

Selected-Response Illustrative Items

Levels 10–14

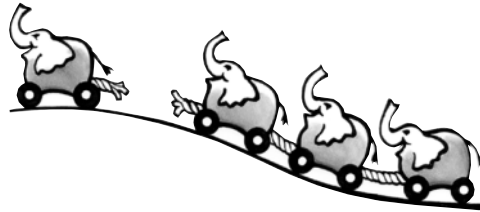
12 Operation Concepts

Most items in this objective require the student to relate situations to operations and mathematical representations. Other items require the student to relate operations to each other and to recognize and use the properties of operations.

(Examiner reads directions aloud to students.)

Four carts were on top of a hill. The rope broke and three carts rolled downhill. Find the number sentence that tells how many carts were left on top of the hill.

1



$4 - 3 = 1$



$3 + 1 = 4$



$4 + 1 = 5$



$3 - 1 = 2$



15 Data Analysis, Statistics, and Probability





This item is typical of data analysis items at the lower levels. The student identifies and translates data into a form that helps answer a question. In other items, the student might make inferences from information, and model data by putting it into graphic form or translating it into a different format.

(Examiner reads directions aloud to students.)

The tally chart shows the snacks the students in Mr. Hansen's class brought to share. Look at the chart. What kind of snack was brought by the most students?

2

TALLY CHART

Raisins	Peanuts	Popcorn	Chips
			



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16 Patterns, Functions, Algebra

Items in this objective target pattern recognition and generation and the use of patterns to solve problems. In this item, the student demonstrates the ability to recognize a pattern by modeling it in a more abstract format.

(Examiner reads directions aloud to students.)

Look at the pattern Molly made with the snacks. Which of the letter patterns below is the same kind of pattern as Molly's?

3



- A B A B A B A B
- A B C A B C A B
- A A B B A A B B
- A B C C A B C C

10 Number and Number Relations

This type of item measures the student's understanding of place value and numbers in context. This objective covers number concepts, relationships, properties, and number theory. This objective includes items that measure problem-solving applications of cardinal and ordinal numbers, money and other number systems, equivalent representations of numbers, fractional parts, and properties of numbers.

4 Look at the chart below.

WATERFALLS OF THE WORLD	
Waterfall	Height (in meters)
King George VI	488
Krimmler	400
Ribbon	491
Upper Yosemite	436

Which waterfall is the highest?

- King George VI
- Krimmler
- Ribbon
- Upper Yosemite

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Directions Nick and Nora are going to mail some postcards. Look at the prices shown in the picture. Then do Numbers 5 and 6.



Postcard 50¢



Stamp 20¢

11 Computation and Numerical Estimation

Items of this type present problems in a realistic context. In this item, the student identifies the applicable data and operation and then performs quick mental computations to find the solution. Concepts in the objective also include estimating and determining the reasonableness of results.

5 Nora bought 5 postcards. How much did she pay for the postcards?

- A** \$1.00
- B** \$1.50
- C** \$2.00
- D** \$2.50

17 Problem Solving and Reasoning

In this objective, students must often integrate skills from different objectives to solve a problem. Here, students determine what operations are needed to solve the problem, perform the operations, and then use mathematical reasoning to solve the problem.

6 Nick wants to send postcards to as many of his friends as he can. He has \$3.00. For every postcard he buys, he also needs to buy a stamp. What is the greatest number of postcards with stamps that Nick can buy?

- | | |
|------------|------------|
| F 3 | H 5 |
| G 4 | J 6 |

Selected-Response Illustrative Items

Levels 10–14

13 Measurement

This item is typical of measurement items at the lower levels where the student is asked to use measurement tools and various units of measure. In this case, the student uses a punch-out ruler provided with the test. Concepts in the objective also include measurement vocabulary, the relationships of measurable attributes, and an introduction to measurement skills (e.g., perimeter, time, and area).

7



Use the centimeter side of your ruler to help you solve this problem.

These leaves are for a science project. How long is the longest leaf?



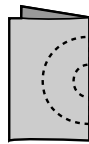
- 2 centimeters
- 5 centimeters
- 6 centimeters
- 8 centimeters

14 Geometry and Spatial Sense

The focus of this item is on visualization and spatial reasoning. Shape and symmetry recognition are measured by asking the student to correlate one shape with another. Spatial sense, two- and three-dimensional shape recognition, geometric relationships, and the observation of physical properties are also measured by items in this objective.

8

Marie folded this paper in half and cut along the dotted lines. What letter did she cut out?









Selected-Response Illustrative Items

Levels 15–18

Directions

The students at Greg’s school raised money to help pay for school projects. The charts show how the money was raised and how it was spent. Study the charts. Then do Numbers 1 through 3.

How Money Was Raised

Activity	Amount
Car Wash	\$ 750
Flea Market	\$2500
Used Book Sale	\$ 750

How Money Was Spent

Project	Amount
Field Trips	\$1500
Computer Lab	\$ 900
Band Equipment	\$1600

10 Number and Number Relations

Items of this type measure the student’s ability to recognize and use various number types. Concepts in the objective also include number properties, divisibility, multiples, factors, number systems, and general number theory. In this item, the student applies number concepts to a real-life situation.

- 1** Which of these represents the part of the total money raised that was spent for field trips?

- A** 37.5%
- B** $\frac{2}{5}$
- C** 0.15
- D** five-eighths

12 Operation Concepts

This item measures the student’s understanding of operational procedure within the context of a data analysis problem. At the middle levels, this objective includes properties of operations, operational order, and applications.

- 2** The students found 500 items to sell at the Flea Market. Everything was sold. How would you find the average price of each object sold?

- F** divide 500 by 2500
- G** multiply 500 by 2500
- H** divide 4000 by 500
- J** divide 2500 by 500

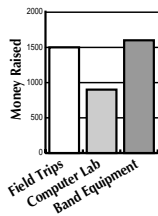
Selected-Response Illustrative Items

Levels 15–18

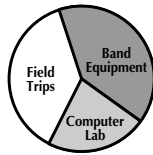
15 Data Analysis, Statistics, and Probability

By the middle levels, data analysis items in the Mathematics test measure the student's ability to interpret the purpose of a data presentation and to design data presentations for specific uses. In this item, the student determines what type of graph is best for a given purpose. Other items in the objective measure procedural knowledge and applications of statistical analysis and probability.

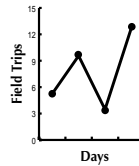
- 3 Greg is designing a graph to show what portion of the total money raised will be spent on band equipment this year. Which of these is the best type of graph for him to use?



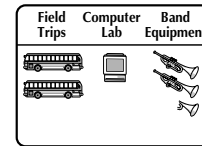
A



B



C



D

11 Computation and Numerical Estimation

By Grade 5, the student is expected to estimate and mentally compute different types of numbers both in and out of the mathematics classroom. In this item, the student is required to recognize and use numerical relationships in estimating the solution to an everyday problem.

- 4 Margot's shopping list shows the prices of all the things that she bought. She paid no added tax. Which of these is the least amount of money that Margot could have given the clerk to pay for her purchases?

- F \$10.00
 G \$15.00
 H \$20.00
 J \$25.00


Shopping List	
bread	\$1.69
cereal	\$2.29
apples	\$0.99
lettuce	\$0.89
rice	\$1.19
milk	\$1.89
meat	\$3.99
peas	\$0.39

Selected-Response Illustrative Items

Levels 15–18

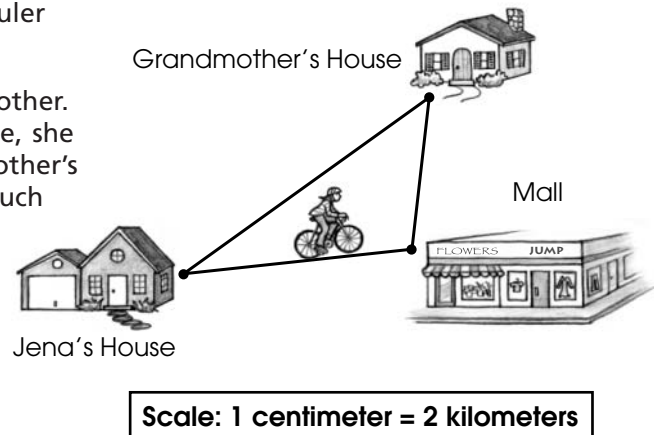
13 Measurement

Measurement items at these levels may involve determining the appropriate measurement tool or unit, direct and indirect measurement (using a ruler, formulas, or scale drawings), and rate. In this item, the student integrates the use of a ruler, a scale, and problem-solving techniques in a real-life context.

- 5**  Use the centimeter side of your ruler to help you solve this problem.

Jena rode her bike to visit her grandmother. On the way to her grandmother's house, she stopped at the mall. From her grandmother's house, she rode straight home. How much shorter was the ride home?

- A** 1 kilometer
B 2 kilometers
C 4 kilometers
D 8 kilometers

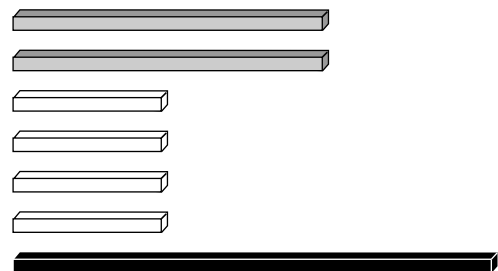


14 Geometry and Spatial Sense

This item, typical of those in the objective, measures the student's understanding of the definition of a figure through its geometric attributes. The student must deduce the answer by using spatial logic as well as geometric knowledge.

- 6** Mary wants to make a trapezoid using some of these sticks by joining them at their ends. Which set of sticks could she use?

- F** 1 gray, 1 black, and 2 white
G 1 gray, 1 black, and 1 white
H 2 gray and 2 white
J 4 white



Selected-Response Illustrative Items

Levels 15–18

16 Patterns, Functions, Algebra

This item measures the student's ability to identify an algebraic equation related to a word problem. At the middle levels, items in this objective may involve using pattern recognition to solve problems, connecting functions to patterns, or modeling situations by algebraic expressions (e.g., manipulating measurement formulas) or equations.

- 7** One of the world's largest dinosaurs was the *brontosaurus*, which weighed about 45 tons. The world's smallest dinosaur was the *compsognathus*, which weighed about 15 pounds.

Which of the equations below describes the difference in weight of the two dinosaurs?

$$1 \text{ ton} = 2,000 \text{ pounds}$$

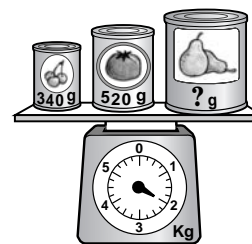
- A** $(45 \times 2,000) - 15 = d$
- B** $(15 \times 2,000) - 15 = d$
- C** $\frac{2,000}{15} + 45 = d$
- D** $15 \times 2,000 = d$

17 Problem Solving and Reasoning

Items for this objective commonly present non-routine problems using content and context from other objectives. This item measures the student's ability to combine knowledge of measurement, data analysis, and algebra to formulate and use a multi-step strategy that leads to the correct answer.

- 8** How much does the largest can on the scale weigh?

- F** 860 grams
- G** 1,060 grams
- H** 1,140 grams
- J** 2,860 grams



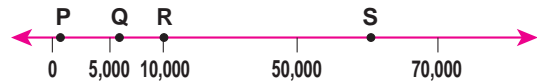
Selected-Response Illustrative Items

Levels 19–21/22

10 Number and Number Relations

At the upper levels, items in this objective measure the student's readiness to use numbers that have special applications in other content areas: exponents, scientific notation, irrational numbers, pi, and imaginary numbers. This item assesses the student's number sense and understanding of exponents.

- 1** Which of these points on the number line represents 6×10^3 ?



- A** Point P
B Point Q
C Point R
D Point S

11 Computation and Numerical Estimation

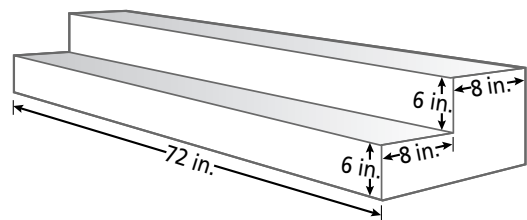
Items in this objective measure the student's ability to apply operations to square roots, integers, and exponential and algebraic expressions. Some items are presented in a real-life context.

- 2** What is the best estimate of $5\sqrt{3} + \sqrt{3}$?

- F** 7
G 10
H 15
J 20

13 Measurement

Measurement items at the high school levels relate to mathematical situations and often require the student to use indirect measurement, rate and scale, and algebraic and geometric principles to find the dimensions of solid figures. Many of the items in the objective are set in contexts of other content areas, such as science, social studies, or manual arts.

3

How many cubic feet of concrete will be needed to build this set of stairs?

- A** 4 cubic feet
B 6 cubic feet
C 3,456 cubic feet
D 6,912 cubic feet

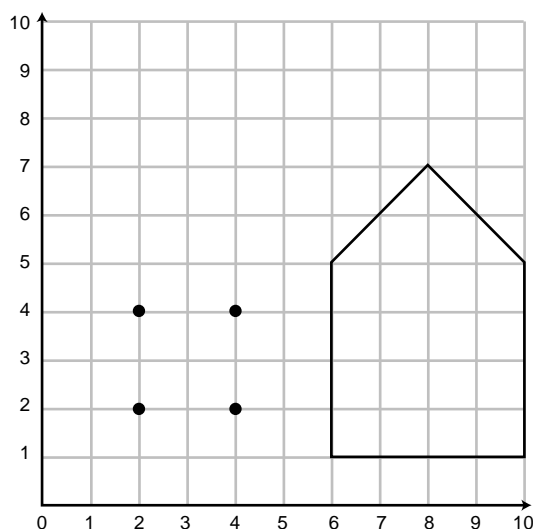
Selected-Response Illustrative Items

Levels 19–21/22

14 Geometry and Spatial Sense

Items in this objective measure the student's understanding of the theoretical basis of geometric principles. The student is required to generalize from observations; propose, prove, and argue theories; apply geometric principles such as congruence, similarity, transformations, and coordinate graph modeling in order to solve problems.

- 4** Jeremy drew one pentagon and the first 4 points for a second pentagon.



Which of these could be the fifth point of a pentagon that is similar to the first?

- F** (5, 4)
- G** (1, 2)
- H** (3, 6)
- J** (3, 1)

Selected-Response Illustrative Items

Levels 19–21/22

15 Data Analysis, Statistics, and Probability

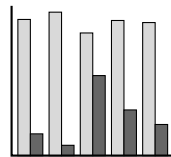
This item requires the student to recognize the best representation of given data. Other items in the objective at the high school levels measure the student's ability to identify statistical bias and error and to demonstrate knowledge of the principles of statistics and probability.

- 5 Which of these graphs most clearly shows a comparison of the relative high and low temperatures among the cities?

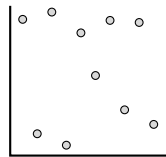
EXTREME TEMPERATURES		
City	High	Low
Portland	107°F	-3°F
Omaha	114°F	-14°F
Honolulu	94°F	53°F
San Francisco	106°F	20°F
Charleston	104°F	6°F



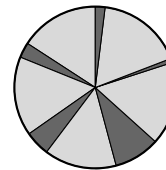
A



B



C



D

Selected-Response Illustrative Items

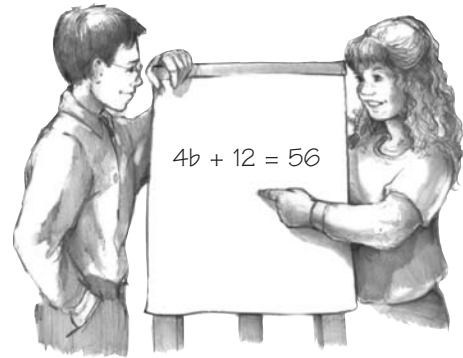
Levels 19–21/22

16 Patterns, Functions, Algebra

At the high school levels, algebra problems measure the student's understanding of basic procedures and ability to apply algebraic principles. This item focuses on a basic procedure for solving for an unknown.

- 6** Alex and Jessie were working on the equation shown to the right. Jessie plans to subtract 12 from both sides, then divide by 4. Alex plans to multiply both sides by 4, then add 12. Which of these statements is true?

- F** Only Jessie has a correct strategy.
 G Only Alex has a correct strategy.
 H Both Jessie and Alex have a correct strategy.
 J Neither Jessie nor Alex has a correct strategy.



17 Problem Solving and Reasoning

In this item, the student is required to devise a strategy using principles from measurement, geometry, and algebra as part of the problem-solving process. A reference card supplying standard equations is provided with the test.

- 7** Joey invented a light that is powered by the rotation of his 26-inch diameter bicycle tire. Every time the tire makes a full turn, a wire touches a battery contact and the light flashes one time. About how many times will the light flash if Joey rides 50 yards?

(use $\pi = 3.14$)

- A** 2 times
 B 7 times
 C 22 times
 D 82 times

