Diagnostic Test 1

59 Questions

Arithmetic

1. If p is an integer such that $-8 < p < 8$, what is the product of all the possible even values of p ?

   ○ −14,746
   ○ −2,304
   ○ −384
   ○ −64
   ○ 0

2. If x, y are distinct positive integers, then which of the following must be true about $x^2 + y + 1$?

   ○ It is odd when x is a factor of y
   ○ It is even when x is odd and y is odd
   ○ It is odd when y is a factor of x
   ○ It is even when x is even and y is odd
   ○ It is odd when x is odd and y is even

3. If the three children in the Yao family are all at least one year apart in age, are they all less than 11 years old?

   (1) The sum of the children's ages is less than 22

   (2) The age of the oldest child is twice that of the youngest child

   ○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
   ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ○ EACH statement ALONE is sufficient.
   ○ Statements (1) and (2) TOGETHER are not sufficient.

4. If x is a positive integer such that $x = \sqrt[3]{k}$, then what is the value of x ?

   (1) $200 < k < 1{,}100$

   (2) x is prime

   ○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
   ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ○ EACH statement ALONE is sufficient.
   ○ Statements (1) and (2) TOGETHER are not sufficient.

5. For the first month of a three-month period, Judy used 19 gallons of gas and her car averaged (arithmetic mean) 24 miles per gallon. For the second month of the three-month period, she used 31 gallons of gas and her car averaged 26 miles per gallon. At the end of the three-month period, Judy used a total of 72 gallons of gas and her car averaged 27 miles per gallon. How many miles per gallon did Judy average in the third month?

   ○ 28
   ○ 29
   ○ 30
   ○ 31
   ○ 32

GO ON TO THE NEXT PAGE.

6. Claudio wants to arrange his book collection on a bookshelf such that all books of the same genre are grouped together and the order of the genres is always fantasy, biographies, and science fiction. He has 3 fantasy novels, 2 biographies, and 4 science fiction novels. How many ways can the books on his bookshelf be arranged?

   ⬭ 32
   ⬭ 48
   ⬭ 124
   ⬭ 288
   ⬭ 396

7. If $xy = -1$, then what is $|x - y|$?

   (1) x is an integer

   (2) y is an integer

   ⬭ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
   ⬭ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ⬭ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ⬭ EACH statement ALONE is sufficient.
   ⬭ Statements (1) and (2) TOGETHER are not sufficient.

8. If $m = \dfrac{\left(\dfrac{1}{6} + \dfrac{3}{8} - \dfrac{1}{4}\right)}{\left(\dfrac{7}{3}\right)}$, then $\sqrt[3]{\dfrac{1}{m}} =$

   ⬭ 2

   ⬭ $\dfrac{1}{2}$

   ⬭ $2\sqrt[3]{2}$

   ⬭ $\dfrac{\sqrt[3]{4}}{2}$

   ⬭ $\dfrac{\sqrt[3]{2}}{7}$

9. 450 is what percent greater than 15 ?

   ⬭ 30
   ⬭ 290
   ⬭ 300
   ⬭ 2,900
   ⬭ 3,000

10. Amy, Barb, and Claire are going on an 800-mile trip in Amy's car. They agree to split the cost for gas such that Barb and Claire each pay twice the amount that Amy pays. Amy's car averages 25 miles to the gallon, and gas costs $1.25 per gallon. If Barb and Claire each pay twice the amount for gas that Amy pays, how much does Barb pay for gas?

    ⬭ $8
    ⬭ $16
    ⬭ $24
    ⬭ $32
   ⬭ $40

11. Is P divisible by 15 ?

    (1) The greatest common prime factor of P and 65 is 13

    (2) The greatest common prime factor of P and 95 is 19

    ⬭ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
    ⬭ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
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    ⬭ EACH statement ALONE is sufficient.
    ⬭ Statements (1) and (2) TOGETHER are not sufficient.

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Geometry
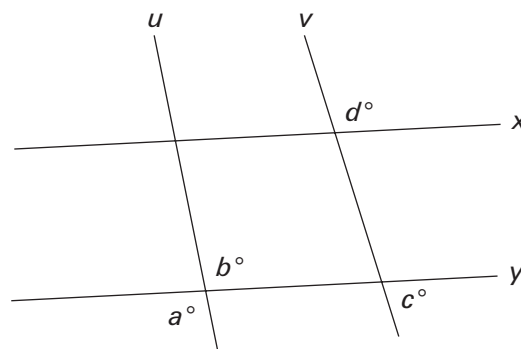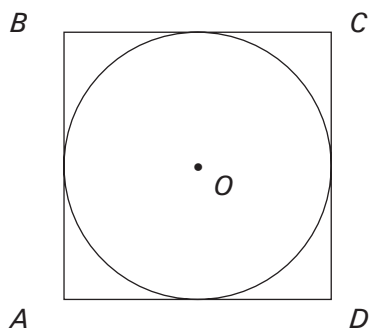
1. In the figure above, the circle with center O is inscribed in square $ABCD$. If square $ABCD$ has an area of 64, what is the area of the circle?

  - ○ 8π
  - ○ 16π
  - ○ 32π
  - ○ 64π
  - ○ 96π

2. If the surface area of a cube is 384 square centimeters, what is the volume of the cube?

  - ○ 64 cm³
  - ○ 216 cm³
  - ○ 288 cm³
  - ○ 384 cm³
 - ○ 512 cm³

3. In the figure above, $u \parallel v$ and $x \parallel y$. What is the value of d ?

  (1) $a + d = 180$

  (2) $a + c = 180$

  - ○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
  - ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
  - ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
  - ○ EACH statement ALONE is sufficient.
  - ○ Statements (1) and (2) TOGETHER are not sufficient.

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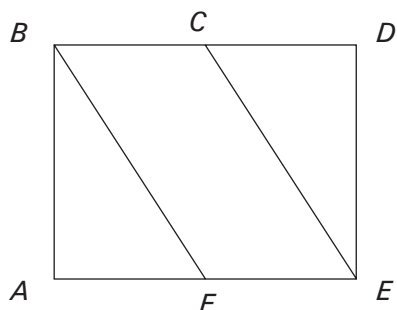
4. In the figure above, if *ABDE* is a rectangle, and *BF* is parallel to *CE*, what is the area of region *BCEF* ?

(1) $AB = 8$ and $AF = 6$

(2) *F* is the midpoint of *AE*

○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
○ EACH statement ALONE is sufficient.
○ Statements (1) and (2) TOGETHER are not sufficient.

5. A rectangular box has side lengths *l, w,* and *h,* and a cube has side lengths *s.* If *l, w, h,* and *s* are integers, how many of these cubes are needed to completely fill this rectangular box?
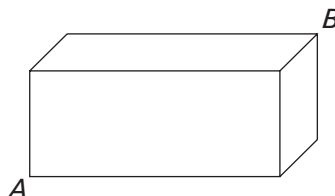
(1) $4s^2 = lw$ and $6s^2 = wh$

(2) $w = 3s$

○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
○ EACH statement ALONE is sufficient.
○ Statements (1) and (2) TOGETHER are not sufficient.

6. The ratio of the length and width of a rectangle is 4:3 and the length of its diagonal is 25 cm. If a border with a uniform width of 2 cm is placed around the rectangle, what is the area of the border, in cm² ?
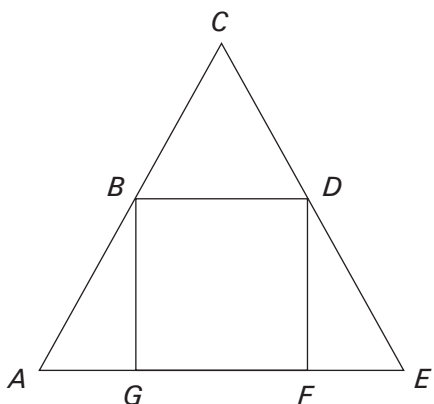
○ 74
○ 156
○ 300
○ 374
○ 456

7. The length, width, and height of the rectangular solid with vertex *A* and *B* shown above have a ratio of 4:3:2 respectively. If the length of *AB* is $\sqrt{58}$, what is the surface area of the solid?

○ 52
○ 104
○ 116
○ 332
○ 348

GO ON TO THE NEXT PAGE.

8. Square *BDFG* is inscribed in equilateral triangle *ACE.* What is the area of triangle *ACE* ?

(1) The area of triangle *BCD* is $9\sqrt{3}$

(2) $DE = 4\sqrt{3}$

- ⬭ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
- ⬭ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
- ⬭ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
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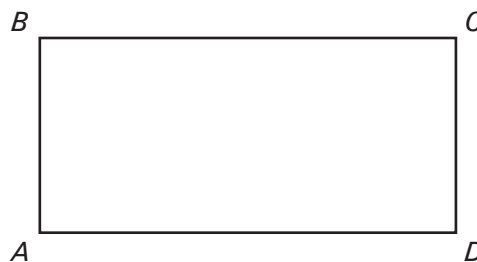
9. What is the area of rectangle *ABCD* ?

(1) $\dfrac{AD}{CD} = \dfrac{4}{3}$

(2) $AC = 10$

- ⬭ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
- ⬭ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
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GO ON TO THE NEXT PAGE.

Algebra

1. If $7y = 4x + 1$ and $z + 3 = 3y + 2$, then what is the value of x when $z = 8$?

   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5

2. What is the value of w ?

   (1) w is a factor of 51

   (2) $w > 17$

   ○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
   ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ○ EACH statement ALONE is sufficient.
   ○ Statements (1) and (2) TOGETHER are not sufficient.

3. Is $k \leq p$?

   (1) $k > 0$

   (2) $k^3 = p$

   ○ Statement (1) ALONE is sufficient, but statement (2) is not sufficient.
   ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ○ EACH statement ALONE is sufficient.
   ○ Statements (1) and (2) TOGETHER are not sufficient.

4. What is the value of k ?

   (1) $2k^2 + 7k + 6 = 0$

   (2) $4k^2 + 12k + 9 = 0$

   ○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
   ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ○ EACH statement ALONE is sufficient.
   ○ Statements (1) and (2) TOGETHER are not sufficient.

5. If x, y, and z are consecutive negative odd integers such that $x > y > z$, is $xy > |z|$?

   (1) $z < -5$

   (2) $|x| > 1$

   ○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
   ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ○ EACH statement ALONE is sufficient.
   ○ Statements (1) and (2) TOGETHER are not sufficient.

GO ON TO THE NEXT PAGE.

6. If x and y are distinct non-zero integers, is
$$x < \left(x^2 - y^2\right)^{\frac{1}{3}} \ ?$$

   (1) $x^2 > y^2$

   (2) $x^3 < y^3$

   ○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
   ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ○ EACH statement ALONE is sufficient.
   ○ Statements (1) and (2) TOGETHER are not sufficient.

7. In the equation $ax^2 + bx + c = (3x - d)^2$, x is a non-zero variable and a, b, c, and d are constants. What is the value of d ?

   (1) $c = 9$

   (2) $a - x = 10$

   ○ Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
   ○ Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
   ○ BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
   ○ EACH statement ALONE is sufficient.
   ○ Statements (1) and (2) TOGETHER are not sufficient.

8. What is the cube root of the square root of 128 ?

   ○ $\sqrt[6]{2}$
   ○ $2\sqrt[6]{2}$
   ○ $2\sqrt[3]{2}$
   ○ $2\sqrt{2}$
   ○ 2

GO ON TO THE NEXT PAGE.

Sentence Correction

1. Rap artists had trouble breaking into the daily rotation of videos on television channels such as MTV in the 1980s, despite the fact that they had been gaining exposure on radio charts and in record stores for several years.

   ○ despite the fact that they had been gaining exposure on radio charts and in record stores for several years.
   ○ even though for several years they had gained exposure on radio charts and in record stores.
   ○ despite the fact that they had gained exposure for several years with radio charts and record stores.
   ○ despite the fact that for several years these artists gained exposure on radio charts and in record stores.
   ○ even though these artists had been gaining exposure on radio charts and in record stores for several years.

2. Writing in a style blending historical fiction and scientific dystopia, the novels of Octavia Butler, who has been called "the godmother of Afrofuturism," have won Hugo and Nebula awards as well as critical acclaim from sociologists for their exploration of racial and environmental issues.

   ○ the novels of Octavia Butler, who has been called "the godmother of Afrofuturism," have won Hugo and Nebula awards as well as critical acclaim from sociologists for their exploration of racial and environmental issues.
   ○ the novels of "the godmother of Afrofuturism," Octavia Butler, have won Hugo and Nebula awards as well as critical acclaim from sociologists for exploring racial and environmental issues.
   ○ Octavia Butler, who has been called "the godmother of Afrofuturism," has won Hugo and Nebula awards, as well as critical acclaim from sociologists for her novels' exploration of racial and environmental issues.
   ○ Octavia Butler, whose novels have won Hugo and Nebula awards as well as critical acclaim from sociologists for their exploration of racial and environmental issues, has been called "the godmother of Afrofuturism."
   ○ Octavia Butler's novels, called "the godmother of Afrofuturism," have won Hugo and Nebula awards as well as critical acclaim from sociologists for exploring racial and environmental issues.

GO ON TO THE NEXT PAGE.

3. Keeping a daily journal improves the organization of one's thoughts and yields quite a few spontaneous ideas about self-reflection <u>that, in turn, becomes the basis of new ambitions and initiatives.</u>

   - ◯ that, in turn, becomes the basis of new ambitions and initiatives.
   - ◯ that, in turn, become the basis of new ambitions and initiatives.
   - ◯ becoming, in turn, the basis of new ambitions and initiatives.
   - ◯ so as to become, in turn, the basis of new ambitions and initiatives.
   - ◯ that becomes the basis of new ambitions and initiatives in turn.

4. Research into information pollution—a term popularized by web usability experts—<u>have determined that the impact of disrupting information pollutants such as unsolicited electronic messages (spam) is less than that caused by</u> information overload due to the proliferation of social media platforms.

   - ◯ have determined that the damage caused by disrupting information pollutants such as unsolicited electronic messages (spam) is less than that caused by
   - ◯ have determined that the damage caused by disrupting information pollutants such as unsolicited electronic messages (spam) is less than that of
   - ◯ has determined that the damage caused by disrupting information pollutants such as unsolicited electronic messages (spam) is less than
   - ◯ has determined that the damage caused by disrupting information pollutants such as unsolicited electronic messages (spam) is less than that of
   - ◯ has determined that the damage caused by disrupting information pollutants like unsolicited electronic messages (spam) is less than that of

5. The leopard geckos that are native to dry and semi-desert areas in Afghanistan, unlike the Gold Dust Day Geckos found in Hawaii, <u>is crepuscular, as evidenced by its habit of "cruising" in search for food at dawn and dusk,</u> even though those held in captivity long term may adapt to their owners' schedules.

   - ◯ is crepuscular, as evidenced by its habit of "cruising" in search for food at dawn and dusk,
   - ◯ is crepuscular, in its habit of "cruising" in search of food at dawn and dusk,
   - ◯ are crepuscular, as evidenced by their habit of "cruising" in searching for food at dawn and dusk,
   - ◯ are crepuscular, in its habit of "cruising" in search of food at dawn and dusk,
   - ◯ is crepuscular, as evidenced by the habit of "cruising" in searching for food at dawn and dusk,

6. When held up to the backdrop of the night sky, <u>the circumference of an ordinary quarter held at arm's length appears greater than other much more distant objects, such as the full moon.</u>

   - ◯ the circumference of an ordinary quarter held at arm's length appears greater than other much more distant objects, such as the full moon.
   - ◯ the circumference of an ordinary quarter held at arm's length appears greater than other much more distant objects, like the full moon.
   - ◯ the circumference of an ordinary quarter held at arm's length appears greater than that of other much more distant objects, such as the full moon.
   - ◯ the full moon seems smaller than the circumference of an ordinary quarter held at arm's length, as it is more distant.
   - ◯ the full moon seems smaller than the circumference of an ordinary quarter held at arm's length, even though it is more distant.

GO ON TO THE NEXT PAGE.

7. The comedian's sharp movements and clipped delivery showed that he was <u>equally prone to show disrespect with his manager than</u> an audience member.

   ○ equally prone to show disrespect with his manager than

   ○ equally prone to show disrespect toward his manager just as he is with

   ○ equally prone to show disrespect with his manager as

   ○ as prone to show disrespect to his manager as

   ○ as prone to show disrespect to his manager as to

8. <u>Known primarily to locals before being discovered by MTV in the late 1980s, in Manhattan Blue Man Group, who started with a troupe of three performers, expanded to a rotating company of eight to nine professionals, who appeared</u> in trios at performances nationwide.

   ○ Known primarily to locals before being discovered by MTV in the late 1980s, in Manhattan Blue Man Group, who started with a troupe of three performers, expanded to a rotating company of eight to nine professionals, who appeared

   ○ Known primarily to locals in Manhattan before being discovered by MTV in the late 1980s, Blue Man Group started with a troupe of three performers and has since expanded to a rotating company of eight to nine professionals who appear

   ○ In Manhattan, Blue Man Group was known primarily to locals before being discovered by MTV in the 1980s, starting with a troupe of three performers, expanded to a rotating company of eight to nine professionals, who appeared

   ○ Originally a troupe of three performers who has since expanded to a rotating company of eight to nine professionals, Blue Man Group was known primarily to locals before being discovered by MTV in the 1980s in Manhattan, who appear

   ○ Blue Man Group was known primarily to locals in Manhattan before being discovered by MTV in the 1980s, and starting with a troupe of three performers, they expanded to a rotating company of eight to nine professionals, who appeared

GO ON TO THE NEXT PAGE.

9. A sea urchin can crawl slowly on its tube feet, sometimes propelling itself with its spine, and feeds primarily on <u>algae, occasionally eating slow moving animals such as</u> periwinkles or mussels.

- ⬭ algae, occasionally eating slow moving animals such as
- ⬭ algae, and will on occasion eat slow moving animals like
- ⬭ algae, and occasionally they will eat slow moving animals such as
- ⬭ algae, so that it occasionally eats slow moving animals like
- ⬭ algae, on occasion it does eat slow moving animals such as

10. <u>Standardized tests in elementary school were once administered every other year, but it was found by an educational commission to be both economical plus reliable to reduce the testing schedule to only two of the six elementary school years.</u>

- ⬭ Standardized tests in elementary school were once administered every other year, but it was found by an independent educational commission to be both economical plus reliable to reduce the testing schedule to only two of the six elementary school years.
- ⬭ Although standardized tests in elementary school were once administered every other year, an independent educational commission found that reducing the testing schedule to only two of the six elementary school years was both economical and reliable.
- ⬭ Since standardized tests in elementary school were once administered every other year, reducing the testing schedule to only two of the six elementary years was found by an educational commission both economical and reliable to reduce the testing schedule to only two of the six elementary school years.
- ⬭ Once administered every other year in elementary school, an independent educational commission found that reducing the standardized testing schedule to only two of the six elementary school years was both economical and reliable.
- ⬭ An independent educational commission, having found it to be both economical plus reliable to reduce the standardized testing schedule only two of the six elementary school years, which were once administered every other year in elementary school.

GO ON TO THE NEXT PAGE.

11. Use of renewable energy has gained popularity in the past decade, but in the United States <u>alternative energy sources, primarily hydroelectric, account for only ten percent of energy use</u>.

   ○ alternative energy sources, primarily hydroelectric, account for only ten percent of energy use.

   ○ alternative energy sources account for only ten percent of energy use, primarily being from hydroelectric sources.

   ○ ten percent of energy use is only from alternative energy sources, primarily hydroelectric.

   ○ primarily hydroelectric alternative energy sources only accounts for ten percent of energy use.

   ○ only ten per cent of alternative energy sources, primarily hydroelectric, account for energy use.

GO ON TO THE NEXT PAGE.

Reading Comprehension

Questions 1–3 are based on the following passage:

A mysterious new material is surprising scientists with its ability to conduct electricity without resistance (a measure of an object's
Line opposition to the flow of electric current) at
(5) close to room temperature, about 60 degrees Fahrenheit. While known superconductors typically function only in extremely frigid temperatures, though at atmospheric pressures, the new material only survives under very high pressures,
(10) such as those near the center of the Earth. Still, while the compound composed of carbon, sulfur, and hydrogen isn't immediately feasible for use, it demonstrates the possibility of zero-resistance materials that are functional at normal
(15) temperatures. Known technological uses for superconductors abound and include generators for wind turbines as well as magnetic resonance imaging machines. But the need for temperatures below –140 degrees Celsius for these common
(20) superconductors currently poses a significant limitation to their usage. Previously tested materials that demonstrated superconductivity comprised only two elements, and the copious research on such compounds means that they
(25) are well-understood. This three-component compound has expanded the possibilities for future superconductor research. Since such a combination is unique in its superconductivity, scientists cannot yet explain this material's
(30) properties or how it can function at such unusually high temperatures.

1. The primary purpose of the passage is to

   ◯ compare technologies in one field to those in another field
   ◯ determine the ideal temperature for a material
   ◯ evaluate the implications of a scientific discovery
   ◯ enumerate potential applications of a new technology
   ◯ speculate about potential future scientific developments

2. The author mentions the highlighted phrase most likely in order to

   ◯ explain how pressures vary in different regions of the Earth
   ◯ highlight a drawback of common superconductors
   ◯ compare the requirements of different superconductors
   ◯ describe the primary location in which superconductors function
   ◯ emphasize the difficulty of achieving extremely low temperatures

3. Each of the following is mentioned in the passage as a characteristic of the new material EXCEPT

   ◯ It is composed of three elements.
   ◯ It can function at temperatures above freezing.
   ◯ It requires high amounts of pressure.
   ◯ It could lead to new and useful technologies.
   ◯ It is well-understood.

GO ON TO THE NEXT PAGE.

Questions 4–6 are based on the following passage:

Mitochondrial DNA from both ancient and modern chicken specimens may provide evidence about the origin of these birds in South America.
Line Cooper's contradiction of Storey's hypothesis
(5) that the chicken was introduced to the region by traveling Polynesians hundreds of years ago is bolstered by evidence that chickens found in the two regions are genetically distinct. Cooper also challenges Burley's contention that Polynesians
(10) must have reached the New World because they found Easter Island and share common flora, such as the bottle gourd and sweet potato, with South America. Cooper's claim that a connection between the South Pacific islands and the South
(15) American continent does not exist is based upon his team's comparison of the DNA from chicken bones collected at Polynesian archaeological sites and feathers from modern Polynesian chickens with the DNA of both ancient and modern South
(20) American chickens.

However, modern DNA has limited applicability in determining the origin of a species in one part of the world. For instance, chickens, among other animals and objects, moved around the world
(25) as people traveled; the chickens on the Pacific Islands today do not necessarily represent those that existed in the region several centuries ago. Furthermore, Cooper's belief severs the historical connection between the regions and displaces the
(30) South American plants that are generally accepted as products of Polynesian trade. Therefore, Cooper's dispute may require a broader view of the strong research supporting both sides of the chicken origin debate.

4. The author of the passage mentions plants that are common to both South America and Polynesia most likely in order to

- ◯ suggest that DNA evidence is mainly useful for comparing modern species
- ◯ point out a potential challenge to the idea that South American chickens did not originate in Polynesia
- ◯ suggest that animals were involved in local, as opposed to international, trade
- ◯ suggest that the chicken probably arrived in South America not from Polynesia but from another region
- ◯ provide evidence that disproves Cooper's claim about the South American chicken's origin

5. The passage suggests which of the following about Cooper's DNA evidence?

- ◯ It did not provide a definitive indication of whether Polynesians traded with South Americans.
- ◯ It demonstrated that modern chickens in Polynesia were not related to ancient South American chickens.
- ◯ It used primarily modern, rather than ancient, genetic material.
- ◯ It is consistent with the prevailing theory regarding plants that occur in Polynesia and South America.
- ◯ It bolstered the theory that Polynesians introduced chickens to South America.

6. According to the passage, Cooper and Burley disagree on which of the following points?

- ◯ Whether voyaging Polynesians traveled to South America
- ◯ The idea that the South American sweet potato exists in Polynesia
- ◯ The time period in which chickens appeared in South America
- ◯ How Polynesians located Easter Island
- ◯ The extent to which modern DNA is useful in ascertaining the regional origin of a species

GO ON TO THE NEXT PAGE.

Questions 7–10 are based on the following passage:

Over the past century, the United States population has continued to grow and so has the amount of hurricane activity along the Gulf
Line and Atlantic coastlines. For meteorologists, a
(5) better understanding of storm frequency and characteristics can assist in hurricane forecasts, which in turn guides infrastructure planning and even insurance rates. Unfortunately, fewer than 200 years of historical weather records exist
(10) in the U.S., and in that time only a handful of category 5 hurricanes—the most destructive tropical cyclones—have made landfall. This paucity of data presents a challenge in accurately predicting the likelihood of future devastating
(15) storms. Consequently, some researchers have turned to a relatively new field, paleotempestology, which examines geologic evidence of prehistoric hurricane landfalls to better understand the frequency with which they occur.

(20) In one early study, Liu and Fearn extracted sediment samples from a lake in Louisiana that was isolated from the Gulf of Mexico by a narrow barrier beach: only a storm could cause water and materials to flow from the ocean to the lake.
(25) By analyzing the overwash layers, the layers of coarse beach sediment observable on the bottom of the lake, the scientists were able to produce a rough storm history for the region, dating back several thousand years. Some have questioned this
(30) method, however, as it does not conclusively verify the sediments' provenance.

Another paleotempestological strategy relies on offshore-indicative foraminifera, single-celled organisms that are similarly thought to have
(35) arrived in a body of water via storm surges. Unlike sediments, which may be of unknown origin, if a species of foraminifera is native to the sea, its presence in a body of water adjacent to a barrier beach provides more compelling evidence as to
(40) the necessity of a historic storm. Nonetheless, Hippensteel's and Martin's method, too, must be qualified: scientists disagree about precisely which taxa are considered "offshore-indicative," and dating methods used on foraminifera fossils merely
(45) demonstrate the age of the fossils, not necessarily when a hurricane might have occurred.

Although scientists have produced estimates of hurricane recurrence rates, the limitations of paleotempestological research temper the
(50) reliability of such predictions. Moreover, long-term changes in weather and climate affect the frequency of tropical storms, which further casts doubt on the field's ability to relate past storm data to the potential for future hurricanes.

7. Which of the following best describes the organization of the passage?

○ After introducing an area of research, the author outlines its history and then casts doubt on its credibility.
○ The author describes a problem, evaluates two approaches to the problem, and then questions the usefulness of a field of study.
○ The author explains the origins of a scientific field and refutes potential criticisms to the field.
○ After comparing two methodologies, the author demonstrates why one is superior to the other.
○ After illustrating a scientific dilemma, the author explores differing perspectives on the dilemma and then reconciles the viewpoints.

8. According to the passage, which of the following is a potential drawback to the sediment analysis method mentioned in the second paragraph?

○ Scientists' inability to easily access overwash layers deep below a lake
○ The difficulty in proving precisely where the sediments came from
○ Incomplete knowledge regarding what types of sediments might have oceanic origins
○ Disagreement among researchers as to the validity of fossil evidence
○ The lack of reliability in current methods for dating sediments

GO ON TO THE NEXT PAGE.

9. It can be inferred from the passage that the two research methods described in the passage have which of the following in common?

    ◯ They involved bodies of water that were not connected to oceans.
    ◯ They were conducted in Louisiana.
    ◯ They did not provide useful paleotempestological data.
    ◯ They used historical records in conjunction with ecological data to construct storm timelines.
    ◯ Their validity has been rejected by most meteorologists.

10. Each of the following is mentioned as a potential benefit of paleotempestological research EXCEPT

    ◯ the ability to predict hurricanes
    ◯ accurate regional insurance rates
    ◯ planning of structural facilities
    ◯ a greater understanding of hurricane patterns
    ◯ preventing destructive hurricanes

GO ON TO THE NEXT PAGE.

Critical Reasoning

1. **Grocer:** Organic produce requires less pesticide use than conventionally grown produce. Pesticides impact the health of the ecosystem, which affects the health of consumers. Shoppers can realize health benefits by buying produce that is organically grown and can become more health-wise and prone to choose organic produce through strategic marketing. Therefore, a nationwide mailing campaign of a brochure extolling the benefits of organic produce will help the ecosystem of our entire country.

   Which of the following, if true, poses the most serious challenge to the argument?

   ○ The negative impact on the ecosystem from the pollution and waste generated by the national mailing campaign will meet or exceed the positive environmental impacts from more people eating organic produce.

   ○ Eating a healthy diet is only one part of what it takes to lead an environmentally-friendly lifestyle.

   ○ Organic produce is already available in nationwide grocery chains in every major city.

   ○ The exact health benefits realized by consuming organic produce cannot be estimated for the nation as a whole.

   ○ Conventional produce will make up a smaller proportion of the produce departments in grocery stores in the future.

2. The Mohs scale of mineral hardness categorizes the ability of one natural sample of mineral to make a visible scratch on another mineral. To measure the hardness of a certain mineral X on the scale, one finds the hardest mineral that mineral X can scratch, or the softest mineral that can scratch mineral X. However, at times, minerals that are classed as lower hardness on the Mohs scale can create microscopic disruptions on minerals that have a higher Mohs hardness. These microscopic disruptions can sometimes damage the structural integrity of the harder mineral.

   Which of the following, if true, most helps to explain how minerals lower on the Mohs scale can still affect minerals that are higher on the Mohs scale?

   ○ Microscopic disruptions are not considered "scratches" for the determination of a Mohs scale number.

   ○ The Mohs scale was created in 1812 without the more complete knowledge of mineral hardness that exists today.

   ○ The softer minerals' impact on the harder minerals is imperceptible to the naked eye.

   ○ Such anomalies do not exist when using the Vickers scale, which is a more precise measure of mineral hardness than the Mohs scale.

   ○ Minerals that are scratched often bear some residue of the mineral that inflicted the scratch.

GO ON TO THE NEXT PAGE.

3. A student response survey found that students who paid for 10 or more in-person tutoring sessions on an hour-by-hour basis missed or rescheduled a session on average once every five sessions. By contrast, those students who purchased tutoring sessions in ten-hour packages missed or rescheduled a session on average only once every ten sessions. This indicates that students are at least partly motivated by the amount of money they have invested for in-person tutoring.

   Which of the following, if true, calls into question the explanation above?

   ○ The price per hour was slightly more expensive for those who bought individual hours.
   ○ Many students who missed or rescheduled sessions did so although they made a strong verbal commitment beforehand to be present.
   ○ All students must pay a 10% fee for rescheduling any tutoring session, but if a student cancels a session entirely, the entire cost is forfeited.
   ○ Upon purchase of any tutoring hours, students are required to immediately schedule all the purchased hours.
   ○ Students who try to reschedule tutoring sessions without enough notice may not be able to make up the session in a timely fashion, so that it counts as a missed session.

4. **Graduate Student:** While there is no doubt that the themes in my new thesis *An Examination of Warp Protocols* echo the themes in the latest quantum physics textbook of my respected mentor, titled *Hypotheses in Hyperspace*, the accusations of plagiarism I face from the committee are invalid. Although both works take similar positions on a relatively new field, I had never read my mentor's textbook, which was published three months ago, before completing my thesis.

   Which of the following, if true, provides the most support for the graduate student's position?

   ○ An abstract of *Hypotheses in Hyperspace* had appeared in a widely circulated physics journal a year and a half prior to the book's publication.
   ○ The themes explored in the thesis and the textbook are both founded on, and extensions of, prior research by a renowned physicist.
   ○ The textbook was published by a company that devotes most of its catalogue to chemistry texts.
   ○ Since the book's publication, other students who have been mentored by the author of *Hypotheses in Hyperspace* wrote papers exploring themes in that book.
   ○ The author began writing *Hypotheses in Hyperspace* before the graduate student began writing *An Examination of Warp Protocols.*

GO ON TO THE NEXT PAGE.

5. **Psychologist:** Negotiators who lie regularly to cover up mistakes or to form new business alliances know that "truth adherence"—the closeness with which a story aligns to the known facts—is more likely to win a listener's trust than a completely unfamiliar story with corroboration from others. Clearly, people are more willing to trust a story that feels familiar but has a few inconsistencies, than a story that is entirely new but completely verifiable.

Which of the following most seriously calls into question the psychologist's conclusion?

○ Negotiators who are regular liars are only slightly more likely than others to use stories that have "truth adherence" to form new business alliances.

○ Although an entirely false story would immediately put the listener on guard, negotiators who are regular liars would never use such a tactic.

○ Most people who negotiate do lie once in a while, but only a very few do so regularly.

○ People tend not to become negotiators unless they already have a tendency to lie on a regular basis.

○ People are more likely to trust a negotiator if they have been referred by friends in common or trusted business acquaintances.

6. The aeronautics commission recently released a report detailing a problem with the thrusters on the newly developed XR rocket. The rocket was designed to explore the near planets in the solar system but not within the orbit of the Moon. Federal regulations require the public to be alerted about any flaw in the design of spacecraft intended primarily to traverse space within the Moon's orbit, but not further out in space. However, the aeronautics commission decided to release its report as soon as the flaw was discovered.

Which of the following, if true, most helps to explain the decision by the aeronautics commission?

○ Until the government decided on the current regulations, the regulatory committee considered implementing stricter regulations that would require public disclosure of problems with any sort of spacecraft.

○ Spacecraft designed for traversing space solely within the orbit of the Moon have a greater likelihood of impacting the earth in the event of a problem.

○ The admission of a design flaw is not enough to deter the public from supporting future developments in space exploration technology.

○ Funding for future spacecraft might be affected if the flaws in the current rockets are made public.

○ The aeronautics commission has recently received negative publicity for a lack of transparency regarding craft design.

GO ON TO THE NEXT PAGE.

7. Prima ballerinas typically begin training between the ages of five and eight. Many ballet enthusiasts believe there is a distinct advantage not only in sheer years of training but also because the early exposure to dance helps shape young muscles develop. However, even though many prima ballerinas begin their overall training at a younger age, **they do not go on pointe any earlier than other ballerinas, typically between the ages of 10 and 12.** Since the bones of the foot require time to mature, many ballet instructors delay pointe work until this age. Therefore, it's more likely that instead of early work shaping the ballerina's muscles towards expertise, **the gifted young performer naturally gravitates toward ballet classes.**

The portions in bold play which of the following roles in the argument?

○ The first is a claim that the argument sets out to dispute, the second is the conclusion formed on the resolution of that dispute.

○ The first is evidence against a common belief, the second is that common belief.

○ The first is evidence in support of a position with which the argument disagrees, the second is that position.

○ The first is evidence that supports an alternative explanation for a phenomenon, the second is the refutation of that explanation.

○ The first offers support for a position the argument advocates, the second is that position.

8. There are many websites that offer metrics for evaluating college-level writing. Nevertheless, professors should never allow students to use these websites to evaluate the merits of their own essays assigned in the course. While the metrics are written to allow easy comprehension, the proper application of the metrics to the specifics of the essay requires a disinterested, objective perspective.

Which of the following, if true, most strengthens the argument?

○ The student who spent time researching and crafting an essay is usually in a better position to evaluate the merits of the essay than a professor who typically only reads the essay once.

○ In order to evaluate an essay, one must have some knowledge of the background topic of the essay.

○ Few students evaluate the essays that other students have written for the same assignment and so lack a broad perspective on what makes an essay worth merit.

○ Any essay written by a college student, when evaluated using these metrics, will demonstrate less merit than would an essay written by a professional writer.

○ For the purposes of a college course, anonymous peer review is the best method of assessing the merits of an assigned essay.

9. Running shoes have to be replaced periodically since the repeated force of impact wears down the sole and collapses the insole. High-tech running shoes that incorporate memory foam and gel inserts adapt to the individual stride, last much longer, and contribute to improved running performance. However, ordinary running shoes cost much less and casual runners do not get enough use out of high-tech shoes to justify the expense of the materials. Therefore, for most runners, high-tech running shoes do not save money.

   Which of the following would be most useful to know in evaluating the argument?

   ◯ If there are shoe materials that increase running performance but do not cost as much as memory foam and gel inserts

   ◯ Whether casual runners are interested in improved running performance

   ◯ How the price of the materials typically used in high-tech running shoes compares to that of materials used in high-tech shoes tailored to other sports

   ◯ The length of time an ordinary running shoe and a high-tech running shoe can be used before needing to be replaced

   ◯ Whether the shoes would be used for any other sport or recreational activity aside from running

10. The election committee in the country of Jana analyzed the records of the Ostrich political party in light of new information about the opposing political party, the Prawn party. The analysis revealed that every year for the last 40 years, the Ostrich party's projections of what Prawn party political donations would be 3 years later was wrong by an average of 22%. The review also revealed that in every year for the last 40 years, the Ostrich party estimate of the Prawn party political donations for the previous year—which the Prawn party never released for public information—was only off by an average of 0.2%.

    Which of the following claims is most strongly supported by the information given?

    ◯ Prawn party political donations fluctuated widely in the last 40 years.

    ◯ Prior to the new information, the Prawn party had not intentionally released data intended to mislead the Ostrich party's projections.

    ◯ The average percent by which the Ostrich party's projections of the Prawn party political donations were wrong increased over time.

    ◯ Even before the new information was released, the Ostrich party had reason to believe their projections were incorrect.

    ◯ The Ostrich party's projections had no impact on the country of Jana.

END OF DIAGNOSTIC TEST