 3×2 is 6.

When I added 1 I got 7
and I kept the pattern going.

Short-Response Student Sample 1A

Rubric Score Point = 2

Note: The student provides the rule “multiply by 2 and add 1” to continue the pattern and correctly applies this rule to find the next three numbers: 7, 15, and 31.

Short-Response Student Sample 1B

The student has written the following on a grid:

Answer: Multiply by 3.

(Rule)

1, 3, 9, 27, 81

Below the numbers, arrows point from 1 to 3, 3 to 9, 9 to 27, and 27 to 81. Each arrow is labeled with "x3".

Short-Response Student Sample 1B

Rubric Score Point = 2

Note: The student provides the rule “Multiply by 3” to continue the pattern and correctly applies this rule to find the next three numbers: 9, 27, and 81.

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 10.5.05, “Apply the fundamental counting principle in a simple problem (e.g., How many different combinations of one-scoop ice cream cones can be made with 3 flavors and 2 types of cones?).”

2

The volleyball team is selling gift sets that include 1 type of soap and 1 type of shampoo. The chart below lists the different types of soap and shampoo available.

Soap	Shampoo
<ul style="list-style-type: none">• Bar• Liquid	<ul style="list-style-type: none">• Rose• Lilac• Melon• Vanilla

How many different combinations of 1 type of soap and 1 type of shampoo are possible for each gift set?

Show your work.

Short-Response Student Sample 2A

B = Soap bar	R = Shampoo Rose	B	L	R	Li	M	V	
L = Liquid	Li = Lilac	X		X				1
	M = Melon	X			X			2
	V = Vanila	X				X		3
		X					X	4
			X	X				5
			X		X			6
			X			X		7
			X				X	8

My answer
8

Short-Response Student Sample 2A

Rubric Score Point = 2

Note: The student provides the correct answer of 8 and shows work using an organized chart.

Short-Response Student Sample 2B

8 I did $4 \times 2 = 8$

Short-Response Student Sample 2B

Rubric Score Point = 2

Note: The student provides the correct answer of 8 and shows work of 4×2 .

Short-Response Student Sample 2C

The student's work is written on a grid background. It includes several tree graphs and a note:

- Bar Soap Tree Graph:** A central node labeled "Bar Soap" has four lines extending upwards and outwards to the letters R, L, M, and V.
- Liquid Soap Tree Graph:** A central node labeled "Liquid Soap" has four lines extending upwards and outwards to the letters R, L, M, and V.
- Melon Shampoo Tree Graph:** A central node labeled "Melon Shampoo" has two lines extending upwards and outwards to the words "Bar" and "Liquid".
- Vanilla Shampoo Tree Graph:** A central node labeled "Vanilla Shampoo" has two lines extending upwards and outwards to the words "Bar" and "Liquid".
- Rose Shampoo Tree Graph:** A central node labeled "Rose Shampoo" has two lines extending upwards and outwards to the words "Bar" and "Liquid".
- Lilac Shampoo Tree Graph:** A central node labeled "Lilac Shampoo" has two lines extending upwards and outwards to the words "Bar" and "Liquid".
- Note:** "I made tree graphs."
- Answer:** "My answer is 16" is circled in a hand-drawn oval.

Short-Response Student Sample 2C

Rubric Score Point = 1

Note: The student provides an incorrect answer of 16 but shows some correct work using tree graphs.

**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:	STRATEGIC KNOWLEDGE:	EXPLANATION:
4	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> identifies all important elements of the problem and shows complete understanding of the relationships among elements shows complete evidence of an appropriate strategy that would correctly solve the problem 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> no answer attempted 	<ul style="list-style-type: none"> no apparent strategy 	<ul style="list-style-type: none"> 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.

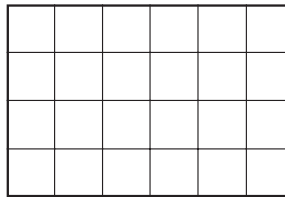
She also wants

$\frac{1}{2}$ 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	} $\frac{1}{2}$ blue
B	B	B	B	B	B	
G	G	G	G	G	G	← $\frac{1}{4}$ gray
R	R	R	R	R	R	← $\frac{1}{4}$ 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 2006 and 2007 ISAT sample books for additional extended-response items and student samples (online at www.isbe.net/assessment/htmls/sample_books.htm).

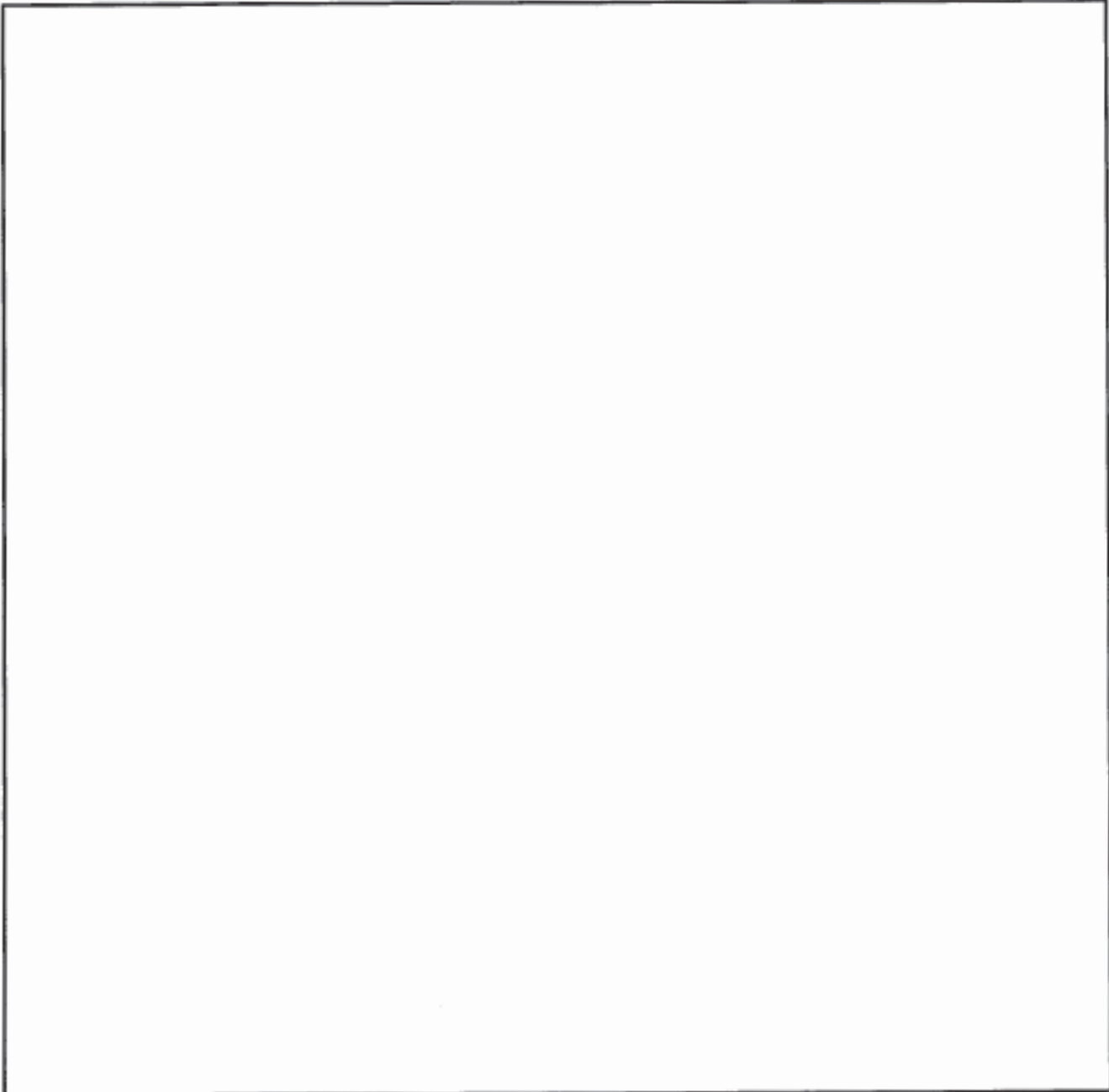
Mathematics - Session 3

Problem 1

DIRECTIONS

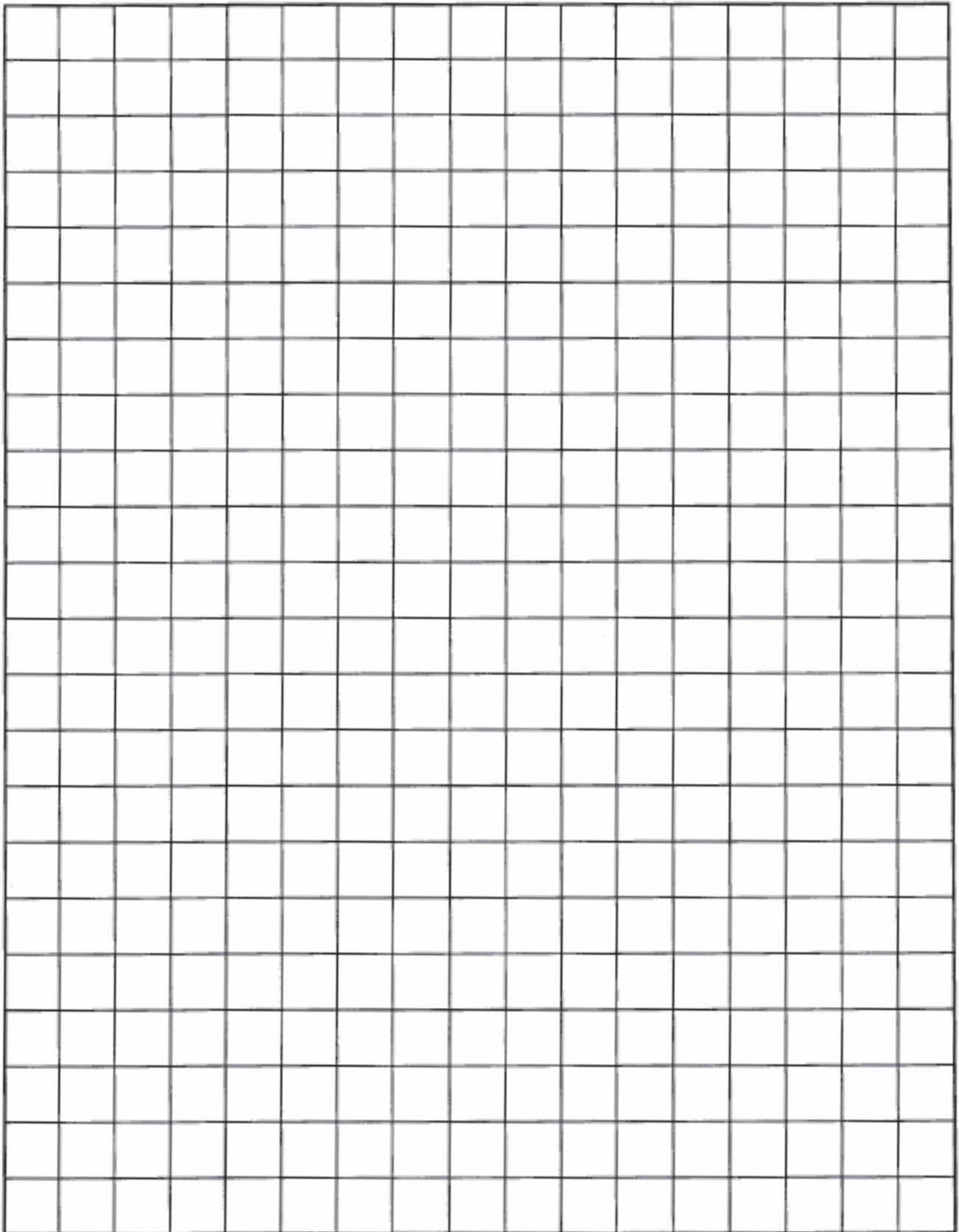
Make sure you

- 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 - Session 3

Problem 1-continued



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 6.5.14, “Model situations involving addition and subtraction of fractions.”

1

Five friends bought a total of 2 pizzas. Each pizza was cut into 12 equal slices. The amount of one whole pizza each person ate is shown below.

Joe: $\frac{1}{2}$

Mary: $\frac{1}{4}$

Kim: $\frac{1}{6}$

Bill: $\frac{1}{3}$

Sue: $\frac{1}{4}$

How many slices of pizza were *not* eaten by these 5 friends?

Show all your work. Explain in words how you found your answer. Tell 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.

$$\begin{array}{r}
 24 = \text{whole} \\
 \text{Joe} = \frac{1}{2} = 6 \\
 \text{Mary} = \frac{1}{4} = 3 \\
 \text{Kim} = \frac{1}{6} = 2 \\
 \text{Bill} = \frac{1}{3} = 4 \\
 \text{Sue} = \frac{1}{4} = 3 \\
 \hline
 \begin{array}{r}
 1 \ 14 \\
 24 \\
 -18 \\
 \hline
 6
 \end{array}
 \end{array}$$

Answer

$\frac{1}{2}$ of one
pizza was
not eaten
by these
five friends.

Extended-Response Student Sample 1A Continued

First I took down the names of the five friends and what fraction they ate. Then I turned them into whole numbers, so it would be easier to add them instead of adding fractions. Then I added the five whole numbers and got 18. Since it asked me to find out how many slices of pizza were not eaten by the five friends I subtracted 18 from the whole. (24) I got six which meant $\frac{1}{2}$ of one pizza was not eaten by the five friends.

Extended-Response Student Sample 1B

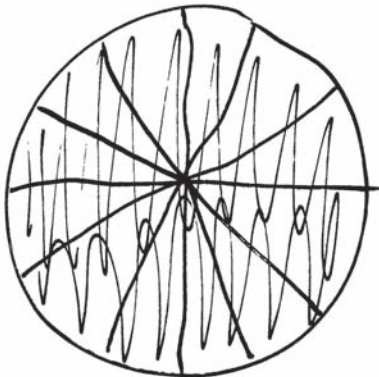
DIRECTIONS

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.

$$\text{Joe} = \frac{1}{2} \quad \text{Mary} = \frac{1}{4} \quad \text{Kim} = \frac{1}{6}$$

$$\text{Bill} = \frac{1}{3} \quad \text{Sue} = \frac{1}{4}$$



$$\frac{6}{12} = \frac{1}{2}$$



Extended-Response Student Sample 1B Continued

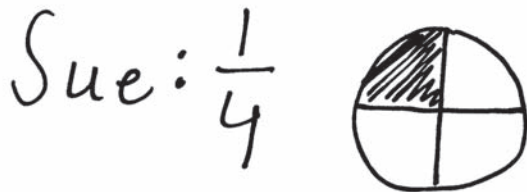
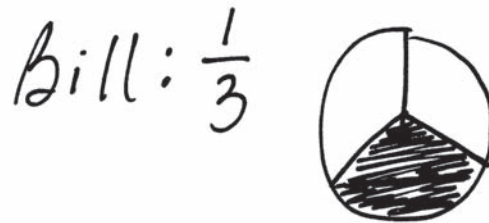
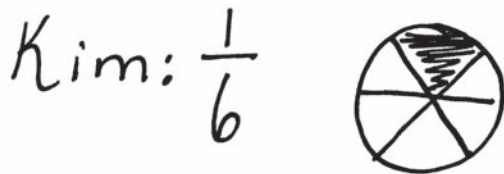
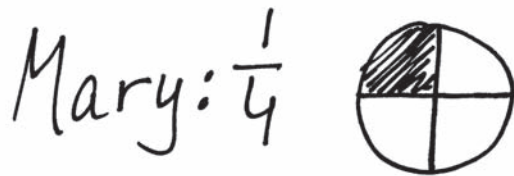
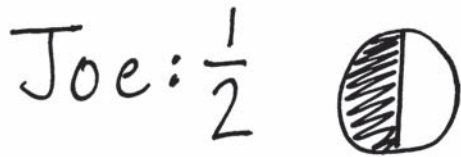
First I made 2 models of the pizza, then I made all the fractions the friends ate into a common denominator which is 12. I then shaded the parts they have eaten then I counted the parts they didn't eat out of the 12 slices of the second pizza. It was 6 out of 12, but simplified is $\frac{1}{2}$, so my final answer was that they didn't eat $\frac{1}{2}$ a pizza.

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.



Extended-Response Student Sample 1C Continued

First, I drew a picture of how many slices of pizza did Joe eat - he ate $\frac{1}{2}$. I drew the picture because I needed to figure out how many pizzas were not eaten by the 5 friends.

Next, I drew a picture of how many slices of pizza did Mary, Kim, Bill, and Sue ate. I drew the picture because I had to find out what was the amount of pizzas that were NOT eaten by the 5 friends.

Finally, I figured my answer by subtracting $12 - 5 = 7$ pizzas. The #12 came from the number of pizzas, the #5 came from the pizzas that were eaten.

Scoring Guide for “Pizza for Friends”

To solve this problem, the student must determine the amount of pizza not eaten by five friends who shared two whole pizzas. Answers of six slices or half of one whole pizza were accepted.

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 correctly determines the number of pizza slices eaten by each friend and correctly determines the number of slices not eaten by the friends (“I got six which meant $\frac{1}{2}$ of one pizza was not eaten by the five friends”).	The response shows complete evidence of an appropriate strategy that correctly solves this problem. The student correctly changes each friend’s fractional amount of pizza into the number of slices eaten ($Joe = \frac{1}{2} = 6 \dots$), adds the number of slices together, and subtracts the number of slices eaten from the total number of slices in both pizzas ($24 - 18 = 6$).	The response provides a complete written explanation of the solution process by clearly explaining <u>what</u> was done and <u>why</u> it was done (“I took down the names of the five friends and what fraction they ate. Then I turned them into whole numbers, so it would be easier to add them instead of adding fractions”).

Extended-Response Student Sample 1B

MATHEMATICAL KNOWLEDGE	STRATEGIC KNOWLEDGE	EXPLANATION
4	4	2
The response shows complete understanding of the problem’s mathematical concepts and principles. The student draws two pizzas, correctly shades the number of pizza slices eaten by the friends, and determines the portion of pizza left uneaten (“they didn’t eat $\frac{1}{2}$ a pizza”).	The response shows complete evidence of an appropriate strategy that correctly solves this problem. The student provides a diagram of each pizza to show the correct total number of slices present (2 pizzas each divided into 12 slices) and shades the correct number of slices that have been eaten by the friends. The student counted the unshaded pieces to determine the uneaten portion.	The response provides some written explanation of the solution process by explaining only <u>what</u> was done (“I made 2 models of the pizza...I made all the fractions the friends ate into a common denominator...I then shaded the parts they have eaten...I counted the parts they didn’t eat”).

Extended-Response Student Sample 1C

MATHEMATICAL KNOWLEDGE	STRATEGIC KNOWLEDGE	EXPLANATION
2	2	3
The response shows some understanding of the problem's mathematical concepts and principles by correctly modeling the fractional portion each friend ate.	The response identifies some of the problem's important elements and shows some evidence of a strategy for solving the problem. However, the student subtracts the total number of friends (5) from the total number of slices in one pizza (12) to determine the number of slices left uneaten, which shows a limited understanding of the relationship among elements.	The response addresses what was done and begins to address why (<i>"I drew a picture...I figured my answer by subtracting...The #12 came from the number of pizzas, the # 5 came from the pizzas that were eaten"</i>).