



National Evaluation Series™

# NES

## PROFILE

**Elementary Education Subtest II (103)**

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# NES Profile: Elementary Education Subtest II (103)

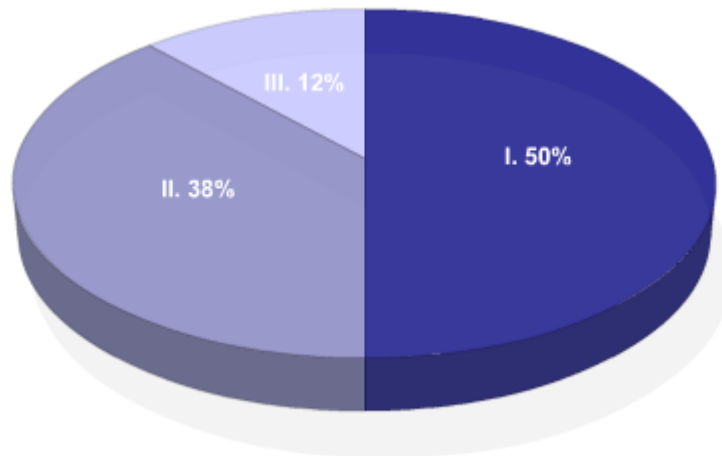
## Overview

The resources below provide information about this test, including the approximate percentage of the total test score derived from each content domain. The complete set of the content domains, the test framework, is provided here and contains all of the competencies and descriptive statements that define the content of the test.

Select any of the content domains presented in the chart or its key to view:

- » the test competencies associated with each content domain,
- » a set of descriptive statements that further explain each competency;
- » a sample test question aligned to the competency.

<b>Test Field</b>	Elementary Education Subtest II (103)
<b>Test Format</b>	Multiple-choice questions
<b>Number of Questions</b>	Approximately 75
<b>Test Duration</b>	Up to 1 hour and 45 minutes
<b>Reference Materials</b>	None required



Key	Approximate Percentage of Test	Content Domain	Range of Competencies
I.	50%	I. Mathematics	0001–0004
II.	38%	II. Science	0005–0007
III.	12%	III. The Arts, Health, and Fitness	0008

## Content Domain I: Mathematics

### Competencies:

**0001** Understand concepts of numeration, number sense, and mathematical operations.

### Descriptive Statements:

- » Demonstrate knowledge of properties of numbers and number systems, operations, place value, rounding, comparing and ordering numbers, and equivalent representations of numbers.
- » Use a variety of models to represent numbers and operations.
- » Demonstrate knowledge of prime and composite numbers, divisibility rules, least common multiple, and greatest common factor.
- » Solve problems involving integers, rational numbers, fractions, decimals, ratios, proportions, percent, exponents, and scientific notation.
- » Apply knowledge of basic concepts of probability, including the use of simulations and counting procedures to estimate probabilities.
- » Demonstrate knowledge of computation, including the use of mental math and estimation.

### Sample Item:

**A student has a bag containing 96 hard candies and wants to give an equal number of them to each of 6 friends. Which of the following mathematical operations would be most useful for the student to use when determining how many candies each friend should receive?**

- A. addition
- B. division
- C. subtraction
- D. multiplication

### Correct Response and Explanation

**B.** This question requires the examinee to demonstrate knowledge of operations. The operation of division can be defined as partitioning a certain number of items into a specified number of groups in order to determine how many items each group contains.

**0002** Understand mathematical reasoning and problem solving, communication and representation, and data analysis.

### Descriptive Statements:

- » Demonstrate knowledge of mathematical reasoning and proofs.
- » Apply knowledge of various strategies and procedures used in problem-solving situations.
- » Translate between verbal descriptions and mathematical language and symbols to express quantitative relationships and to solve problems.

- » Apply knowledge of a variety of diagrams, models, charts, manipulatives, and other tools used to represent mathematical concepts and real-world situations.
- » Apply knowledge of statistical measures (e.g., mean, median, mode, range, frequency distribution) to describe and analyze data.
- » Apply knowledge of data interpretation and of methods for displaying data in a variety of formats.

### Sample Item:

A member of a local environmental group uses a spreadsheet to track the amount of paper, plastic, glass, and aluminum a community recycles each month, as shown below. The spreadsheet software can automatically create several types of graphs from the data. Which of the following types of graphs would be most appropriate for visually representing the percentages of the various recycled materials relative to the total amount recycled?

	A	B	C
1	<b>Recycled Material</b>	<b>Number of Pounds</b>	<b>Percentage of Total</b>
2	Paper	1380	69%
3	Plastic	280	14%
4	Glass	240	12%
5	Aluminum	100	5%

- A. circle graph
- B. line graph
- C. bar graph
- D. scatter plot

### Correct Response and Explanation

A. This question requires the examinee to apply knowledge of graphs to represent real-world situations. A circle graph is used to compare the parts of a whole and the area of each sector is proportional to the fraction or percentage of the area of the circle that it represents.

**0003** Understand basic concepts of patterns, algebra, and functions.

### Descriptive Statements:

- » Recognize patterns in numbers, shapes, and data and ways to use variables, expressions, equations, and inequalities to communicate quantitative relationships.
- » Apply knowledge of patterns to model real-world situations and make predictions.
- » Recognize types and properties of functions.
- » Use algebraic concepts to solve equations and real-world problems.

Sample Item:

[0, 1, 5, 14, 30, 55, . . . ]

Which of the following numbers would appear next in the patterned sequence above?

- A. 64
- B. 81
- C. 91
- D. 121

**Correct Response and Explanation**

**C.** This question requires the examinee to recognize patterns in numbers. In the pattern given, the differences between the successive terms in the pattern are 1, 4, 9, 16, and 25, which are the squares of the first 5 integers. To determine the next term, the square of 6, or 36, must be added to 55 to get 91.

**0004** Understand basic concepts of geometry and measurement.

Descriptive Statements:

- » Recognize types and properties of lines, angles, and two- and three-dimensional shapes, including symmetry, congruence, and similarity.
- » Solve problems involving perimeter, area, volume, geometric transformations, measurement, scale, and coordinate systems.
- » Use geometric concepts to solve real-world problems.
- » Identify and use appropriate measurement units, tools, and measurement techniques in various situations.
- » Convert measurements within the metric and customary systems.

Sample Item:

**Two rectangles, A and B, are similar. Rectangle A has a length of 100 centimeters and a width of 50 centimeters. If the area of rectangle B is 200 square centimeters, what is its perimeter?**

- A. 40 centimeters
- B. 60 centimeters
- C. 80 centimeters
- D. 120 centimeters

**Correct Response and Explanation**

**B.** This question requires the examinee to solve problems involving perimeter. If rectangles A and B are similar, the length and width of rectangle B must be proportional to the length and width of rectangle A. In addition, the product of the length and width of rectangle B must equal 200 square centimeters. If the length of rectangle B is 20 centimeters and its width is 10 centimeters, both of these conditions are met. Therefore, the equation representing the perimeter of rectangle B is  $20 + 10 + 20 + 10 = 60$ .

## Content Domain II: Science

### Competencies:

**0005** Understand fundamental concepts of the life sciences.

### Descriptive Statements:

- » Apply knowledge of the characteristics and life processes of plants, animals, and other living organisms.
- » Demonstrate knowledge of the multiple ways in which organisms are ordered and classified and how species change over time.
- » Recognize the life cycles and reproductive patterns of common organisms and the application of basic principles of heredity to the transmission of traits from one generation to the next.
- » Analyze the interactions between organisms and their environment and the characteristics of and interactions between populations of organisms in an ecological community.

### Sample Item:

**The waxy layer covering the exoskeleton of an insect is an adaptation that primarily aids in which of the following functions?**

- A. absorbing oxygen
- B. avoiding detection by predators
- C. minimizing water loss
- D. blocking ultraviolet radiation

### Correct Response and Explanation

**C.** This question requires the examinee to apply knowledge of the characteristics of living organisms. In terrestrial insects, the waxy layer of the exoskeleton acts as a waterproof barrier that keeps water in and prevents insects from becoming dehydrated.

**0006** Understand fundamental concepts of the physical, Earth, and space sciences.

### Descriptive Statements:

- » Demonstrate knowledge of the composition, structure, and properties of matter and the difference between physical and chemical changes in matter.
- » Recognize the effects of various types of forces on objects in given situations and the properties and uses of simple machines and tools.
- » Apply knowledge of the properties of light, sound, electricity, and magnetism.
- » Recognize forms of energy, energy sources, and processes of energy transfer and transformations.
- » Recognize types and characteristics of objects in the solar system and universe and the effects of the relative positions and motions of the sun, Earth, and moon.
- » Apply knowledge of the composition, structure, landforms, and processes of Earth's geologic system and how it interacts with other Earth systems.

- » Apply knowledge of the composition, structure, and processes of Earth's hydrologic and atmospheric systems, including weather and climate, and how these systems interact with each other and with Earth's geologic system.
- » Identify types and characteristics of renewable and nonrenewable natural resources, their uses, and their management.

Sample Item:

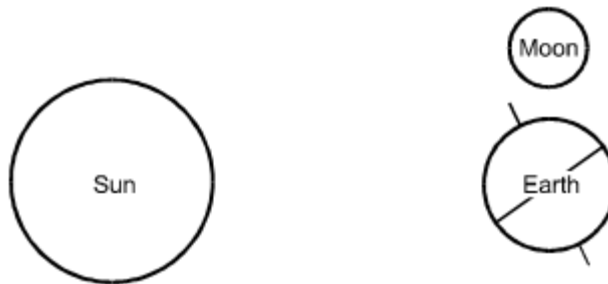
Which of the following shows the relative positions of the sun, Earth, and moon during a solar eclipse?

A.



Note: Not to Scale

B.



Note: Not to Scale

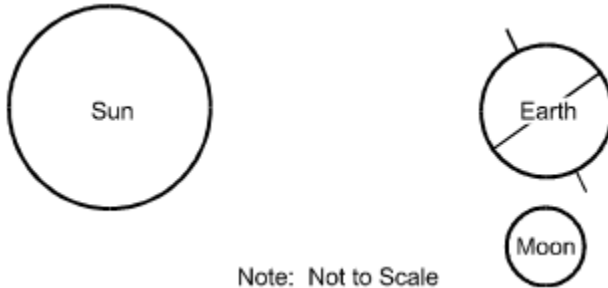


C.



Note: Not to Scale

D.



Note: Not to Scale

**Correct Response and Explanation**

**A.** This question requires the examinee to recognize the effects of the relative positions of the sun, Earth, and moon. A solar eclipse can only occur when the moon moves directly between the sun and Earth, casting its shadow over part of Earth.

**0007** Understand the nature of science and the processes of scientific inquiry.

**Descriptive Statements:**

- » Recognize the basic tenets, goals, and values of science and how scientific knowledge develops and changes over time.
- » Recognize connections between and unifying themes among the life sciences, physical sciences, and Earth and space sciences, including the relationship between form and function, the nature of cycles and systems, the conservation of energy and matter, the use of models, and ways to organize and classify information.
- » Apply knowledge of the scientific method, including the design of scientific investigations, systematic observation, and controlled experimentation.
- » Apply knowledge of strategies for collecting, measuring, recording, summarizing, analyzing, and representing scientific data.
- » Analyze the relationships between science, mathematics, technology, and society.

Sample Item:

**The relationship between form and function is a common theme in science. For example, the specific type of chemical bonding between copper atoms is what is responsible for the high electrical conductivity and ductility of this metal. Which of the following is another example of this relationship?**

- A. the expression of human genes in bacterial cells
- B. the differences in weathering patterns caused by wind and water
- C. the shape of plant leaves in the understory of a tropical rain forest
- D. the jigsaw puzzlelike characteristics of the continents

**Correct Response and Explanation**

**C.** This question requires the examinee to recognize the relationship between form and function. Plant leaves in the understory of a tropical rain forest are usually large in order to capture as much sunlight as possible, and they often have drip tips to help excess precipitation run off.

## Content Domain III: The Arts, Health, and Fitness

### Competencies:

**0008** Understand basic elements of the arts and fundamental concepts of health and fitness.

### Descriptive Statements:

- » Identify basic terms and elements associated with music, drama, dance, and the visual arts.
- » Recognize basic techniques, tools, and processes for creating and performing works in the various arts.
- » Demonstrate knowledge of the ways the arts can be used as a form of communication, self-expression, and social expression and the connections between the art disciplines, other disciplines, and everyday life.
- » Identify the basic structures and functions of the human body, common diseases and illnesses and how to prevent or treat them, and nutritional principles that influence health and development.
- » Apply knowledge of principles, practices, and skills for maintaining physical, mental, and emotional health and safety and for reducing health risks.
- » Identify the components of health-related fitness and appropriate activities to promote the development of locomotor, nonlocomotor, manipulative, and perceptual awareness skills in children.

### Sample Item:

**In dramatic literature, which of the following is a common characteristic of plays that are classified as tragedies?**

- A. a story line that ridicules a situation in society for the purpose of improving it
- B. stock characters who represent particular personality types
- C. a clear and unchanging view of right and wrong
- D. a main character who makes an error that leads to inevitable consequences

### Correct Response and Explanation

**D.** This question requires the examinee to identify basic terms associated with drama. Tragedy is a serious dramatic form that has a sorrowful or disastrous conclusion in which a central character suffers some misfortune that is logically connected to the character's actions.

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