



# Study Guide

PEARSON

A thin, dark, curved line arching under the word 'PEARSON'.

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# The *Miller Analogies Test* Study Guide

The *Miller Analogies Test* (MAT) is a high-level test of analytical ability that requires the solution of problems stated as analogies. The MAT consists of 120 partial analogies that are to be completed in 60 minutes. The test measures your ability to recognize relationships between ideas, your fluency in the English language, and your general knowledge of the humanities, natural sciences, mathematics, and social sciences.

## The Structure of MAT Analogies

An analogy is a statement that suggests two terms are related to each other in the same way that two other terms are related to each other. The MAT analogy items are written as equations in the form “A : B :: C : D.” This can be read as either “A is related to B in the same way that C is related to D” or as “A is related to C in the same way as B is related to D.”

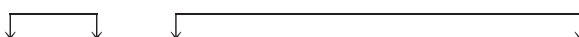
In each MAT analogy item, one term is missing and you must choose which of the four answer options correctly completes the analogy. For example:

PLANE : AIR :: CAR : (a. motorcycle, b. engine, c. land, d. atmosphere)

The first step in solving a MAT analogy is to decide which two of the three given terms form a complete pair. In the example, this could either be “PLANE is related to AIR” (the first term is related to the second term) or “PLANE is related to CAR” (the first term is related to the third term).

On the MAT, *the first term is never related to the fourth term*. Therefore, this example could not be read as “PLANE is related to (a. motorcycle, b. engine, c. land, d. atmosphere).”

The solution to a MAT analogy item requires that you select the option that forms a second pair of terms that are in the same relationship to each other as the terms in the complete pair. In this example, none of the available options form a second pair of terms if the analogy is seen as a relationship between two vehicles—AIR is definitely not a vehicle. However, when the complete pair is seen as “PLANE travels on AIR,” the second pair, and the correct answer, becomes obvious as “CAR travels on c. land”:


  
 PLANE : AIR :: CAR : (a. motorcycle, b. engine, c. land, d. atmosphere)

The missing term in a MAT analogy—the term represented by the four answer options—could be in any one of the four positions. All of the possible formats for MAT analogies are represented in the following examples:

- SALT : HYPERTENSION :: SUGAR : (a. cholesterol, b. carbohydrates, c. hyperthyroidism, d. diabetes)

**Solution**—The answer is “d. diabetes”; salt contributes to or aggravates the symptoms of hypertension, and sugar does the same for diabetes.

- SEEK : FIND :: (a. locate, b. book, c. retrieve, d. listen) : HEAR

**Solution**—The answer is “d. listen”; one seeks something in order to find it, and one listens to something in order to hear it.

- INDUCTION : (*a.* confirmation, *b.* graduation, *c.* ordination, *d.* resistance) :: SOLDIER : PRIEST

**Solution**—The answer is “*c.* ordination”; induction is the ceremony for becoming a soldier, and ordination is the ceremony for becoming a priest.

- (*a.* cure, *b.* epidemic, *c.* immunity, *d.* patient) : SHADE :: INOCULATION : PARASOL

**Solution**—The answer is “*c.* immunity”; a parasol produces shade, and an inoculation produces immunity.

Regardless of how the terms in a MAT analogy are presented, there is only one valid and logical relationship that exists between each pair of terms.

## Solving MAT Analogies

There are four basic steps in solving a MAT analogy:

1. Read the three given terms in the analogy carefully.
2. Determine the relationships between the two possible pairs among the three given terms.
3. Without looking at the answer options, think of a fourth term that would complete an analogy along with the three given terms. You may be able to identify more than one possible analogy that would include the three given terms.
4. Examine the answer options, and select the option that most closely resembles your idea of a term that would complete the analogy.

If none of the answer options seems to form an analogy, rethink the relationship you identified in the given terms. You may need to repeat the steps to arrive at an acceptable answer.

For example, consider the following:

PINT : (*a.* cup, *b.* quart, *c.* liter, *d.* gallon) :: 1 : 2

Reading the three given terms in this analogy may not initially seem to provide obvious clues as to which option will complete it, until you consider the relationship of 1 to 2, a likely candidate for a complete pair. These two numerals can be seen as either a sequence of numbers or as one representing twice the value of the other.

If the relationship is seen as a sequence, then none of the answer options seems to form a similar relationship with “PINT,” the third given term. However, if the relationship is seen as 2 being twice the value of 1, then the correct answer would be a measure that is twice the volume of a pint.

This solution seems to work, because answer choice “*b.* quart” represents a volume that is twice that of a pint. While the other options are related to *pint* in the sense that each one is a measure of volume, none is related in the same way that 1 is to 2.

## Types of Relationships in MAT Analogies

There are many ways in which a pair of words can be related. Sometimes the relationship is obvious as soon as you read the terms. Sometimes, however, you have to formulate a statement before the relationship becomes apparent. Although there are many possible types of relationships, within a particular item only one or two types will be present.

The relationships found in MAT items can be grouped into four broad categories: semantic, classification, association, and logical/mathematical. Each of these groups contains several sub-classifications.

When you take the MAT, you do not need to classify each item. Nevertheless, reviewing these types of relationships may help you see the relationships between pairs of words that form MAT analogy items.

## Semantic

This type of analogy can be thought of as involving definitions of the terms. Relationships of this type have to do with what a word stands for and how that word is linguistically connected to others. The words may be any part of speech.

1. **Synonym or Definition**—The terms have the same or similar meaning.

TEACH : INSTRUCT	Both words mean “to impart knowledge.”
EDGE : BORDER	Both words refer to a boundary.
EMPTY : VACUOUS	Both words mean “lacking in substance.”
EIRE : IRELAND	Both words are accepted names for the same country.

2. **Antonym or Contrast**—The terms have opposite meanings or are used to express unlike concepts.

RARELY : FREQUENTLY	The word <i>rarely</i> means “not often” or “infrequently.”
ORDER : CHAOS	Chaos is a state of total disorder, the opposite of order.
LEGALIZE : OUTLAW	To outlaw something is not to legalize it but to make it illegal.

3. **Intensity**—One term expresses a greater size or degree of something than the other. This category can be difficult if you misinterpret the analogy as a simple synonym or antonym.

JOYFUL : ECSTATIC	To be ecstatic is to be wildly and intensely joyful.
SLAM : CLOSE	To slam is to close forcefully and loudly.
STREAM : TORRENT	A torrent is a swift-flowing stream.

4. **Word Part/Meaning**—One term explains what the other term means.

–ISM : PRACTICE	One meaning of the suffix <i>–ism</i> is the practice of something; for example, criticism is the act or practice of criticizing.
NOT : UN–	The prefix <i>un–</i> means “not”; for example, something unalterable cannot be changed.
Penta– : Five	The prefix <i>penta–</i> means five; for example, a pentagon is a five-sided polygon.

## Classification

The classification type of analogy concerns the hierarchy of words and concepts. For example, when you outline a topic, you list main headings, subtitles, and so on. In a classification analogy, one word could be a heading for the other word, or both words might fall under the same heading.

1. **Category**—One term is a subordinate or superordinate class of the other. In other words, one term is a type or example of the other one.

SPECIES : GENUS                      A species is a subdivision of a genus.

EMOTION : LOVE                      Love is one type of emotion.

MEASLES : DISEASE                      Measles is an example of a disease.

2. **Membership**—Both terms are parts of the same thing or members of a larger category.

WHEEL : FENDER                      Both are parts of a car.

FINGERS : THUMBS                      Both are digits of the hand.

LOVE : FEAR                      Both are examples of emotions.

3. **Whole/Part**—One term is a part of another term.

WHEEL : CAR                      A wheel is part of a car.

GALAXY : STAR                      A galaxy is made up of stars.

YEAR : CENTURY                      A century consists of one hundred years.

## Association

The association type of analogy represents the largest group. This type deals with relationships between two distinct but related ideas. The terms are often nouns but may be any part of speech.

1. **Object/Characteristic**—One term is a characteristic, source, or location of another term.

**One term is an attribute, characteristic, or description of the other:**

PARROT : BEAK                      A parrot has a beak as its jaws.

MONSTER : FEROCIOUS                      A monster usually has a ferocious disposition.

IMAGINARY : FABLE                      A fable is a story about imaginary characters.

**One term is an attribute that the other term lacks:**

HAIR : BALD                      A person who has no hair is bald.

INEPT : SKILL                      An inept person is lacking in skill.

DELIBERATE : HASTE                      A deliberate action does not involve haste.

**One term is the source of the other or the material out of which the other is composed:**

BOOK : PAPER                      A book is printed on paper.

FLOUR : BREAD                      Bread is made from flour.

CABLE : WIRE                      A cable is composed of wires.

**One term gives the location or setting of the other:**

INDIA : RUPEE                      A rupee is a denomination of the currency used in India.

STOMATA : LEAF                      Stomata are tiny pores in a leaf.

PARTHENON : ATHENS              The Parthenon temple is in Athens, Greece.

2. **Order**—The terms are in a sequential or reciprocal relationship to one another.

**The terms have a time or other sequential relationship, but one does not cause the other:**

DAWN : SUNRISE                      The dawn occurs just before a sunrise.

7 : 11                                      These are consecutive prime numbers.

ALPHA : OMEGA                      These are the first and last letters of the Greek alphabet.

**The terms have a reciprocal relationship so that one concept cannot exist without the other:**

AUNT : NIECE                      A niece is related to an aunt through the same person; the niece's parent is the aunt's sibling.

WEIGHT : MASS                      On earth, anything with mass also has weight, due to the force of gravity acting upon it.

OBJECT : TRANSITIVE              In a sentence, a transitive verb must have a direct object that it links to the subject.

**One word is a grammatical transformation of the other:**

BRING : BROUGHT                      The verb changes from present to past tense.

MY : MINE                              The possessive form changes from adjective to pronoun.

DATUM : DATA                      The noun changes from singular to plural.

3. **Agent/Object**—There are many possibilities within this group, all of which involve one term that causes, creates, provides, requires, uses, or in some other way relies on the other term. Some of the most common types of agent/object analogies include the following examples.

**Cause/Effect—One term causes the other:**

RAIN : FLOOD                      Excessive rain can cause a flood.

HUNGER : FASTING                      Fasting from food results in hunger.

CRIME : PUNISHMENT              Punishment is a consequence of crime.

**Creator/Creation—One term creates the other:**

ROBIN : NEST                      A robin builds a nest.

SUIT : TAILOR                      A tailor makes a suit.

HOMER : ILIAD                      Homer wrote the epic poem the *Iliad*.

**One term provides the other or makes it possible:**

EDUCATION : TEACHER              A teacher provides education.

FOOD : NUTRITION                      Food provides the body with nutrition.

POSTAGE : MAIL                      Postage covers the cost and enables mail to be delivered.



**One term represents the function or purpose of the other:**

KNIFE : CUT	A knife is used to cut something.
SOUND : AUDIOMETER	The purpose of an audiometer is to measure sound.
SALUTE : RESPECT	A salute shows respect.

**One term is a tool or object used by the other:**

PLUMBER : WRENCH	A plumber uses a wrench to work on a pipe.
SEAMSTRESS : NEEDLE	A seamstress uses a needle to pull thread through cloth.
VIOLINIST : BOW	A violinist uses a bow to play a violin.

**Logical/Mathematical**

A few MAT items may include logical or mathematical equations, numerical fractions, multiples, negation, or letter and sound patterns.

**1. One term is a fraction or multiple of another:**

11 : 121	121 is the square of 11.
ANNUAL : BIENNIAL	A biennial time period (two years) is twice as long as an annual time period (one year).
$\frac{1}{2} : \frac{1}{20}$	$\frac{1}{2}$ is ten times as much as $\frac{1}{20}$ .

**2. The terms are related through some non-semantic similarity or change, such as rhyming, homophones, letter reversal, or other wordplay.** There are not many such word puzzles on the MAT, but you should be prepared for the few that you may encounter.

EMIT : TIME	The two words are spelled with the same letters in reverse order.
BOUGH : BOW	Two of the meanings of the word <i>bow</i> (“the front of a ship” and “to bend downward”) are pronounced the same as the word <i>bough</i> .
SPRUNG : RUN	The word <i>run</i> is contained within the word <i>sprung</i> .

**The Content of MAT Analogies**

The terms in most of the MAT analogy items are words, but in some cases they may be numbers, symbols, or word parts. A number of items are drawn from areas of everyday experience, such as food, clothing, tools, transportation, education, and common expressions. Other analogy items rely upon your knowledge of the various academic disciplines or subjects that are typically studied by American undergraduate students.

When the terms in an analogy are taken from a specific academic area, the two pairs of terms that form the analogy come from that same subject matter.

Washington : Adams :: Bush : Clinton

In this analogy, all four of the terms involve some knowledge of American history; the analogy here is that John Adams followed George Washington into the presidency, just as Bill Clinton followed George H. W. Bush.

However, sometimes the terms in the two pairs that form the analogy come from different subject matter.

Steinbeck : Gershwin :: Literature : Music

An analogy such as this involves pairs of terms from different subject areas. Nevertheless, it is the relationship between terms that is crucial here: both John Steinbeck and George Gershwin were creative artists in their respective areas—literature and music.

While there is no specific body of information that can be studied or memorized to improve your MAT score, you may find it useful to be aware of the subject areas represented on the MAT.

## Language and Vocabulary

These analogy items include aspects of English grammar and usage to test your understanding of word meanings and your ability to recognize the relationships between those meanings.

Language analogy items most often use one of three relationships: synonym (words with similar meanings), antonym (words with opposite meanings), or intensity (words with the same general meaning but with a difference in degree).

NAIVE : (a. cosmopolitan, b. credulous, c. experienced, d. pretentious) ::  
SOPHISTICATED : WORLDLY

This analogy requires the recognition that *sophisticated* and *worldly* have similar meanings and form a complete pair. The correct answer will then be a synonym for *naive*. Thus, the correct answer is *credulous*. This item can also be interpreted as an antonym analogy by interchanging the middle terms: *naive* is an antonym for *sophisticated*, *worldly* is an antonym for *credulous*.

ANNOY : ENRAGE :: ENLARGE : (a. increase, b. exaggerate, c. augment, d. reduce)

This analogy involves degrees of meaning: to enrage is to annoy to a greater degree. The correct answer should then be the word that means to enlarge, but to a greater degree. Thus, the correct answer is “b. exaggerate.” This is an example of an item that requires you to distinguish fine shades of meaning between terms. If you incorrectly consider *annoy* and *enrage* to be synonyms, then you would have to choose between “a. increase,” “b. exaggerate,” or “c. augment” for an answer, all of which are generally related to *enlarge*. However, to choose between these three options, you need to see that the difference between them is the same as the difference between *annoy* and *enrage*—a difference in degree.

## Humanities

MAT analogy items involving content from the humanities include subject matter from literature, philosophy, and the fine arts. Literature items may test your knowledge of authors, their works, literary genres, or literary devices. Philosophy items are concerned with philosophers, their works, and their beliefs or schools of thought. Fine arts analogy items cover the entire spectrum of the fine arts: the performing arts of music, drama, and dance; the visual arts of painting and sculpting; and other arts such as filmmaking and sound recording. These items use a variety of relationships. Two common ones are creator/creation and whole/part.

FROST : POETRY :: MILLER : (a. grain, b. drama, c. literature, d. bard)

Looking at the three given terms in this literary analogy there is a creator/creation relationship between *Frost* and *poetry*: Robert Frost is best known for his poetry. For this reason, the correct

answer should be the type of literature that the American playwright Arthur Miller is best known for creating—“*b. drama.*”

POEM : (*a. line, b. rhyme, c. stanza, d. sonnet*) :: BOOK : CHAPTER

In this analogy, the last two of the three given terms have a whole/part relationship to each other. A section of a book is a chapter. The missing term, then, should be a section of a poem.

The correct answer is “*c. stanza.*” Even though a line (option *a*) is also part of a poem, it is not a complete section in the same way that a chapter is a complete section of a book.

## Social Sciences

MAT analogy items with content from the social sciences include subject matter from history, geography, political science, economics, sociology, and psychology. Analogy items with content from the social sciences may use many different types of relationships. For example, a historical event may be paired with the year it occurred, a key person associated with the event, the country in which it occurred, a piece of legislation associated with the event, or a cause or result of the event.

INDEPENDENCE : 1776 :: EMANCIPATION : (*a. 1783, b. 1863, c. 1876, d. 1920*)

In this analogy, the relationship between the first two given terms is event/date. You need to supply implied words in order for the relationship to become obvious. The Declaration of Independence was issued in 1776, whereby the American colonies declared their independence from Great Britain. The missing term should then be the year that the Emancipation Proclamation was issued in the United States, whereby slaves were declared free in the states still at war with the federal government. The correct answer is “*b. 1863.*”

STRIKE : (*a. customer, b. employer, c. picket, d. union*) :: BOYCOTT : MERCHANT

The agent/object relationship between the terms may not be immediately obvious until the given terms are considered in an economic sense. Then it is seen that a boycott is a protest action taken against a merchant in the form of abstaining from buying or using. Similarly, a strike is a protest in the form of work stoppage directed against an employer (option *b*).

## Natural Sciences

Both the biological and physical sciences provide subject matter for MAT analogy items. Some commonly used relationships in such items include agent/object (such as FLOWER : BLOOM) and category (such as HYDROGEN : ELEMENT).

CARNIVORE : HERBIVORE :: TIGER : (*a. antelope, b. lion, c. predator, d. vegetation*)

A tiger is an example of a carnivore—a meat-eating animal. The missing term should be an example of a herbivore—an animal that eats only plants. Thus, the correct answer is “*a. antelope.*”

LIMESTONE : (*a. cement, b. metamorphic, c. sedimentary, d. volcano*) :: GRANITE : IGNEOUS

The last two given terms have a member/group relationship. Granite is an example of igneous rock. Limestone is an example of sedimentary (option *c*) rock.

## Mathematics

Mathematics analogies may include concepts from number theory, arithmetic, algebra, or geometry. Mathematics analogy items may use numbers, words, symbols, or combinations of these. Mathematics items often employ transformation, order, or object/characteristic relationships. In solving mathematics analogies, you must recognize the conceptual relationship between two of the three given terms. For some of these items, you may also have to use computation to determine the value of the missing term.

(*a.* radius, *b.* diameter, *c.* area, *d.* circumference) : PERIMETER :: CIRCLE : SQUARE

Examining the three given terms, you may recognize that a perimeter is the distance around a square. You can then also recognize that the distance around a circle is “*d.* circumference.”

4 : 64 :: 5 : (*a.* 8, *b.* 25, *c.* 32, *d.* 125)

You might suppose that a possible relationship between the first two given numbers is that an implied 16 multiplied by 4 equals 64. However, this cannot be the relationship, since 16 multiplied by 5 equals 80, which is not one of the answer choices. The relationship here is that 4 cubed equals 64. Since 5 cubed equals 125, the correct answer is *d.*

## Test-Taking Strategies for the MAT

### Read All the Answer Options Carefully

Avoid selecting the first answer that seems to make sense. One choice may seem to fit, but a better answer choice may also be listed. Remember that you are looking for the best answer among options that may all seem plausible. Many of the incorrect answer options on the MAT have some relationship to the term that you are trying to match it with. However, you will correctly solve the analogy only when you determine which answer option most accurately reflects the same relationship as the two given terms that form a complete pair.

### Consider Alternative Meanings of Words

If at first an analogy does not seem to make sense, you may need to think of one or more of the terms in a different way. For instance, consider the following analogy:

NAPOLEON : PERGOLA :: (*a.* baker, *b.* general, *c.* lumber, *d.* trellis) : CARPENTER

This analogy makes no sense if you think of Napoleon as the French general and emperor. However, a napoleon is also a pastry. Therefore, a napoleon (the pastry) is made by a baker (option *a.*), just as a wooden pergola (a trelliswork arbor or patio covering) is built by a carpenter.

### Reorder the Analogy

Sometimes you can clarify the relationship in an analogy by changing the order of the terms, since the location of the terms of a valid analogy can be changed without affecting the meaning. In other words, the analogy “A is to B as C is to D” will remain valid even if it is rearranged to “A is to C as B is to D.” For example, consider the following analogy:

French : Roman :: Russian : Cyrillic

The relationship here is that the French language uses the Roman alphabet, and the Russian language uses the Cyrillic alphabet, and the analogy remains valid even when it is reordered to read “FRENCH : RUSSIAN :: ROMAN : CYRILLIC.” In this second arrangement, the relevant relationships remain the same: the French language uses the Roman alphabet in the same way that the Russian language uses the Cyrillic alphabet.

## Check the Part of Speech

The answer you choose should be the same part of speech as the corresponding term in the complete pair.

For example, consider the following analogy:

FOOD : ATE :: BALL : (a. red, b. slow, c. game, d. threw)

The correct answer in this analogy would have to be the verb *threw* (d), corresponding to the verb *ate* in the complete pair. However, it is not always this obvious.

For instance, consider this analogy:

TABLE : BILL :: (a. chair, b. direct, c. gesture, d. shelve) : MOTION

In this analogy, two options are nouns and two options are verbs, requiring a solution that involves a further distinction. If your first reaction is to think of the words *table*, *bill*, and *motion* as nouns, then none of the options seems to make complete sense. However, once you think of the word *table* as a verb, it becomes clear that to delay consideration of a legislative bill is to table it and, similarly, to delay consideration of a motion (a formal proposal) is to shelve it (option d). Thus, it is necessary to recognize both the part of speech and the relevant meaning of the terms in order to solve an analogy like this one.

## Reduce the Number of Choices

If you are uncertain about the answer to an analogy, try to eliminate the answer options that do not seem to fit and then guess from among the remaining options. The more options you can eliminate the more likely you are to select the correct answer.

If an analogy completely baffles you, look for clues. For instance, you may at first be uncertain about the following analogy:

SINANTHROPUS : PITHECANTHROPUS :: (a. Peking, b. Hong Kong, c. Cairo, d. Kabul) : JAVA

However, the root *anthropus* in the first and second terms suggests that this analogy has to do with human beings. From there you may well make the connection between the first two terms and the common names for two famous early anthropological finds—Peking man and Java man—and arrive at the correct answer of “a. Peking.” Another way that you might reason through this analogy is that since the first two terms share the same root (*anthropus*), it must be the prefixes that distinguish them. If you know that *Sino-* means “Chinese,” you can reasonably narrow the choices to either “a. Peking” (currently called Beijing) or “b. Hong Kong,” both of which are cities in China.

## **Postpone Difficult Items**

The MAT is a timed test. Because you have 60 minutes to answer 120 questions, you have an average of 30 seconds to solve each analogy and to indicate your answer. Because each item counts the same, you may not want to spend too much time on an analogy if the relationship is not apparent to you. Your time would be more wisely used by moving on to analogies that are clear to you. Try to use the last 10 minutes or so of the testing period to go back to items that were unclear.

When you return to an analogy, you may understand it more clearly than you did the first time you looked at it. One explanation for this new clarity may be that the more analogies you complete the more skilled at solving them you become. Another reason may be that you have unconsciously been thinking about the analogies you skipped. If the answer does not come to you quickly on your second try, make your best guess and move on.

## **Answer Every Question**

Your scores are based on the number of items you answer correctly. Points are not deducted for incorrect responses. If you are not sure which answer choice is correct for an item, eliminate as many incorrect options as you can first. If you have doubts about an answer to an item, change your answer only if you have a valid reason.

## **Indicate Your Answers Carefully**

If you are taking a paper-and-pencil version of the MAT, be sure to mark your answer to each numbered item in the corresponding number on your Answer Booklet. Be especially careful if you skip items. Putting the right answer in the wrong place will result in an inaccurate score. Also, make sure your marks completely fill the circles. Do not mark more than one answer for each question. Questions with more than one circle marked are always scored as incorrect.

If you are taking a computer-based version of the MAT, the answer you select is shown on the screen. You will not be able to select more than one answer per item on the screen display, but it is up to you to confirm that the answer you intend is the one that is displayed on the screen before you move to the next item. You will have the opportunity to review your answer choices at the end of the test if time permits.

## Sample Analogies

One of the best ways to prepare for the MAT is to become familiar with analogies through practice in solving them. Like the Practice Tests available on the MAT website (see “Online Practice Tests”), these sample analogies will give you a sense of what to expect when you take the MAT. In the “Annotated Answers” section, the sample analogies are complete with the correct answer and explanation provided for each one.

One effective way to improve your performance on the actual MAT will be to look for patterns in your incorrect answers to the sample analogies or the items on the online Practice Tests. If you notice that your errors are caused by misinterpreting the relationships between terms, then you may need more practice with the analogy format. If you notice that your errors result from not knowing the meanings of words or from unfamiliarity with certain facts, then you may need more background in vocabulary or specific content areas.

If you would like to time yourself, allow 5 minutes to complete the 10 items, which is an amount of time proportional to the 60 minutes allowed to complete the 120 items on the actual MAT.

1. SPRING : RING :: COIL : (*a. rope, b. loop, c. cowl, d. stretch*)
2.  $97^\circ$  :  $45^\circ$  :: (*a. obtuse, b. equilateral, c. angle, d. cosine*) : ACUTE
3. MOLLUSK : (*a. fish, b. cell, c. plant, d. mammal*) :: PEARL : AMBERGRIS
4. (*a. epistemology, b. axiology, c. teleology, d. pedagogy*) : ONTOLOGY :: KNOWLEDGE : BEING
5. ELBOW : NERVE :: HINGE : (*a. lever, b. electricity, c. fulcrum, d. wire*)
6. INDIVIDUAL : MUNICIPALITY :: LOAN : (*a. county, b. bond, c. stock, d. certificate*)
7. HOMOPHONE : (*a. paradigm, b. antonym, c. synonym, d. acronym*) :: SOUND : MEANING
8. (*a. Rembrandt, b. Dalí, c. Cassatt, d. Matisse*) : MONET :: WHISTLER : CÉZANNE
9. -IVE : -ION :: ADJECTIVE : (*a. verb, b. noun, c. conjunction, d. adverb*)
10. CONSTITUTION : MAGNA CARTA :: UNITED STATES : (*a. Pilgrims, b. Virginia, c. England, d. Rome*)

## Annotated Answers

1. SPRING : RING :: Coil : *b.* loop

A spring forms or has the shape of a coil, and a ring forms a loop.

2.  $97^\circ$  :  $45^\circ$  :: *a.* obtuse : ACUTE

An acute angle is any angle less than  $90^\circ$ , so a  $45^\circ$  angle is acute. An obtuse angle is any angle between  $90^\circ$  and  $180^\circ$ , so a  $97^\circ$  angle is obtuse. Thus,  $97^\circ$  is to  $45^\circ$  as *obtuse* is to *acute*.

3. MOLLUSK : d. mammal :: PEARL : AMBERGRIS

Pearls are found in oysters, a type of mollusk; ambergris is found in sperm whales, a type of mammal.

4. *a.* epistemology : ONTOLOGY :: KNOWLEDGE : BEING

In the discipline of philosophy, ontology is the branch that deals with the nature or being, and epistemology is the branch that deals with the nature of knowledge.

5. ELBOW : NERVE :: HINGE : *d.* wire

The elbow of an arm and a hinge on a door or gate function similarly; a nerve (a cordlike bundle of fibers) functions in the nervous system similar to the way a wire functions in an electrical system.

6. INDIVIDUAL : MUNICIPALITY :: LOAN : *b.* bond

An individual borrows money by obtaining a loan; a municipality borrows money by issuing a bond.

7. HOMOPHONE : *c.* synonym :: SOUND : MEANING

Words that have the same sound are called homophones; words that have the same meaning are called synonyms.

8. *c.* Cassatt : MONET :: WHISTLER : CÉZANNE

Claude Monet and Paul Cézanne were two French painters, and Mary Cassatt and James Whistler were two American painters, all of whom were born in the nineteenth century and lived into the early twentieth century.

9. -IVE : -ION :: ADJECTIVE : *b.* noun

The suffix -ive is used to form an adjective denoting action; the suffix -ion is used to form a noun denoting action.

10. CONSTITUTION : MAGNA CARTA :: UNITED STATES : *c.* England

The Constitution is the defining political and legal document of the United States; the Magna Carta was a political charter granted by the King of England in which basic rights were delineated.