

Middle School: Content Knowledge (0146)

Test at a Glance

Test Name	Middle School: Content Knowledge		
Test Code	0146		
Time	2 hours		
Number of Questions	120		
Format	Multiple-choice questions, nonprogrammable calculator use permitted		
	Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Literature and Language Studies	30	25%
	II. Mathematics	30	25%
	III. History/Social Studies	30	25%
	IV. Science	30	25%

About This Test

The Middle School: Content Knowledge test is designed to measure knowledge and higher-order thinking skills of prospective middle school teachers.

The 120 multiple-choice test questions focus on the four subject areas that are considered central to all education: literature and language studies, mathematics, history/social studies, and science. Test questions are arranged in the test book by subject area; an index on the back page of the test book lists the subject order and page locations.

This test may contain some questions that will not count toward your score.

Topics Covered

Representative descriptions of topics covered in each category are provided below. Within each content area, the approximate percentage of examination questions is shown for each topic.

I. Literature and Language Studies

Focus is on literature, language, and components of written and oral communication. Literature includes both expository and narrative texts and the written materials of all disciplines. Language Studies includes the processes of language development and the uses of language in written and oral communication. Questions allow examinees to demonstrate their knowledge and understanding of literature and language as well as their ability to think critically about relevant problems and to apply the principles of the language arts within diverse contexts.

- Literature (35%)
 - literary concepts, conventions, terminology
 - assumptions and conventions of primary literary genres, including children’s literature
 - social/historical contexts as they relate to literature
 - approaches to reading and interpreting literature
- Language and linguistics (30%)
 - basic stages of language development, including factors that enhance or inhibit this development
 - historical and cultural influences on the evolution of standard American English
 - principles of linguistics in analyzing various textual contexts
 - integration of language across disciplines
- Oral and written communication (35%)
 - application of communication skills to analysis and production of written text
 - application of communication skills to analysis of oral discourse
 - rhetorical conventions of narration, exposition, reflection, and argumentation
 - retrieval of information from print and nonprint sources
 - interpretation of the written reports of research

II. Mathematics

Focus is on the mathematical understandings that middle school teachers must have, the ability to communicate these understandings, and the ability to solve mathematical problems.

Because the emphasis is on assessing the examinee’s ability to reason logically, to use mathematical techniques in problem solving, and to communicate mathematical ideas effectively, examinees are not required to do much computation. *Examinees may use non-programmable calculators while taking the test; a basic four-function calculator will be adequate.*

The test questions do not require knowledge of advanced-level mathematics vocabulary but may require examinees to relate mathematics to real-life situations. Mathematics is conceptualized as an integrated field; therefore, a single problem may test several mathematical content areas.

Although few technical words are used in the test questions, terms such as area, perimeter, ratio, integer, factor, and prime number are used because it is assumed that these are commonly encountered in the mathematics that all examinees have studied.

- Number sense and numeration (20%)
 - understand the meaning/implication of number and number concepts as they relate to problem solving, using cardinal and ordinal numbers, place value, ordering of fractions, decimals, whole numbers
- Geometry (20%)
 - knowledge of relationships in both two and three dimensions
 - ability to draw inferences based on precepts/concepts of parallelism, perpendicularity, congruence and similarity, angle measures and polygons
- Measurement (5%)
 - knowledge and application of standard units of both the English and metric systems, nonstandard units, estimation, perimeter, area, volume, mass, weight, angle measure, time, temperature

- Algebraic concepts (10%)
 - recognize and apply algebraic concepts and properties
 - describe patterns by writing or identifying a formula
- Number theory (10%)
 - problem solving that demonstrates an understanding of prime and composite numbers, divisibility rules, least common multiple, greatest common divisor and set theory
- The real number system and its subsystems (20%)
 - solve real-world situational problems
 - work with both standard and alternate algorithms
- Probability and statistics (15%)
 - understand the organization, presentation, and interpretation of data in various forms
 - recognize valid and invalid inferences
 - solve basic problems
 - make predictions involving probability and statistics

III. History/Social Studies

Focus is on essential understanding of important historical events and issues and basic social science concepts. Because history and the social sciences are best seen as mutually enriching, most questions will require knowledge of both history and the social sciences.

Since critical thinking skills are integral to essential understandings, most questions will require the exercise of such skills. In many instances, examinees will be asked to utilize these skills in demonstrating an understanding of original documents, such as maps, charts, graphs, cartoons, and short quotations.

History: all questions in the History/Social Studies area require knowledge of history except for one question that has a non-historical perspective

- United States history (50%)
 - Native American civilizations
 - European exploration and colonization
 - the American revolution and the founding of the nation
 - growth of the new republic
 - the Civil War and Reconstruction: causes and consequences
 - industrialization of America
 - World War I: causes and consequences
 - post-World War I America
 - World War II: causes and consequences
 - post-World War II America

- World history (45%)
 - prehistory and the development of early civilizations
 - classical civilizations
 - development of world religions
 - feudalism in Japan and Europe
 - Chinese and Indian empires
 - sub-Saharan kingdoms and cultures
 - Islamic civilization
 - civilizations of the Americas
 - rise and expansion of Europe
 - European developments
 - nationalism and imperialism
 - twentieth-century ideologies and conflicts
- Nonhistorical perspective (5%)
 - social science questions not posed in historical context

Social Sciences: most questions in the History/Social Studies area require knowledge of social science as well as history. For those questions that require knowledge of both history and social science, the approximate percentages that require knowledge in each social science area are given below

- Government and politics (20%)
 - political concepts and theories
 - United States political system
- Geography (35%)
 - map and globe skills
 - physical geography
 - cultural geography
 - political geography
 - economic geography
 - regional geography
- Economics (25%)
 - basic economic concepts
 - government's role in the economy
- Anthropology and sociology (20%)
 - definitions, research methods, techniques of study
 - human culture, social organization
 - how cultures change

IV. Science

Focus is on the ability to demonstrate an understanding of scientific concepts, apply those concepts, identify problems, formulate and test hypotheses, design experiments, analyze and evaluate data, use both theoretical and practical models, and use instruments. Because science is viewed as an integrated field, a single question may assess understanding of several content areas.

- Biology (33–34%)
 - cellular biology: biologically important molecules, structure and function of cells and their organelles, energy sources and processes, and genes and gene function
 - biology of organisms: life forms, structure and function of organ systems, and basic principles of heredity
 - ecology, interrelationships in the biosphere: characteristics of ecosystems, energy flow in biological communities, and characteristics of biological communities
 - evolution: evolutionary mechanisms, evolutionary patterns, evidence for evolutionary change, and history of life as related to the geological timeline
- Geosciences (33–34%)
 - astronomy: the solar system and planetary systems, stars and galaxies, and cosmology
 - geology: earth materials, internal processes, landforms and external processes, and the history of the Earth and its life forms
 - meteorology: atmospheric composition and structure, atmospheric movement, and weather and climate
 - oceanography: biological, chemical, geological, and physical processes and characteristics
- Physical sciences (33–34%)
 - matter: characteristics, structure, and physical and chemical properties
 - reactions and interactions: kinetic theory, changes in state, chemical reactions, oxidation and reduction, acids and bases, catalysts, and chemical bonding
 - macromechanics: straight line, projectile, circular, and periodic motion, Newton’s laws of motion, gravity, weight, mass, and conservation laws
 - energy: sources and transformations, and heat
 - electricity and magnetism: static and current electricity, circuits, magnetism, and applications
 - wave phenomena: electromagnetic spectrum, mirrors, lenses, sound production, and applications
 - modern physics/nuclear chemistry: relativity, radioactivity, fusion, and fission

Sample Test Questions

The sample questions that follow illustrate the kinds of questions in the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.

Directions: Each of the questions or statements below is followed by four suggested answers or completions. Select the one that is best in each case.

I. Literature and Language Studies

1. (1) Early twentieth-century studies of spoken Native American languages proved otherwise.
- (2) That flexibility was evidenced, in part, by the complexity and range of Native American oral literature.
- (3) Linguists once believed that peoples without an elaborate written literature had no more than a few hundred words in their vocabulary.
- (4) Each language studied contained at least 20,000 words.
- (5) In addition to copiousness, the spoken languages were found by linguists to be as flexible as languages with a written tradition.

Which of the following represents the best ordering of the sentences above into a coherent paragraph?

- (A) 1, 2, 3, 4, 5
- (B) 3, 1, 4, 5, 2
- (C) 3, 2, 1, 5, 4
- (D) 5, 3, 2, 4, 1

Questions 2–4 are based on the following excerpt from *Thousand Pieces of Gold*, by Ruthanne Lum McCunn.

Polly laid her forehead against the cold pane of glass. Outside a meadowlark sang, its haunting melody reminding her of the three robins she had saved after Mr. Grostein’s cat had killed the birds’ mother.

At first, they were content to fly around her room, but soon they began pecking at the window, demanding to be let out. So Charlie built a cage for them, and Polly hung the cage on a tree outside. But their cries tore at her, and finally she opened the door, letting them fly where they pleased. Then one day Mr. Benson, the butcher, came to the saloon and handed her a cigar box with three stiff bodies crusted with blood.

He was sorry, he said. He knew how much the birds meant to her, and he had reprimanded his clerk severely. But the way they hovered, demanding scraps, had been annoying, and if she had kept them in the cage Charlie had made for them, his clerk would not have killed them.

Charlie had told her the same thing, and she had tried to explain why, even though she mourned the birds’ deaths, she did not regret leaving them uncaged. But he had not understood. Then how could she make him understand her own need to escape the cage that held her?

2. The central analogy presented in the passage suggests which of the following?
 - (A) Mr. Benson understood better than Charlie how Polly felt about the birds.
 - (B) Polly would prefer to be free, even if she suffered as a result.
 - (C) Polly had at one time been imprisoned but had managed to escape.
 - (D) Charlie was correct in believing that the birds were better off caged than free.
3. The narrative suggests that Polly feels her relationship with Charlie is
 - (A) new and fragile
 - (B) loving but argumentative
 - (C) caring but flawed
 - (D) frivolous and demeaning
4. Which of the following best describes Polly’s mood as it is presented in the passage?
 - (A) Hostile
 - (B) Self-recriminating
 - (C) Disinterested
 - (D) Pensive

5. ə abut ə kitten ər further a back ā bake ä cot, cart
 au out ch chin e less ē easy g gift i trīp ī life
 j joke ŋ sing ō flow ó flaw òi coin th thin th this
 ü loot ù foot y yet yü few yù furious zh vision

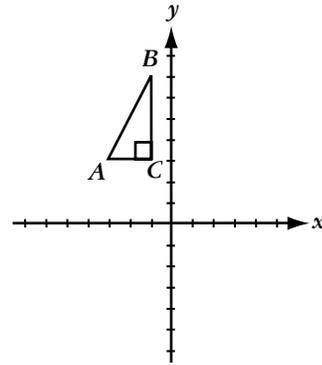
According to the pronunciation guide above, which of the following words would be represented as “tə-’päg-rə-fē”?

- (A) Telepathy
 - (B) Typographer
 - (C) Topography
 - (D) Telegraphic
6. Freewriting, brainstorming, clustering, and idea mapping are most important during which stage of the writing process?
- (A) Prewriting
 - (B) Drafting
 - (C) Revising
 - (D) Proofreading

II. Mathematics

7. Which of the following is a way to find 420 percent of 39.7?
- (A) $\frac{39.7}{42}$
 - (B) $(0.42)(39.7)$
 - (C) $(4.2)(39.7)$
 - (D) $(420)(39.7)$

8.



Which figure below results if right triangle ABC above is flipped (reflected) across the y-axis and then turned (rotated) clockwise about point C by 90 degrees?

- (A)
- (B)
- (C)
- (D)

9. If $a^3 \cdot b^2 \cdot a^4 \cdot b^3$ can be written as a^7b^5 , then $2^3 \cdot 3^4 \cdot 2^2 \cdot 3^3$ can be written as

- (A) $2^5 \cdot 3^7$
- (B) $4^5 \cdot 9^7$
- (C) 6^{12}
- (D) 36^{12}

10. In a certain office, the average (arithmetic mean) weekly salary of the 6 computer operators is \$367, and the average weekly salary of the remaining 4 office workers is \$382. What is the average weekly salary of the 10 office staff members?

- (A) \$370
- (B) \$373
- (C) \$375
- (D) \$377

11. On an achievement test taken by a large group of people, Bill scored at the 70th percentile with respect to the test-score distribution for the group. This information implies that

- (A) Bill got 70% of the test correct
- (B) 70 scores were lower than Bill's score
- (C) 30% of the scores were higher than Bill's score
- (D) Bill's score was approximately one standard deviation above the mean test score for the group

12. What is the units digit of 3^{43} ?

- (A) 1
- (B) 3
- (C) 7
- (D) 9

III. History/Social Studies

13.

ESTIMATED POPULATION OF AMERICAN COLONIES, 1630 AND 1750		
	1630	1750
New England		
White Inhabitants	1,796	349,029
Black Inhabitants	0	10,982
Middle Colonies		
White Inhabitants	340	275,723
Black Inhabitants	10	20,736
Southern Colonies		
White Inhabitants	2,450	309,588
Black Inhabitants	50	204,702
Total		
White Inhabitants	4,586	934,340
Black Inhabitants	60	236,420

Which of the following is a correct statement supported by the chart above?

- (A) Religion was a powerful force opposing slavery in the American colonies.
- (B) Slavery grew rapidly throughout the American colonies despite restrictions on the slave trade.
- (C) Southern landholders preferred the labor of indentured servants to slave labor.
- (D) By 1750, the southern colonies had become demographically distinct from the other colonies.

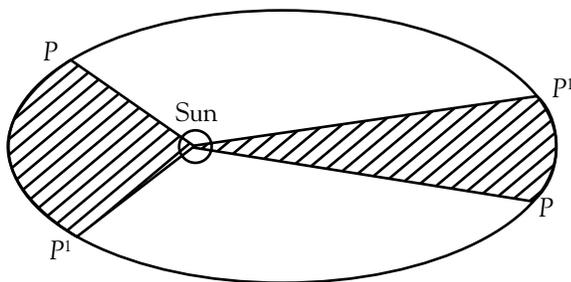
14. "We hold these truths to be self-evident: that all men and women are created equal; that they are endowed by their Creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness; that to secure these rights governments are instituted, deriving their powers from the consent of the governed. Whenever any form of government becomes destructive of these ends, it is the right of those who suffer from it to refuse allegiance to it, and to insist upon the institution of a new government."

–Seneca Falls Declaration of Sentiments and Resolutions, 1848

The excerpt above is from a major declaration of which of the following movements?

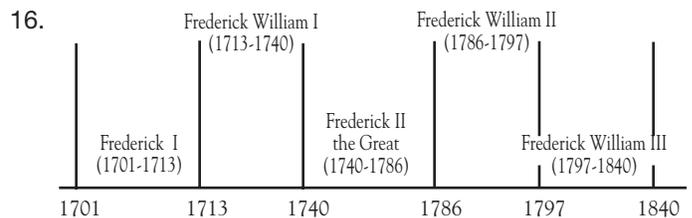
- (A) Abolitionism
- (B) Revivalism
- (C) The women's rights movement
- (D) The public school movement

15. **KEPLER'S SECOND LAW**



The diagram above of the second law of Johannes Kepler illustrates that Kepler believed that

- (A) the Earth was the center of the universe and the Sun revolved around the Earth
- (B) the language of mathematics could describe the movements of the planets
- (C) planetary motion was random and not subject to human understanding
- (D) there were only four planets in the Solar System



The timeline above of the Hohenzollern rulers of Prussia is misleading primarily because it

- (A) omits essential information about each ruler
 - (B) omits other events of historical importance
 - (C) lists only male rulers of the Hohenzollern dynasty
 - (D) spaces the reigns, not the years, equally
17. European interest in the Middle East grew significantly in the twentieth century primarily because
- (A) Europe became interested in settling part of its growing population in the Middle East
 - (B) many European countries began hiring guest workers from the Middle East
 - (C) the Middle East became a significant producer of a critical natural resource that Europe sought
 - (D) the Middle East became a large potential market for European goods
18. Which of the following resulted from President Franklin D. Roosevelt's New Deal?
- (A) All large banks were nationalized.
 - (B) The United States Supreme Court gained two new justices.
 - (C) The national government grew in size, scope, and responsibility.
 - (D) Decisions about welfare spending were entrusted to the states.

IV. Science

19. Some human traits are carried by genes on the Y chromosome. A man will transmit these traits to
- (A) one-half of his male offspring only
 - (B) one-half of his female offspring only
 - (C) all of his male offspring
 - (D) all of his female offspring

20. "Shooting stars" that appear in the night sky are most likely to be
- (A) particles of exploding stars
 - (B) comets passing near the Earth
 - (C) meteors passing into the Earth's atmosphere
 - (D) northern or southern lights caused by magnetic storms on the Sun
21. A chlorine compound is added to swimming pools in order to
- (A) monitor the pH of the water
 - (B) add color to the water
 - (C) soften the water by precipitating harmful chemicals
 - (D) destroy bacteria through an oxidation reaction
22. Which of the following methods of producing electricity contributes most of the incidence of acid rain in North America?
- (A) Generators that use windmills
 - (B) Nuclear generators that utilize fission
 - (C) Power plants that burn fossil fuels
 - (D) Hydroelectric power plants
23. Two campers want to bake potatoes in a fire. Both wrap their potatoes in aluminum foil. One camper, however, sticks a large nail through her potato.
- Which of the following is most likely to happen after the potatoes are placed in the fire?
- (A) Both potatoes will cook at the same rate.
 - (B) Neither potato will cook because the foil will reflect the heat.
 - (C) The potato with the nail will cook faster because heat will be conducted into the potato.
 - (D) The potato with the nail will cook more slowly because heat will be conducted out of the potato.
24. Which of the following statements is true of hurricanes but not of tornadoes?
- (A) They form only over warm oceans.
 - (B) They have very high winds.
 - (C) They may cause great property damage.
 - (D) They may cause human fatalities.

Answers

Literature and Language Studies

1. The correct answer is B. Only sentence 3 has characteristics that both introduce a paragraph and contain a suggestion of the way the ideas in the paragraph will be developed. The words “once believed” in sentence 3 anticipate the counterassertion in sentence 1, which introduces the example of Native American languages. Sentence 4 provides specific support to sentence 1. The introductory phrase in sentence 5 refers back to the number of words mentioned in sentence 4. Further, sentence 5 introduces the notion of flexibility, which is restated and developed in sentence 2.

2. The correct answer is B. The central analogy links Polly’s feelings of confinement and desire for freedom to the plight of the birds she had released from their cage. She did not regret her action although the birds’ freedom had led to their deaths.

3. The correct answer is C. Charlie tried to protect the birds for Polly and to solve the problem they presented by caging them. He regretted that they had been killed. Polly longs to have Charlie understand what she is feeling; there is no suggestion, however, of angry confrontation. The passage presents evidence of caring but also of a failure of communication.

4. The correct answer is D. The characterizations of Polly in the first and last paragraphs suggests reflection, not hostility or self-reproach or disinterest.

5. The correct answer is C. The first syllable contains a schwa vowel sound and the second the vowel sound in the word “cot.” The third syllable contains a schwa vowel sound, and the fourth contains the sound of the vowels in the word “easy.”

6. The correct answer is A. The terms mentioned are processes and devices associated with generating new ideas and organizing them. These processes and devices would not be associated with proofreading (D). While they might be part of drafting (B) or revising (C), they are most important during the prewriting stage of the writing process.

Mathematics

7. 420% of 39.7 equals 4.2 times 39.7. Only option C offers this choice or an equivalent for this choice. The correct answer is C.

8. When triangle ABC is reflected across the y axis, the figure formed is located in quadrant I and is the mirror image of the given figure. Rotating the triangle about vertex C by 90 degrees yields choice A.

9. When multiplying two numbers with like bases, the exponents can be summed. Therefore, 2 raised to the third power times 2 raised to the second power can be expressed as 2 raised to the fifth power. Also, 3 raised to the fourth power times 3 raised to the third power can be expressed as 3 raised to the seventh power. The correct answer is A.

10. The total average (arithmetic mean) salary of all 10 employees can be determined by calculating $6(\$367) + 4(\$382) = \$3,730$. The average salary of the 10 staff members is $\$3,730/10 = \373 . The correct answer is B.

11. Scoring at the 70th percentile implies that 70 percent of the group had scores below Bill, or 30 percent of the group had scores higher than Bill. The correct answer is C.

12. In order to solve this problem, let us look at the sequence of powers 3^n in relation to the exponent n .

n	3^n	Units digit
0	1	1
1	3	3
2	9	9
3	27	7
4	81	1
5	243	3
6	729	9
7	2,187	7
8	6,561	1

Note that the units digit of 3^4 is 1, which is equal to the units digit of 3^0 , and then the sequence of units digits repeats itself in sets of four, with the following pattern (where k is some positive integer):

- If n is of the form $n = 4k$, the units digit of 3^n is 1.
- If n is of the form $n = 4k + 1$, the units digit of 3^n is 3.
- If n is of the form $n = 4k + 2$, the units digit of 3^n is 9.
- If n is of the form $n = 4k + 3$, the units digit of 3^n is 7.

In the problem, the value of the exponent is 43; i.e., $n = 43 = 4 \times 10 + 3$; thus, the units digit of 3^{43} is 7.

The correct answer is C.

History/Social Studies

13. While choices A, B, and C might have some truth for some aspects of the population of the different regions, the only claim supported by the table is D, the correct answer.

14. The Seneca Falls Declaration is associated with the women’s rights movement. The correct answer is C.

15. The only conclusion supported by the diagram is choice B. The diagram reflects the mathematical concept of an ellipse, which is defined as the set of all points, the sum of whose distances from two fixed points is constant.

16. Upon inspection of the diagram, the correct answer is D. The reigns are spaced equally, the years are not. There are only 12 years shown between Frederick I and Frederick William I. Frederick William I ruled for 27 years, and Frederick II the Great ruled for 26 years. Frederick William II ruled for only 11 years, and Frederick William III ruled for 43 years.

17. Choice C is the correct answer. It was in the twentieth century that technological advances throughout the world increased the demand for oil and made it economically beneficial to mine the oil of the Middle East countries. This need for larger quantities of crude oil increased European interest in the politics and economics of the area.

18. The correct answer is C. Roosevelt's New Deal established a wide range of new federal agencies concerned with issues including financial regulation of the economy, social welfare, and economic development, thereby expanding the size, scope, and responsibility of the national government. Banks were not nationalized, the size of the Supreme Court did not expand, and decisions about welfare spending were concentrated in the federal government.

Science

19. The correct answer is C. Human males generally have one X and one Y chromosome. Male offspring will only receive a Y chromosome from their father, while female offspring will only receive an X chromosome from their father. Therefore, genes on the Y chromosome are passed only to male offspring.

20. The correct answer is C. "Shooting stars" are meteors that have entered into the Earth's atmosphere where frictional heating has caused them to glow.

21. The correct answer is D. Chlorine and certain chlorine-containing compounds are highly reactive oxidizing agents that are used as chemical disinfectants in a variety of situations including swimming pools.

22. The correct answer is C. Acid rain is caused by the reaction of sulfur oxides and nitrogen oxides with water in the atmosphere to form acids. The burning of fossil fuels is a major source of these oxides.

23. Although the aluminum foil will reflect radiant energy, it will not significantly reduce the flow of energy by conduction. Because a nail is a good thermal conductor, heat will flow through the nail and cook the potato from the inside as well as from the outside. Thus, the potato with the imbedded nail will cook faster. C is the correct answer.

24. The correct answer is (A). The other options are true of both tornadoes and hurricanes. However, hurricanes require warm ocean surface waters in order to develop, and it is from these warm waters and the release of latent heat that they derive their energy. Tornadoes are associated with thunderstorms, form over land, and are most likely to occur when large differences in temperature and moisture exist between two air masses and the boundary between the air masses is sharp.



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