


Practice ISEE #3: Answer Explanations

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Verbal Reasoning - Synonyms

1. HOMOGENEOUS = of the same kind or being similar in nature; uniform composition

A. hominid member of primate family including humans	B. identical alike in every way	C. intelligent mentally able; sensible or rational	D. luminous emitting or reflecting light
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2. MELANCHOLY = feeling or causing sadness

A. cheerful happy and optimistic mood or nature	B. droll amusing in a wry or odd way	C. glum quietly melancholic or miserable	D. tolerant accepting different views
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3. AMITY = friendliness and peaceful relations

A. benevolence showing kindness or goodwill	B. chaos complete disorder and confusion	C. loathing intense dislike of somebody or something	D. penchant liking or tendency of something
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4. DOWDY = unattractively plain and unfashionable

A. amazing outstandingly good, skillful or admirable	B. joyous making people happy or joyful	C. plain not pretty or good- looking	D. rich costly and fine
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5. PARAMOUNT = greatest in importance or significance

A. incapable lacking necessary ability to do something	B. justified having acceptable reason for the action taken	C. personable pleasant and polite	D. utmost greatest degree, number, or amount
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6. SEEDY = shabby, dirty-looking, and often disreputable

A. growing becoming more intense or greater in size	B. nurtured cared for and developed	C. shabby poorly maintained and falling apart; dirty	D. warlike hostile and inclined to fight
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7. PARTISAN = showing strong and usually biased support for a cause

A. biased unfairly preferred over other causes	B. senatorial relating to senate or the post of senator	C. troubled experiencing worry or distress	D. unbiased fair and impartial rather than prejudiced
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8. PREROGATIVE = individual right or privilege to make decisions, usually restricted to select few

A. alteration a change or modification made to something	B. female relating or belonging to women or girls	C. mind seat of thought and memory	D. privilege rights and advantages enjoyed by elite
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9. RAUCOUS = loud and harsh-sounding; noisy

A. boisterous noisy, energetic, and rowdy	B. fascinating inspiring great interest or attraction	C. patriotic supporter of own country	D. violent using physical force to damage something
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10. ETHOS = fundamental character of a group, typically expressed in habits and beliefs

A. appearance outward aspect of somebody or something	B. character distinctive qualities of one's mind and beliefs	C. emotion strong feeling about something or somebody	D. logic sensible rational thought and argument
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11. LUCRATIVE = producing profit or wealth

- | | | | |
|--|------------------------------------|---|---|
| A. comparable
as good as another or
each other | B. dubious
unsure about outcome | C. futile
having no practical effect
or useful result | D. profitable
yielding a financial
profit; useful |
|--|------------------------------------|---|---|

12. EPITOME = highly representative example of a type, class, or characteristic

- | | | | |
|--|---|---|--|
| A. manuscript
book or other text
written by hand | B. parody
satirical and deliberate
imitation of something | C. personification
embodiment or perfect
example of something | D. song
instrumental work in
vocal style |
|--|---|---|--|

13. SPURIOUS = different from what it is claimed to be, not authentic, or not valid

- | | | | |
|---|--|--|---|
| A. absolute
unequivocal or
unmodifiable | B. inauthentic
not authentic or genuine | C. incriminating
make appear guilty | D. stimulating
encouraging something
to greater degrees |
|---|--|--|---|

14. CONVOCATION = a large formal assembly

- | | | | |
|--|--|--|---|
| A. assembly
a formal gathering of
people | B. dialogue
formal discussion or
negotiation | C. lecture
instructional speech on a
subject | D. memory
ability to retain
knowledge |
|--|--|--|---|

15. PERIPHERAL = at edge of something or not significant

- | | | | |
|---|--|--|--|
| A. centered
placed in the middle or
well-balanced | B. outlying
far from the central part
of a place or region | C. significant
meaningful or
momentous | D. vision
ability to anticipate
possible future events |
|---|--|--|--|

16. PHLEGMATIC = generally unemotional and difficult to arouse; unexcitable

- | | | | |
|---|--|--|---|
| A. composed
not agitated or distracted | B. hasty
done in a hurry due
impetuosity | C. practical
appropriate and sensible | D. sickly
unhealthy or tending to
be frequently ill |
|---|--|--|---|

17. PARSIMONIOUS = very frugal or ungenerous

- | | | | |
|---|---|---|--|
| A. generous
willing to give money,
help, or time freely | B. religious
believing in a higher
power or being | C. thrifty
careful with money and
resources | D. vegetative
having sedentary
lifestyle |
|---|---|---|--|

18. EXONERATE = free somebody from blame or guilt

- | | | | |
|--|---|--|--|
| A. denounce
criticize somebody or
something publically | B. isolate
separate something or
somebody from others | C. judge
form opinion of
something or somebody | D. pardon
release from punishment
or guilt |
|--|---|--|--|

19. MACABRE = including gruesome and horrific details of death and decay

- | | | | |
|---|--|---|---|
| A. dramatic
exciting and intense;
sudden and marked | B. gruesome
horrifying and disturbing | C. opportune
fitting and fortunate at
just the right time | D. verdant
green with vegetation or
foliage |
|---|--|---|---|

20. ASYLUM = protection from danger or imminent harm provided by a sheltered place

- | | | | |
|--|--|--|---|
| A. criminal
somebody acting illegally | B. insanity
lack of reason or good
sense | C. sanctuary
safe place protecting
from harm | D. warden
principal officer in
charge of a prison |
|--|--|--|---|

Verbal Reasoning - Sentence Completions

21. Though only four years old, Erin is quite precocious due to her large vocabulary and skill with the piano. B

Explanation “Though only four years old” indicates the rest of the sentence will be in contrast with what is expected of a four year old. Thus, the blank is a word that fits the spirit of this context. The definition of precocious is mentally advanced for age.

22. As an atheist, he does not believe that any sort of deity governs this universe. A

Explanation The comma indicates the second part of the sentence defines the blank in the first part. The definition of atheist is somebody who does not believe in God or deities.

23. The new business plan was ratified by three-fourths of the executive board and immediately took effect. D

Explanation Since the business plan “immediately took effect,” we know that the executive board approved the plan. Thus, we need a word that means approved. The definition of ratified is formally approve something.

24. Although sugar is the antithesis of salt, combining the two seasonings together sometimes creates a balanced flavor. A

Explanation “Although” indicates that the second part of the sentence is in contrast with the blank. If the second part states the combination of sugar and salt creates balance, the blank is a word that is opposite of balance or shows that sugar and salt are different. The definition of antithesis is direct opposite of something.

25. She swiftly resigned after he boss’s long and inappropriate harangue against her and her coworkers. C

Explanation The context of the sentence is negative, as is our blank. If she resigned, the boss may have been attacking her in some way. The definition of harangue is to criticize or question somebody, usually in a forceful and angry way.

26. The derelict property is an eyesore among the manicured lawns and gardens of the neighborhood. C

Explanation The keywords here are “eyesore” and “manicured,” which are in contrast with one another. If the property is in contrast with the well-cared for lawns and gardens, it is not well-cared for. The definition of derelict is in poor condition due to neglect.

27. Playing off of people’s fears of sickness, Trent would often malingering to get out of work. D

Explanation The first part of the sentence shows Trent is doing something with sickness to get out of work. The definition of malingering is to pretend to be sick to get out of work.

28. The evidence was irrefutable, and he was sentenced to 20 years in prison the next day. B

Explanation The state of the evidence caused the man to be sent to jail the very next day. This indicates the blank makes the evidence unquestionable and strong. The definition of irrefutable is impossible to refute or disprove.

29. Humans are known to thrive in ecosystems with abundant water and food sources. D

<i>Explanation</i>	Humans need food and water to survive. If an ecosystem has “abundant” sources of food and water, then humans will survive and thrive well. The definition of thrive is to grow vigorously and healthily or do well.
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30. At the end of the controversial lecture, an outspoken student stood up to vehemently gainsay the speaker’s claims. A

<i>Explanation</i>	If the lecture was controversial, then it went against what is normally accepted. An outspoken student would regularly speak his mind on any topic and would speak against the speaker’s claims. The definition of gainsay is to deny something.
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31. Patrick lived by the aphorism “an apple a day keeps the doctor away,” but often contracted illnesses anyway. B

<i>Explanation</i>	“an apple a day keeps the doctor away” refers to eating apples to keep from having to see a doctor. “anyway” indicates that Patrick still gets sick, which is our second blank. The first blank is what kind of statement “an apple...” is. The definition of aphorism is a general truth, while the definition of contracted is get illness.
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32. The level of passion the team’s fans showed at games ran the gamut from disinterested to fanatical. C

<i>Explanation</i>	“level of passion” indicates the fans will demonstrate different levels of interest in their team’s performance at games. The first blank is a word for the range of passion felt, and the second blank will be the complete opposite of disinterested. The definition of gamut is the entire range of something, while the definition of fanatical is extremely enthusiastic.
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33. The scientist was indifferent with his personal hygiene, and his body odor was far from aromatic. C

<i>Explanation</i>	“body odor” indicates the scientist smells and must not care about the fact he smells. The first blank is a word that doesn’t care about hygiene, and the second blank is a word that is in contrast with body odor. The definition of indifferent is not caring about, while the definition of aromatic is having pleasant smell.
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34. The charitable donation by the recluse to the orphanage belied his tendency towards misanthropy. B

<i>Explanation</i>	If the man is a recluse, he is apart from society and chose to be that way, which refers to the second blank. Since he donated money to the orphanage, the first blank will be in contrast with the second blank in some way. The definition of belied is contradicted, while the definition of misanthropy is hating people.
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35. Mike’s thrifty approach to spending led to a plethora of cash in his checking account that he later used to fund a round-the-world cruise. D

<i>Explanation</i>	If Mike is cruising around the world, then he is spending a large amount of money. Thus, his spending habits (first blank) result in a large amount of money (second blank). The definition of thrifty is to be careful with money, while the definition of plethora is a large or excessive amount or number.
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36. After concert ticket sales plummeted, the band went on a hiatus to spend time reinventing their music and image. A

<i>Explanation</i>	If ticket sales plummeted, no one was interested in seeing or hearing the band's music. Thus, the first blank indicates the band went away for a while to fix this problem (second blank). The definition of hiatus is a pause or break, while the definition of reinventing is to create new version of something.
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37. Phil has this annoying idiosyncrasy where he forswears something but picks it right back up again the following day. A

<i>Explanation</i>	If Phil is picking up something again the next day, he got rid of it the day before (second blank). If Phil regularly does something, it is a habit of his (first blank). The definition of idiosyncrasy is an unusual habit or way of behaving, while the definition of forswears is to vow to stop doing, having, or using something.
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38. The club had one caveat to membership: any mention of the club would lead to the member being ostracized from the club. C

<i>Explanation</i>	"from" indicates that the second blank refers to a member doing something away from the club. The first blank is a word that means one thing is needed for membership, which is defined by the statement after the colon. The definition of caveat is something said as a warning, caution, or qualification, while the definition of ostracized is to banish or exclude from society or particular group.
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39. Not normally one to mince words, Kelly broached her concerns for the company's future before the executive board with discretion. C

<i>Explanation</i>	"Not" indicates the first and second blank will be in contrast with how Kelly normally handles her words. If Kelly is expressing her concerns before the executive board, the people who make the decisions, she will need to be careful with how she states things. The definition of mince is speak daintily or carefully, while the definition of discretion is done with tact or good judgment to avoid embarrassing or upsetting others.
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40. Though they represent grotesque creatures, gargoyles are actually waterspouts that keep rainwater from eroding the mortar in walls. D

<i>Explanation</i>	The first blank refers to the look of the gargoyles, while the second blank refers to the gargoyles keeping rainwater away from the mortar. The definition of grotesque is misshapen (especially in a strange or disturbing way), while the definition of eroding is gradually wearing away something by water or wind.
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Quantitative Reasoning

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1. {books, box of tissues, calculator, notebooks, paper, paperweight, pencils, pens} D
- Tools:* set notation
- Steps:*
- (1) Lawrence's locker (L), written in alphabetical order using set notation is: $L = \{\text{books, box of tissues, calculator, notebooks, pencils}\}$
 - (2) Lawrence's desk (D), written in alphabetical order using set notation is: $D = \{\text{box of tissues, calculator, paper, paperweight, pens}\}$
 - (3) Using the definition of Union (\cup), we combine all elements of L and D without repeating an element to create a new set, $L \cup D$
- Quick Tips:*
- Union (\cup) means to combine the elements of the given sets without repeating elements
-
2. y^4 A
- Tools:* powers and roots
- Steps:*
- (1) We need x by itself, so we need to raise both sides of the equation to the power of $\frac{1}{4}$, the reciprocal of the exponent of x
 - (2) $(x^4)^{\frac{1}{4}} = (y^{16})^{\frac{1}{4}} \rightarrow x = y^4$
 - (3) Now, x is by itself and written in terms of y
- Quick Tips:*
- To get a in terms of b , a needs to be by itself on one side of the equal sign
 - To get rid of an exponent, raise the root to the reciprocal of its exponent; that creates an exponent of 1
-
3. 50.25% C
- Tools:* systems of linear equations, percentages
- Steps:*
- (1) Call votes for Lemon A and votes for Lime B
 - (2) We know $A + B = 4,000,000$, or total votes for Lemon and Lime equal 4,000,000
 - (3) We also know that $A = B + 20,000$, or votes for Lemon equal 20,000 more than votes for Lime
 - (4) Using substitution, we find $A = 2,010,000$ and $B = 1,990,000$
 - (5) To get percentage of votes for Lemon we must divide A by 4,000,000 $\rightarrow \frac{2,010,000}{4,000,000} = .5025$, or 50.25%
- Quick Tips:*
- It may be faster to subtract in your head using logic to determine the number of votes for Lemon and Lime. Then, the work comes down to finding the percentage
-
4. 0.01 A
- Tools:* functions
- Steps:*
- (1) From the given information, we know b must be less than 0.05
 - (2) Answer choice A is the only value that is less than 0.05
- Quick Tips:*
- Don't let unusual symbols confuse you; use your knowledge of replacing variables with number values as you normally would
-

5. 4 faces

B

Tools: surface area

Steps: (1) Surface area of one side of the cube equals $s^2 \rightarrow s = 3 \rightarrow 3^2 = 9 \text{ in}^2$

(2) Two sides of the cube equal $9 + 9 = 18 \text{ in}^2$

(3) The white faces of the cube equal 18 in^2

(4) Therefore, there are two white faces, which leaves four faces that must be black

Quick Tips: • Draw a cube with the appropriate measurements to help visualize the problem

6. 2

C

Tools: functions

Steps: (1) Find the lowest y -value on the graph (the minimum), which is at $y = -4$

(2) The x -value at $y = -4$ is $x = 5$

(3) Using the given equation, if we set $x + 3$ equal to 5, we find that $x = 2$

Quick Tips: • Don't rush! One of the answer choices is 5, but that is not the final answer

7. $\frac{4}{5}$

D

Tools: ratios and proportions, triangles

Steps: (1) Recognize that the triangles are similar by the shared degree value of x° and that the smaller triangle is contained within the larger triangle

(2) Since the triangles are similar, their side lengths are proportional in some way

(3) The side lengths opposite angle A is $60 : 75$ or $\frac{60}{75}$

(4) $\frac{60}{75} = \frac{4}{5}$, which means that all side lengths will have this ratio

(5) The quotient of AB and AC will be the same thing: $\frac{60}{75} \rightarrow \frac{4}{5}$

Quick Tips: • If two of the angles in one triangle have the same degree values in the second triangle, then the triangles share the same degree values for all three angles

• Similar triangles share the same angle values but not the same side lengths

8. 10 miles

C

Tools: triangles

Steps: (1) Draw a picture and connect the ending points of both campers; this creates two congruent right triangles

(2) If they walk for 45 minutes at 4 mph, then they have each walked 3 miles

(3) If they walk another hour at 4 mph, then they have each walked 4 miles

(4) The legs of each triangle are 3 and 4, which means they are special right triangles with hypotenuses equal to 5

(5) The distance between the campers is equal to the length of both hypotenuses put together, which is 10

Quick Tips: • Drawing a picture can help you to visualize the word problem

9. 12

D

Tools: arithmetic word problem*Steps:* (1) If Kaitlyn is twice as old as her brother ten years ago, then we set up our equation with both ages subtracted by 10

(2) $K - 10 = 2(B - 10)$

(3) Now, Kaitlyn is only two years older than her brother, so we set up our second equation as $K = B + 2$ (4) Substitute $B + 2$ for K in the first equation to find the current age of her brother

(5) $(B + 2) - 10 = 2B - 20 \rightarrow B - 8 = 2B - 20$

(6) $B - 8 = 2B - 20 \rightarrow B = 12$

Quick Tips: • 10 years is subtracted from the brother's current age and not the equivalent of Kaitlyn's age, which would be double the brother's age

10. 95°

B

Tools: types of angles*Steps:* (1) Recognize that adding the angles, making a full circle, will equal 360°

(2) Add all angles you know: $90^\circ + 20^\circ + 120^\circ + 35^\circ = 265^\circ$

(3) Subtract 265° from 360° to get 95° *Quick Tips:* • The angles formed by segments that meet at the same vertex sum to 360°

11. 64

C

Tools: area*Steps:* (1) Sketch a graph of the square

(2) Notice each side of the square is equal to 8 (the absolute distance from -4 to 4 is 8 in all cases)

(3) Area = $8 \times 8 = 64$

Quick Tips: • Drawing a picture can help you to visualize the word problem

12. 18

D

Tools: sequences*Steps:* (1) We only need to write out the first three terms: $2c, c, \frac{c}{2}$, which sum to 31.5

(2) Solving for c yields 9: $3.5c = 31.5 \rightarrow c = 9$

(3) The question asks for $2c$, which equals 18*Quick Tips:* • Always reread the final question; the answer choices may be set up to trick you if you are rushing

13. $13z$

D

Tools: operations on algebraic expressions*Steps:* (1) Factor out a common factor of 26 and 52 in the second expression, which is 13:
 $26x + 52 = 13(2x + 4)$

(2) Substitute $2x + 4$ for z : $13(2x + 4) = 13(z)$

Quick Tips: • Ask yourself, "How can I make one algebraic expression look like the other?"

14. Variable B

B

Tools: number lines

Steps: (1) Solve: $-\left(\frac{1}{2}\right)^2 = -\frac{1}{4}$, which is where variable B lies on the number line

- Quick Tips:*
- Try to simplify values where possible
 - Follow PEMDAS

15. 41

C

Tools: number types, powers and roots

Steps: (1) Write out a few perfect squares, starting with 1, 4, 9, etc.

(2) Then add 5 to each of these in your list

(3) Find the answer choice which appears in your list

- Quick Tips:*
- Nonzero integers include negative numbers, but negatives square to become positive numbers, so all values for n^2 are positive

16. 25%

A

Tools: arithmetic word problems; multiplying polynomials

Steps: (1) If length is l and width is w , then length increased by 50% is $l + 0.50l$ and width decreased by 50% is $w - 0.50w$

(2) The original area equals l times w , so the new area equals the product of $l + 0.50l$ and $w - 0.50w$, or $(l + 0.50l)(w - 0.50w)$

(3) If we use FOIL to multiply this out, we get $0.75lw$; this is a 25% decrease in the original area lw

- Quick Tips:*
- When dealing with percentages, it does not matter what the values of a shape's side lengths are; using variables will suffice

17. $x - 2$

C

Tools: factoring algebraic expressions, operations on algebraic expressions

Steps: (1) We need to factor the numerator in order to simplify this expression; doing so yields a numerator of $2(x - 2)(x + 5)$

(2) Factoring the denominator yields $2(x + 5)$

(3) The 2 and $(x + 5)$ in the numerator and denominator divide to 1, so we are left with $(x - 2)$

- Quick Tips:*
- When addition and subtraction are involved in a fractional algebraic expression, you must try to factor before you can divide or "cancel" any terms

18. $-1 < c < 0$

B

Tools: number types

Steps: (1) Variable a is positive and b is negative, so ab will always be negative; that eliminates answer choices A and D

(2) The difference between answer choices B and C is that c (or ab) can be -1 and 0 in answer choice C; no combination of ab will yield -1 or 0

(3) Therefore, B is the correct answer choice

- Quick Tips:*
- It may help to pick values for a and b to guess and check, but eliminating answer choices first will save time

19. $-x^2 - 4x - 3$

A

Tools: quadratic equations and their graphs*Steps:* (1) Notice the parabola is facing down, so the coefficient in front of the x^2 must be negative; this eliminates answer choice B

(2) You could find the vertex for each answer choice to find the right equation

(3) However, notice that the graph's y -intercept is -3 (4) If you input 0 for x , answer choice A is the only equation where $y = 3$ *Quick Tips:* • Another way to solve would be to take an x -value, such as -2 , and plug into each equation to solve for y ; the equation that yields the appropriate y -value to match the graph would be the correct choice

20. The two values are equal

C

Tools: powers and roots; operations on algebraic expressions*Steps:* (1) $(x^0)^5 = (1)^5 = 1$ (2) $\frac{(x)(x^2)(x^4)}{x^7} = \frac{x^7}{x^7} = 1$ *Quick Tips:* • No need to try to solve for x , these are expressions not equations

21. The LCM of 15 and 22 is the greater value

B

Tools: factors and multiples*Steps:* (1) Since 15 and 22 have no common factors, their least common multiple (LCM) is $15 \times 22 = 330$

(2) The LCM of 24 and 30 is 120; one way to find this is to count by multiples of 30 until you reach a value that is also a multiple of 24

(3) $330 > 120$ *Quick Tips:* • Once you realize 15×22 is greater than 120, there is no need to multiply 15×22 out; this will save time

22. The percentage increase of the triangle's area is the larger value

B

Tools: rules for triangles*Steps:* (1) Although it is possible, it would take too much time to try to find the change in area and perimeter in a triangle with our own values for its measurements

(2) Instead, test the changes that occur with a more simple scenario, such as increases the side lengths of a triangle by 100%

(3) If our triangle is a $3 : 4 : 5$ triangle, we'd increase its measurements to $6 : 8 : 10$

(4) The perimeter of the first triangle is 12, while the perimeter of the changed triangle is 24, or a 100% change

(5) The area of the first triangle is 12, while the area of the changed triangle is 48, or a 300% increase

(6) This test will be true for all instances, where the change in perimeter will not be as great as the change in the area of a triangle

(7) Think of it this way: increasing the values will increase those same values' product more than their sum

Quick Tips: • For questions that test properties of geometric shapes, you can answer some questions faster by testing out simpler scenarios

23. The number of subsets in set A is the greater value

A

Tools: set notation

- Steps:*
- (1) Set A has 3 elements, so it has 2^3 subsets, or 8 subsets
 - (2) Even whole numbers from 2 to 10 include: 2, 4, 6, 8, 10, which is only 5 elements
 - (3) $8 > 5$

- Quick Tips:*
- Determine the number of subsets by using 2^n , where n is the number of elements in the set

24. The two quantities are equal

C

Tools: permutations, fractions

Steps: (1) In Column B, when you divide by a value you are actually multiplying by its reciprocal

$$(2) 2 \div \frac{1}{4 \times 90} \rightarrow 2 \div \frac{1}{360} \rightarrow 2 \times \frac{360}{1} = 720$$

(3) Since the order matters in a batting lineup, we use permutations $\left(\frac{n!}{(n-r)!}\right)$

$$(4) \frac{6!}{(6-6)!} \rightarrow \frac{6!}{0!} \rightarrow \frac{6!}{1} \rightarrow 720 \text{ combinations}$$

- Quick Tips:*
- Who bats when affects the outcome of the game, so order matters here

25. x is the greater value

A

Tools: slope, ratios and proportions

Steps: (1) Understand that slope is a ratio of the change in y over the change in x

(2) If y is 50, then the change in y is also 50

(3) To determine the change in x , or the length of x , we set up a proportion and cross-multiply

$$(4) \frac{1}{3} = \frac{50}{x} \rightarrow 150 = x \text{ (} 150 > 132 \text{)}$$

- Quick Tips:*
- The change in y and x refers to the difference between the x and y coordinates of two points

26. The relationship cannot be determined from the information given

D

Tools: powers and roots

Steps: (1) For Column A, $\frac{x^{34}}{x^{27}} = x^7$

(2) For Column B, $\sqrt[3]{x^{12}} = x^4$

(3) While Column A would seem the greater value, we do not know the value of x

(4) If we input 1, the values are equal

(5) If we input -1, Column B is greater

(6) Our answer changed, thus the true answer for this question is D

- Quick Tips:*
- While it might seem like a good idea to assume that the answer is D whenever the values of the variables is unknown, it is best to input simple values for the variables to make sure your assumption is correct
 - Sometimes rules come into play that eliminate D as a possible answer

27. The positive result from $|2x - 3| - 4 = 3$ is the greater value

B

Tools: absolute value, algebraic equations

Steps: (1) Solve the equation to find the two values for x , $|2x - 3| = 7$

(2) $2x - 3 = 7 \rightarrow 2x = 10 \rightarrow x = 5$

(3) $2x - 3 = -7 \rightarrow 2x = -4 \rightarrow x = -2$

(4) Square the negative result: $(-2)^2 = 4$

Quick Tips:

- If a value exists outside of the absolute value signs, move it to the other side of the equation before you start solving to make things easier

28. The value of x is the greater value

B

Tools: number lines, fractions

Steps: (1) Find the difference between 24 and 4: $24 - 4 = 20$

(2) Four marks exist between 24 and 4, so divide the difference by 4 to determine the increase in value each mark represents: $20 \div 4 = 5$

(3) If each mark increases in value by 5, then the second mark from 4, which is the value of x , is $4 + 5 + 5 = 14$

(4) Find two-thirds of 20: $\frac{2}{3} \times 20 \rightarrow \frac{40}{3} \rightarrow 13\frac{1}{3}$

Quick Tips:

- Double check your values for the marks to avoid simple addition errors

29. The perimeter of square ABCD is the greater value

A

Tools: perimeter, area, triangles

Steps: (1) Line AC forms two 45 - 45 - 90 right triangles in the square, with line AC as each triangle's hypotenuse

(2) The ratio for their side lengths is $x : x : x\sqrt{2}$

(3) $\sqrt{8}$ can be simplified: $\sqrt{8} \rightarrow \sqrt{(2 \times 4)} \rightarrow \sqrt{(2)(4)} \rightarrow (\sqrt{2})(\sqrt{4}) \rightarrow 2\sqrt{2}$

(4) Thus, $x = 2$, which is the length of each side

(5) The perimeter of this square is 8, while the area is 4

Quick Tips:

- Each angle in a square is 90° , which is 45° when cut in half

30. The volume of the triangular prism is the larger value

A

Tools: volume

Steps: (1) For Column B, the volume is $12 \times 4 = 48$ inches³

(2) Since all of Column B is in inches, all of Column A needs to be in inches

(3) Convert 0.75 feet into inches: $0.75 \text{ feet} \times \frac{12 \text{ inches}}{1 \text{ foot}} = 9 \text{ inches}$

(4) For Column B, the volume is $\frac{2 \times 6 \times 9}{2} = 54$ inches³

Quick Tips:

- You do not necessarily need to multiply the values out
- Instead, recognize that 12×4 results in a smaller product than 6×9

31. The two quantities are equal

C

Tools: mean

- Steps:*
- (1) Amanda has scored 86, 86, 88, 88, and 88 on five of her tests
 - (2) If Amanda wishes to have at least a 90 in her class, she must score much higher on the sixth test to make up for the two 86's
 - (3) Set the sum of all six tests (divided by the total number of tests) equal to 90 to find the value needed for the sixth test
 - (4) $\frac{86+86+88+88+88+x}{6} \rightarrow \frac{436+x}{6} = 90 \rightarrow 436 + x = 540 \rightarrow x = 104$

Quick Tips: • Avoid leaving out needed values by writing out all data from the question

32. The probability that both cards drawn are numbered is the greater value

B

Tools: probability

- Steps:*
- (1) A standard deck of cards has four suits, two black and two red
 - (2) Each suit has 13 cards, with four unnumbered (ace, king, queen, jack)
 - (3) For Column A, the probability is $\frac{26}{52} \times \frac{26}{52}$
 - (4) For Column B, the probability is $\frac{32}{52} \times \frac{32}{52}$
 - (5) The product for Column B will be greater than Column A

Quick Tips: • Set up the operations that need to take place, but don't multiply them out just yet, as you can analyze the values beforehand

33. The relationship cannot be determined from the information given

D

Tools: slope

- Steps:*
- (1) In $y = mx + b$ (slope-intercept) equations, the m is the slope
 - (2) For Column A, the slope is 2 or $\frac{2}{1}$
 - (3) For Column B, $x = 10$ indicates a vertical line that where the only x -coordinate is 10
 - (4) This means that while the y -coordinates change, the x -coordinate does not, which puts 0 in the denominator of its slope ($\frac{y_2 - y_1}{10 - 10} = \frac{y_2 - y_1}{0}$)
 - (5) The slope for Column B is undefined and we cannot compare the two values

Quick Tips: • If a value is undefined, you cannot compare it to a known value

34. The number of teammates on your swim team is the greater value

A

Tools: combinations, quadratic equations

- Steps:*
- (1) Since the order does not matter, we use combinations ($\frac{n(n-1)\dots(n-r+1)}{r(r-1)\dots(1)}$)
 - (2) Two choices are being made, so we will have two values in the numerator
 - (3) $\frac{n(n-1)}{(2)(1)} \rightarrow \frac{n^2-n}{2}$
 - (4) We know the number of combinations is 10: $\frac{n^2-n}{2} = 10 \rightarrow n^2 - n = 20$
 - (5) Find the values of n : $n^2 - n = 20 \rightarrow n^2 - n - 20 = 0 \rightarrow (n - 5)(n + 4) = 0$
 - (6) If you cannot have a negative number of teammates, $n = 5$ is the answer

Quick Tips: • It is difficult to determine the value of variables using factorials, so make sure you know both ways of solving for combinations and permutations

35. The positive result of $9x^2 - 12x + 4 = 16$ is the greater value

B

Tools: quadratic equations*Steps:* (1) Solve for the values of x in Column B by setting the equation equal to 0

(2) $9x^2 - 12x + 4 = 16 \rightarrow 9x^2 - 12x - 12 = 0$

(3) $9x^2 - 12x - 12 = 0 \rightarrow (3x + 2)(3x - 6) = 0$

(4) $3x + 2 = 0 \rightarrow 3x = -2 \rightarrow x = -\frac{2}{3}$

(5) $3x - 6 = 0 \rightarrow 3x = 6 \rightarrow x = 2$

(6) $2 > \frac{3}{2}$

- Quick Tips:*
- You can input the value of Column A and see if the result garners a greater or lesser value than 16 in the equation in Column B
 - If the value is less, then Column B is greater
 - If the value is greater, then Column A is greater
-

36. \$3.50 is the greater value

B

Tools: compound interest*Steps:* (1) Use the compound interest formula to determine the value of Column A

(2) $A = p(r + 1)^t \rightarrow A = 1(0.5 + 1)^3 \rightarrow A = 1.5^3$

(3) $1.5 \times 1.5 = 2.25$

(4) $2.25 \times 1.5 = \$3.375$

- Quick Tips:*
- A stands for the total amount of money in your account, including the principal and the accrued interest
-

37. The two quantities are equal

C

Tools: arc length, circumference*Steps:* (1) Each angle in a rectangle is 90° (2) Since the circle is labeled as A , then the origin point of the circle is A (3) The angle formed by sector BAE is 90° (4) The portion of the circle sector BAE takes up is $\frac{90}{360} \rightarrow \frac{1}{4}$

(5) Arc length refers to a portion of the circle's circumference

(6) Since the arc length is $\frac{1}{4}$ of the circle's circumference, it is also 25% of the circle's circumference

(7) The two values are the same

- Quick Tips:*
- You do not need to know the exact values for the radius of the circle to solve this question
 - Focus on what the question is asking you for and pay attention to the degree values of any object that is tangent to a circle

Reading Comprehension - Passage 1

1. The main purpose of this passage is to demonstrate the purpose and end of playing video games. D

Explanation The author begins by discussing concerns people have for the purpose of playing video games. The author then responds to these questions with explanations for what video games do and how they affect those who play them. The author even asks in lines 18 to 20, "What is the purpose and end of video games? I will tell you."

2. We can infer from the passage that the author believes video games can better a person. B

Explanation Look to lines 20 to 23, "Video games are a portal into..." The author is stating video games improve people's knowledge and ability to understand things. Lines 39 to 42, "Video games change our perceptions..." state that video games make people more compassionate and motivates them to do good in this world.

3. The series of questions show that the author is knowledgeable of the concerns people who have never played video games might have. D

Explanation The author is asking questions about why someone would spend their time on a video game as opposed to going out and doing something in the real world. Those who do not play video games spend their time doing real world activities and don't understand the importance (if any) video games have. By expressing their questions and subsequently answering them, the author shows he is knowledgeable of these concerns.

4. "You will..." is repeated to give the sense that the things you do in a video game are incredibly varied and important. A

Explanation Each "You will..." expresses very different actions taken or scenarios in video games; thus, demonstrating that the things you do in video games are varied. Each "You will..." has the person playing the video games accomplishing great feats and they even demonstrate failure. Accomplishments and failure give the sense that what the person does in the video games is important to them in some way.

5. In line 10, "tangible" most nearly means concrete. A

Explanation The author is discussing the difference between a digitally made pile of dirt and a real pile of dirt. If the pile of dirt is tangible, it is concrete or solid and real. The definition of tangible is actual or able to be touched.

6. According to the passage, those who play video games might fight and destroy many rats. B

Explanation Look to lines 31 to 32, "You will drive rats into extinction..." The author is stating that people who play video games will attack and defeat a large number of rats. So much so that the rat population will cease to exist in the game.

Reading Comprehension - Passage 2

7. In line 56, “distend” most nearly means expand.

C

Explanation

In line 56, Sherlock Holmes is discussing the extent of information that can be stored in one’s mind. He is using a room as an example to explain how the mind works. He states it is a mistake for Watson to assume the room’s walls are elastic and can distend or expand to any degree to fit all sorts of information.

8. According to Holmes, one’s brain-attic must avoid tools that are not relevant to one’s work.

D

Explanation

Look to lines 43 to 62. Holmes is describing a scenario in which a fool stuffs his brain-attic full of useful and useless information. With the useless information crowding out or cluttering the useful information, the fool will have difficulty performing his work. “It is of the highest importance, therefore, not to have useless facts elbowing out the useful ones.”

9. We can infer from this passage that Holmes would not study the philosophies of Aristotle.

A

Explanation

Look to lines 21 to 23, “Of contemporary literature, philosophy and politics he appeared to know next to nothing.” Because Holmes knows nothing of contemporary philosophy, it is just as likely he would not want to know anything about Aristotle’s philosophy. Also, Answer choices B, C, and D are not support by this passage; thus, only answer choice A works.

10. The tone of this passage suggests Dr. Watson is both enthralled and befuddled by Holmes.

B

Explanation

The first paragraph discusses the zeal Holmes has for certain areas of study and that Holmes has great knowledge and ability in understanding these areas. The rest of the passage is Watson trying to figure out why Holmes studies the way he does. In line 63, “But the Solar System!” I protested. Watson is confused that Holmes doesn’t even know we revolve around the sun.

11. According to this passage, Holmes had not heard of Thomas Carlyle.

B

Explanation

Look to lines 23 to 26, “Upon my quoting Thomas Carlyle, he inquired in the most naïve way who he might be and what he had done.” Holmes had not heard of Thomas Carlyle.

12. The main purpose of this passage is to provide insight into how Holmes views and pursues information.

C

Explanation

The first part of the passage discusses how Holmes pursues information, while the second part of the passage discusses how Holmes views information (useful versus useless information).

Reading Comprehension - Passage 3

13. We can infer from this passage that the author takes interest in the nature of cooking ingredients.

B

Explanation

The author opens with a brief description of salt and its effect on history, followed by a long description on the different types of pepper. The passage in its entirety indicates the author is interested in cooking ingredients. Also, Answer choices A, C, and D are not supported by the passage.

14. The best title for this passage is “Black Pepper and Its Drupes Exposed.”

D

Explanation

The majority of the passage is about black pepper and its variations. The passage does not go into detail about salt outside of the first paragraph, nor does the passage spend most of its time talking about pickling versus cooking drupes. The same is true for Answer choice C. Answer choice D encompasses the whole passage.

15. In line 55, “deteriorate” most nearly means diminish.

B

Explanation

The last paragraph discusses loss of flavor and aroma via evaporation, exposure to light, and grinding. Since deteriorate is used in the same sense as loss, we need a word that fits this criteria. The definition of deteriorate is become or make worse in quality, value, or strength (diminish).

16. The author will most likely write about black pepper’s effect on history and societies.

A

Explanation

The author opens with a brief description of salt and its effects on the world, but asks the question, “But what of salt’s compatriot on the dining room table?” The author is interested in how black pepper affects the world as well. The passage is about the origin of black pepper, so it is likely the author will talk about how black pepper affects history and societies.

17. According to this passage, pepper spirit is used as an ingredient in soda beverages.

C

Explanation

Look to line 23, “Pepper spirit is used in sodas...” Answer choices A, B, and D are not supported by the passage.

18. The style of this passage is informative.

D

Explanation

The author is not trying to convince the reader to believe one thing over another (Answer choice A). The author is not criticizing pepper or salt (Answer choice B). The author is not idealizing rural life or giving advice to students (Answer choice C). The passage is providing information about the origin of the black pepper.

Reading Comprehension - Passage 4

19. The best title for this passage is “The How of Storytelling.”

C

Explanation The first part of the passage discusses one method of storytelling, while the second part of the passage discusses another method of storytelling. Answer choices A, B, and D are not supported by the information presented in the passage.

20. According to the passage, it is TRUE that novices should start with stories that rely on the point of the story and not the telling of the story.

C

Explanation Look to lines 8 to 12, “In the public telling of an anecdote...” The author is stating that a novice storyteller should focus on stories that rely on the point and not its content. In other words, someone new to storytelling should stick with a quick story that is not filled with detail.

21. If a detail is omitted from the point of a story that relies on its point, then the entire story fails.

A

Explanation Look to lines 24 to 26, “As to the point itself, he must guard against any carelessness. Omission of an essential detail is fatal.” This portion of the passage is discussing the first method of storytelling, where the point is everything. If the storyteller omits even one thing from the point, then the entire story is a flop.

22. In line 9, “tyro” most nearly means rookie.

D

Explanation The first method of storytelling is one where the story is short and the point is everything. A much longer story requires a great deal of practice and experience, where the first method does not. With this in mind, the storyteller of the first method is one without experience or a rookie. The definition of tyro is a beginner or a novice.

23. We can infer from the passage that the author would respect storyteller’s who diligently practice their art.

B

Explanation Look to the second portion of the passage that discusses the longer method of storytelling. The author uses words such as “intelligent,” “skilled,” and “unwearying,” which are positive words that reflect the hard work necessary to become skilled in the longer method of storytelling. Answer choices A, C, and D are not supported by any information in the passage.

24. The tone of the passage suggests that the author values precision.

B

Explanation Whether it’s the shorter or longer version of storytelling, the author makes use of many versions of the word “precise.” For the shorter method, the storyteller must avoid any errors in delivering the point of the story. For the longer method, the storyteller must avoid any errors in delivering all of the details of the story. In both cases, the author is very interested in accuracy or precision. Answer choices A and D are not supported by the passage, and the author does not stress tranquility as a necessary factor in telling stories.

Reading Comprehension - Passage 5

25. In line 18, “deity” most nearly means god.

B

Explanation

Uranus and Gaea are described as beings that represent ideas and the laws of nature and are worshiped because of this. Even the other Greek gods invoke the name of Gaea in veneration. The definition of deity is a god or goddess or one exalted as supremely good or powerful.

26. According to the passage, the ocean was formed by heaven’s rains and earth’s streams.

C

Explanation

Look to lines 54 to 56, “The ocean is formed from the rains which descend from heaven and the streams which flow from earth.” Something of heaven (Uranus) joined with something of earth (Gaea) to form the ocean.

27. We can infer from this passage that the author understands the logic behind the origin of Uranus, Gaea, and Oceanus.

D

Explanation

Look to lines 50 to 54, “Here we meet with another logical though fanciful conclusion...” The author is stating that though the Greek’s ideas of how things were formed are fanciful or outlandish, he understands the process by which they determined their ideas. In the most basic of terms, the Greek’s ideas were logical in their observations of how one thing lead to another in nature.

28. The main purpose of this passage is to discuss the creation of the sky, earth, and ocean.

B

Explanation

The first portion of the passage discusses how Uranus and Gaea (heaven and earth) came from Chaos and what their role was. The second portion of the passage discusses how Uranus and Gaea came together to create Oceanus (ocean) and why this creation made sense to the Greeks. Answer choices A and C refer to only one part of the passage and not all of it, while Answer choice D only refers to the very beginning of the passage.

29. In the next several paragraphs, it is logical the author will discuss more deities created by Gaea and Uranus.

A

Explanation

The logical flow of the passage’s discussion of Greek’s theories of the origin of the world begins with Chaos, followed by the creation of two major deities, followed by the two deities creating another deity. Look to lines 63 to 65, “...as in all manifestations of the powers of nature, an actual tangible divinity.” Uranus, Gaea, and Oceanus are manifestations of the power of nature, and the “all” in those lines indicates there are many more like them. Answer choices B, C, and D are not supported by the information in the passage.

30. Uranus, Gaea, and Oceanus represent manifestations of nature’s power.

C

Explanation

Look again to lines 63 to 65, “...as in all manifestations of the power of nature.” These three deities represent the power of nature, such as light, water, and fertile earth. The author is stating that all Greek gods or deities were manifestations of nature’s power, and Uranus, Gaea, and Oceanus were Greek deities.

Reading Comprehension - Passage 6

31. We can infer from the passage that Lincoln sought to turn the energies acting upon him to his benefit. C

Explanation Look to the second paragraph, which discusses how living things endure, "...it may be said that a living being is one that subjugates and controls for its own continued activity the energies that would otherwise use it up." Lincoln was a living being and would have done the same as any other living being. Answer choice A is not supported by the passage, and Answer choices B and D are in opposition to what is stated in the passage.

32. The best title for this passage is "Life of Living Things." B

Explanation Though the very beginning of the passage briefly discusses how inanimate objects interact with the environment, it was used as a backdrop to the main discussion of how living beings interact with the environment, or how living beings maintain living. Answer choices A and D focus on how inanimate objects interact with the environment, while Answer choice C is only a small part of the passage.

33. According to the passage, continuity of life means continual re-adaptation of the environment to the needs of living organisms. A

Explanation Look to lines 51 to 53, "Continuity of life means continual re-adaptation of the environment to the needs of living organisms." Answer choices B, C, and D are not in context with what the passage is stating about how life maintains itself.

34. In line 61, "antecedents" most nearly means progenitors. D

Explanation An antecedent is a person or event that existed before or preceded another person or event. "We look for an account of social antecedents" refers to social events that preceded other social events in Lincoln's life, or even friends or friendships that preceded others. In this sense, progenitors refers to events, relationships, or people that affected Lincoln in some way in the early stages of his life.

35. This passage moves from the actions of living things to the various aspects of "life." C

Explanation The passage first briefly discusses how inanimate objects interact with the environment. Then the passage moves to discussing how animate or living beings interact with the environment. Lastly, the passage moves to showing how "life" includes many more things besides interacting with the environment to survive. Answer choice C is the only answer choice that follows this progression.

36. In line 28, "compensated" most nearly means rewarded. D

Explanation Lines 25 to 29 discuss how a living being expends energy to manipulate the energies the environment uses against him for his own benefit. The idea is that through effort the living being continues to grow and does not die, which is the same as working to earn a wage that will allow one to purchase food and shelter to continue living. The definition of compensated is rewarded or receiving payment.

Mathematics Achievement

1. 16

C

Tools: deciphering word problems

- Steps:*
- (1) Since Parker purchased an equal number of binders and paper, we can represent the number with x
 - (2) Multiply the cost of the paper bundles and binders by x and add them together ($3.5x + 9x$)
 - (3) Set it equal to \$100 and solve for x
 - (4) $3.5x + 9x = 100 \rightarrow 12.5x = 100 \rightarrow x = \frac{100}{12.5} \rightarrow 8$
 - (5) multiply by 2 (16)

Quick Tips:

- Don't forget the order of operations (PEMDAS)

2. $\begin{bmatrix} 4 & -6 \\ 1 & 8 \\ -13 & 8 \end{bmatrix}$

C

Tools: matrices

Steps: (1) Subtract each section of the two matrices, respectively

$$(2) \begin{bmatrix} (11 - 7) & (19 - 25) \\ (-3 - (-4)) & (51 - 43) \\ (5 - 18) & (-14 - (-22)) \end{bmatrix} \rightarrow \begin{bmatrix} 4 & -6 \\ 1 & 8 \\ -13 & 8 \end{bmatrix}$$

Quick Tips:

- Instead of subtracting every row and column, try looking for the one section that is different in every answer choice
- The top right or bottom left are the only sections that differ

3. 5

A

Tools: radicals

- Steps:*
- (1) Factor 625 into four equal parts
 - (2) $\sqrt[4]{625} \rightarrow \sqrt[4]{25 \times 25}$
 - (3) $\sqrt[4]{25 \times 25} \rightarrow \sqrt[4]{5 \times 5 \times 5 \times 5}$
 - (4) $\sqrt[4]{5 \times 5 \times 5 \times 5} \rightarrow 5$

Quick Tips:

- You could also try to raise the answer choices to the 4th power (start with the lowest number)

4. 260%

D

Tools: percent change

- Steps:*
- (1) Subtract the two prices ($90 - 25 = 65$)
 - (2) Divide by the original prices ($\frac{65}{25} = 2.6 = 260\%$)

Quick Tips:

- To convert to a percentage, just move the decimal point to the right twice

5. 136 Π

B

Tools: area of a circle, distance formula*Steps:* (1) Find the radius of the circle with the distance formula

(2) $\sqrt{(8-2)^2 + (-2-8)^2} \rightarrow \sqrt{6^2 + (-10)^2} \rightarrow \sqrt{36+100} \rightarrow \sqrt{136}$

(3) Don't bother finding the square root of 136 since you'll be squaring it in the next step

(4) Plug the radius into the area formula and solve $(\pi(\sqrt{136}))^2 = 136\pi$

Quick Tips: • The radius of a circle is just a line formed from the origin to the edge of the circle

6. 12

D

Tools: polynomials*Steps:* (1) Multiply the parentheses together $(2x^2 + 2xk - 2x - 2k)$

(2) $2xk - 2x$ equals $10x$, solve for k ($2xk - 2x = 10x \rightarrow 2xk = 12x \rightarrow k = 6$)

(3) $2k$ equals m , plug in value for k ($2(6) = 12$)

Quick Tips: • Since one factor is positive and the other is negative, m must be a positive number

7. 77

A

Tools: trapezoids, mean*Steps:* (1) The angles for the trapezoid must add up to be 360 degrees

(2) The angles for the triangle must add up to be 180 degrees

(3) $360 + 180 = 540 \rightarrow \frac{540}{7} = 77.14 \approx 77$

Quick Tips: • For a mean, you must divide the total amount by the number of variables8. 113.04 meters³

B

Tools: volume of a sphere*Steps:* (1) Divide the diameter in half (3)

(2) plug into the volume formula and solve ($V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(3)^3 = 36\pi = 113.04$)

Quick Tips: • You can round π down to 3 and find the closest answer choice9. $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$

B

Tools: probabilities*Steps:* (1) Since each die has only one side with a three on it and there are a total of 6 sides, the probability of rolling on 3 is $\frac{1}{6}$ (2) If we want to roll three 3's, we will have to multiply $\frac{1}{6}$ together three times ($\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$)*Quick Tips:* • Answer choice C is not dividing the probabilities, so it cannot be an answer choice

10. 4

D

Tools: data analysis, mode

Steps: (1) Written out, the data is 1, 1, 1, 2, 2, 2, 3, 3, 3, 4, 4, 4, 4, 4
 (2) The value 4 appears five times in the data, so 4 is the mode

Quick Tips: • The mode is the value that occurs most frequently in a given set of data

11. $\frac{x}{70}$

A

Tools: linear functions

Steps: (1) Multiply both sides by 70 ($70y = x$)
 (2) Divide by 70 on both sides ($y = \frac{x}{70}$)

Quick Tips: • You can also try plugging in the answer choices in the place of y , but this may take a while to find the right answer

12. 4.5

C

Tools: absolute value

Steps: (1) Set $x - 5$ equal to both the negative and positive value and solve
 (2) $x - 5 = 0.5 \rightarrow x = 5.5$
 (3) $x - 5 = -0.5 \rightarrow x = 4.5$
 (4) $4.5 < 5.5$

Quick Tips: • Remember, absolute value will have two answers to choose from

13. 13

B

Tools: distance formula

Steps: (1) Plug in the points into the distance formula ($\sqrt{(-2 - 3)^2 + (-7 - 5)^2}$)
 (2) $\sqrt{(-5)^2 + (-12)^2} \rightarrow \sqrt{25 + 144} \rightarrow \sqrt{169} \rightarrow 13$

Quick Tips: • The square of a negative will always be a positive number

14. 18 feet²

B

Tools: area of a square, triangles

Steps: (1) Use the 45 – 45 – 90 triangle ratio to calculate the side length ($x - x - x\sqrt{2}$)
 (2) $x\sqrt{2} = 6 \rightarrow x = \frac{6}{\sqrt{2}} \rightarrow 3\sqrt{2}$
 (3) Square the side length to get the area ($(3\sqrt{2})^2 = 18$)

Quick Tips: • The diagonal on a square will always create two 45 – 45 – 90 triangles

15. 88

B

Tools: deciphering word problems, pie charts

Steps: (1) Since the Lizrades are equal to FizzFizz, it will also equal 11
 (2) MedPop's are double FizzFizz, so it will equal 22
 (3) Since twice as many LoveTea's were sold than MedPop's, they will equal 44
 (4) Add all of them up together ($11 + 11 + 22 + 44 = 88$)

Quick Tips: • Do not assume that the chart is accurate unless the question says so

16. $\frac{1}{48}$

D

Tools: probability

- Steps:*
- (1) Find the probability of the red car first (
- $\frac{17}{34} = \frac{1}{2}$
-)
-
- (2) Next, find the probability of the blue car, keeping in mind that we have one fewer car left (
- $\frac{11}{33} = \frac{1}{3}$
-)
-
- (3) Finally, find the probability of the silver car (
- $\frac{4}{32} = \frac{1}{8}$
-)
-
- (4) Multiply the three probabilities together (
- $\frac{1}{2} \times \frac{1}{3} \times \frac{1}{8} = \frac{1}{48}$
-)

Quick Tips: • Since the cars leave, you need to reduce the denominator of the probability by the number of cars left

17. 117 cm

A

Tools: polygons

- Steps:*
- (1) Divide the total degrees by 180 (7)
-
- (2) Add 2 (9)
-
- (3) Multiply by 13 cm (117 cm)

Quick Tips: • You can use the total interior angle formula ($180(n - 2) = \text{total interior}$)

18. 25 minutes

A

Tools: work word problem

- Steps:*
- (1) Patrick's time is
- x
- and Stewart's
- $4x$
-
- (2) Use the work word problem formula to solve for
- x
- :
- $\frac{1}{x} + \frac{1}{4x} = \frac{1}{20}$
-
- (3)
- $\frac{1}{x} + \frac{1}{4x} = \frac{1}{20} \rightarrow \frac{4}{4x} + \frac{1}{4x} \rightarrow \frac{5}{4x} = \frac{1}{20} \rightarrow 100 = 4x \rightarrow x = 25$

Quick Tips: • Work word problems rely on time, so pay attention to how quickly or how slowly workers complete the job

19. 76

B

Tools: weighted averages

- Steps:*
- (1) Since we are dealing with fifths, we know that 10 of the students score an 85 and 15 score a 70 on the test
-
- (2)
- $\frac{10 \times 85 + 15 \times 70}{25} = \frac{850 + 1050}{25} = \frac{1900}{25} = 76$

Quick Tips: • Remember an average is the sum of all terms divided by the number of terms

20. 15

A

Tools: sequences

- Steps:*
- (1) The sequence is divided by
- -2
- , which will cause every other number to be negative
-
- (2) Since half of the number will be positive (greater than 0), we have to divide 30 by 2 (15)

Quick Tips: • To find the ratio of the sequence, just divide the second term by the first and the third term by the second, and see if they equal each other

21. 32 cubes

A

Tools: cubes

Steps: (1) Divide each dimension by 6 to see how many whole cubes can fit

(2) $\frac{12}{6} = 2, \frac{15}{6} = 2.5, \frac{48}{6} = 8$

(3) $2 \times 2 \times 8 = 32$

Quick Tips: • The cubes must completely fit inside the box

22. 28.125π

C

Tools: area of sectors

Steps: (1) Find the total area of circle N ($\pi(15)^2 = 225\pi$)

(2) Since circle O is similar to circle N , the two sectors will have the same angles.

(3) Divide the angle of the sector by 360 degrees ($\frac{45}{360} = \frac{1}{8}$)

(4) Multiply the total area of circle N by $\frac{1}{8}$ ($\frac{225\pi}{8} = 28.125\pi$)

Quick Tips: • A circle will always have a total of 360 degrees

23. 12

B

Tools: system of equations

Steps: (1) Solve for x in the first equation by subtracting 10 on both sides ($y - 10 = x$)

(2) Plug in the value for x into the second equation ($5y + 2(y - 10) = 64$)

(3) $5y + 2y - 20 = 64 \rightarrow 7y - 20 = 64 \rightarrow 7y = 84 \rightarrow y = 12$

Quick Tips: • You can also try plugging in the answer choices, but this method could take a while to solve

24. 3

C

Tools: absolute value, exponents

Steps: (1) Set the two equations equal to each other ($-4x + x = x^2$)

(2) $-3x = x^2 \rightarrow -3 = x$

(3) Since the first equation is an absolute value and the second is being squared, we can take the absolute value of negative 3

Quick Tips: • You can also try plugging in the answer choices

25. 7.5 cups

D

Tools: analyzing graphs

Steps: (1) Set up the proportions and solve

(2) $\frac{2}{5} = \frac{3}{x} \rightarrow 2x = 15 \rightarrow x = 7.5$

Quick Tips: • Group the proportions with plant 2 on top and plant 4 on bottom

26. 8

A

Tools: mean*Steps:* (1) Add all of the x 's ($15x + 23x + 2x + 42x = 82x$)(2) Divide by 4 and set equal to 164 ($\frac{82x}{4} = 164$)(3) $\frac{82x}{4} = 164 \rightarrow 82x = 656 \rightarrow x = 8$ *Quick Tips:* • Remember an average is the sum of all terms divided by the number of terms

27. \$3,937.01

B

Tools: compound interest*Steps:* (1) Plug the information into the interest rate formula $A = P(1 + r)^t$ (2) $A = 3,500(1 + .04)^3 = 3,500(1.04)^3 = 3,500(1.125) = 3,937.01$ *Quick Tips:* • Just move the decimal place of the percentage to the left twice to get the decimal value

28. 72 beads

B

Tools: probability*Steps:* (1) If there are 15 green beads, and the probability is 5 times that of orange, then there should be only 3 orange beads ($\frac{15}{5} = 3$)(2) Since there are 3 times more marble beads than wooden beads, add up all the wooden beads and multiply by 3 to find the number of marble beads
($(15 + 3) \times 3 = 54$)(3) Add up the number of marble beads and wooden beads ($15 + 3 + 54 = 72$)*Quick Tips:* • Pay attention to keywords like "times", "probability", and "total"

29. 1,680 boards

D

Tools: measurements*Steps:* (1) Multiply the perimeter by 12 inches ($420 \times 12 = 5040$)

(2) Divide the portion of the fence by 3, since there are 3 boards per portion (3)

(3) Divide the total perimeter by 3 inches ($\frac{5040}{3} = 1,680$)*Quick Tips:* • Make sure that your measurements are the same before you perform any operations30. 100°

C

Tools: triangles, supplementary lines*Steps:* (1) The missing left angle of the triangle is 50° , because 130° is supplementary(2) The same can be said with 150° and the missing right angle (30°)(3) Add the two together and subtract from 180° ($180 - (30 + 50) = 100^\circ$)*Quick Tips:* • All three angles of a triangle must add up to be 180°

31. 10

A

Tools: permutations

- Steps:* (1) We are making two choices, so we multiply two numbers together to hit 90
 (2) $n(n - 1) = 90 \rightarrow n^2 - n = 90$
 (3) Set the equation equal to zero and find the positive value for n
 (4) $n^2 - n = 90 \rightarrow n^2 - n - 90 = 0 \rightarrow (n - 10)(n + 9) = 0; n = 10$

Quick Tips: • Memorize both forms of the permutations formula for questions like this one

32. $y < -3x + 4$

B

Tools: linear inequalities

- Steps:* (1) Since the graph has a dotted line shaded underneath, our inequality will be less than ($<$)
 (2) Our graph crosses the positive part of the y -axis, which tells us the y -intercept is positive
 (3) The only answer choice that has a positive y -intercept and a dotted line is $y < -3x + 4$

Quick Tips: • If the line is solid, our inequality would be less than or equal to (\leq)

33. 6π

B

Tools: circles, triangles

- Steps:* (1) Find the circumference of the circle ($2(9)\pi = 18\pi$)
 (2) Add the two angles in the triangle and subtract from 180° to find angle C (60°)
 (3) Divide angle C by the total degrees of the triangle ($\frac{60}{180} = 1/3$)
 (4) Multiply the one third by the total circumference ($\frac{1}{3}(18\pi) = 6\pi$)

Quick Tips: • The circumference of a circle is just π times double the radius

34. 5.14 inches

D

Tools: ratios

- Steps:* (1) Set up the proportions, with the couch on the left and the length of the room on the right ($\frac{x}{9} = \frac{24}{42}$)
 (2) Cross multiply ($42x = 216$)
 (3) Divide by 42 on both sides (5.14)

Quick Tips: • Watch out for extra unnecessary information (28 feet)

35. \$69.44

D

Tools: percentages

- Steps:* (1) The price before the 10% coupon (x) multiplied by 90% equals 50 dollars ($.9x = 50 \rightarrow x = 55.55$)
 (2) The price before the initial 20%-off sale (y) multiplied by 80% equals 55.55 ($.8y = 55.55 \rightarrow 69.44$)

Quick Tips: • Just move the decimal place of the percentage to the left twice to get the decimal value

36. 35

C

Tools: combinations*Steps:* (1) Since the order of the members does not matter, we need to plug the information into the combinations formula ($\frac{n!}{r!(n-r)!} = \frac{7!}{3!(7-3)!}$)

(2) Subtract 7 by 3 to get 4! inside the parenthesis

(3) Expand and eliminate like terms ($\frac{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{3 \times 2 \times 1 (4 \times 3 \times 2 \times 1)} = \frac{7 \times 6 \times 5}{3 \times 2 \times 1}$)(4) Simplify ($\frac{210}{6} = 35$)*Quick Tips:* • Order doesn't matter for this question, so we use the combinations formula

37. 4.8 mph

A

Tools: averages*Steps:* (1) Since Lucille's route is the exact same, we can make up a distance (24 miles)(2) Add up both too and from the gym ($24 + 24 = 48$)(3) Figure out the time it takes to go to the gym ($\frac{24}{6} = 4$ hours) and for her to go back ($\frac{24}{4} = 6$ hours)(4) Add the two times together ($6 + 4 = 10$)(5) Divide the total distance by the total time ($\frac{48}{10} = 4.8$)*Quick Tips:* • Try to pick a distance that will divide easily with the two speeds (least common multiple)38. $Z < \sqrt[3]{Z} < Z^2$

C

Tools: exponents, radical*Steps:* (1) Pick a number less than negative one (-2)(2) Plug into the functions ($\sqrt[3]{-2}$, -2 , $(-2)^2$)(3) $\sqrt[3]{-2}$ will simplify to around -1.25 , and $(-2)^2$ will simplify to 4(4) $-2 < -1.25 < 4 \rightarrow Z < \sqrt[3]{Z} < Z^2$ *Quick Tips:* • A negative number to an even power will always be positive39. $X = \{x \mid x \neq -1 \text{ or } 2\}$

A

Tools: domains*Steps:* (1) Set the denominator equal to zero ($x^2 - x - 2 = 0$)(2) $x^2 - x - 2 \rightarrow (x - 2)(x + 1) = 0 \rightarrow x = 2 \text{ or } -1$ (3) These values of x cannot be used, since they will cause the function to be undefined ($x \neq -1 \text{ or } 2$)*Quick Tips:* • If you cannot factor the function, try plugging in answer choices and see which will give you zero for the denominator

40. The range of the data.

D

Tools: range, median, mode

- Steps:*
- (1) Subtract the highest paid employee by the lowest ($6,000 - 2,500 = 3,500$)
 - (2) Add \$2,000 to both the highest paid employee (8,000) and the lowest (4,500)
 - (3) Subtract the two ($8,000 - 4,500 = 3,500$)
 - (4) The range in both are the same

- Quick Tips:*
- The range is the only factor that does not change if every element changes by the same amount

41. 0

A

Tools: remainders

- Steps:*
- (1) Pick a positive integer that will divide to give you a remainder of 3 (7)
 - (2) Add 1 to 7 and divide by 4 ($\frac{8}{4} = 2$)
 - (3) There is no remainder (0)

- Quick Tips:*
- Make sure to pick an easy number to work with

42. 5

B

Tools: modes

- Steps:*
- (1) Since the mode is 4 and 19, we can set 4 equal to $a^2 - 5$ and 19 equal to $5b + 9$
 - (2) Solve for a ($a^2 - 5 = 4 \rightarrow a^2 = 9 \rightarrow a = 3$)
 - (3) Solve for b ($5b + 9 = 19 \rightarrow 5b = 10 \rightarrow b = 2$)
 - (4) $a + b = 3 + 2 = 5$

- Quick Tips:*
- The mode is the number that appears most often in the set

43. $\frac{5}{\tan 60^\circ}$

B

Tools: trigonometry

- Steps:*
- (1) Sides BC and AC are adjacent and opposite to angle B (respectively)
 - (2) Use the tangent formula to solve for BC
 - (3) $\tan(60^\circ) = \frac{5}{BC} \rightarrow BC = \frac{5}{\tan(60^\circ)}$

- Quick Tips:*
- Remember the Mnemonic: SOH-COH-TOA

44. 96

A

Tools: circles

- Steps:*
- (1) Since the plow is 18 feet wide, let's assume that the field is also 18 feet wide
 - (2) Divide the area of the field by 18 feet (2420)
 - (3) Find the circumference of the tire ($\pi d = 48\pi = 150.72 \text{ inches} = 12.56 \text{ feet}$)
 - (4) Divide the length of the field by 12.56 feet (192.675)
 - (5) Divide this by half ($96.34 \approx 96$)

- Quick Tips:*
- Each rotation of the tire equals to the circumference
 - We divide by half in the last step because the question asks for "half-acre"

45. complex number

D

Tools: imaginary numbers, complex numbers*Steps:* (1) An example of a complex number would be $2 + 3\sqrt{-1}$ (2) Multiply it by an imaginary number of $\sqrt{-1}$ ($\sqrt{-1} \times (2 + 3\sqrt{-1}) \rightarrow 2\sqrt{-1} - 3$)

(3) This gives us another complex number

- Quick Tips:*
- A complex number is a number of the form $a + bi$ where a and b are real numbers and i is the square root of -1
 - When you multiply two imaginary numbers together you will get a real number
-

46. $y + .8x^2 = 7x - 4$

C

Tools: quadratic functions*Steps:* (1) The function is pointing down, which tells us that the number in front of the x^2 will have to be negative(2) The y -intercept of the function is negative, so if we plug in zero for x , we should get a negative number for y ($y + .8x^2 = 7x - 4 \rightarrow y = -.8x^2 + 7x - 4 \rightarrow y = -4$)

- Quick Tips:*
- You should first set the quadratic equation equal to y , in order to see the trends
-

47. 391

C

Tools: integers*Steps:* (1) Since 452 is the median in 127 consecutive numbers, there will be 63 number less than and higher

(2) Subtract 452 by 63 to get the first integer (389)

(3) Add two (391)

- Quick Tips:*
- 452 will be the 64th number
 - Pay attention to keywords "third smallest"
-

Essay

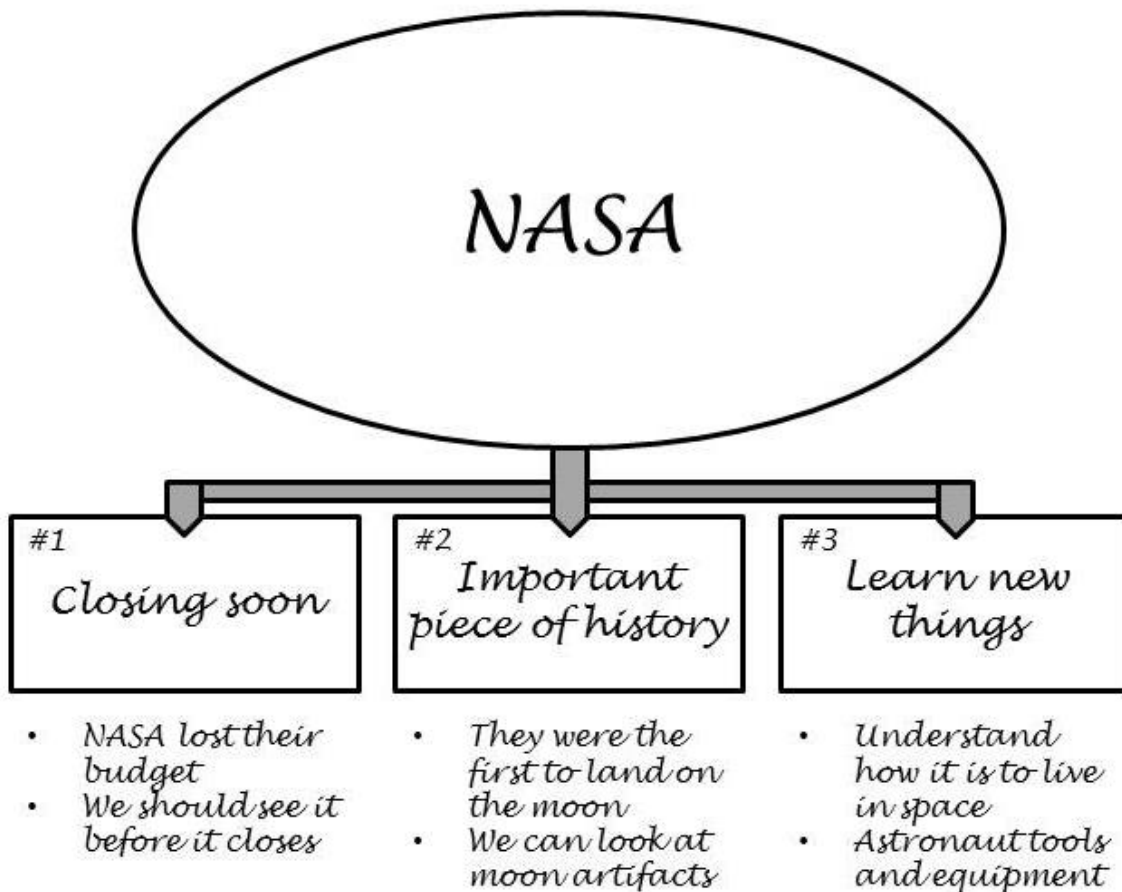
If you were in charge of a school trip, where would you go and why?

Brainstorming

The prompt is asking you about an eventful school trip that you would like to go to with your friends. This could be a place that would be educational, sports related, or anything that just interests you. You should think about all of the necessary things that a class must need for this trip. The trip should also be meaningful in some way. For Example:

- Movie theater
- Baseball game
- Science museum
- The waterpark
- NASA
- Washington D.C.
- The Renaissance festival
- Rodeo

Outline



Section 5 - Essay (EXAMPLE)

30 Minutes

Please write your essay prompt here.

If you were in charge of a school trip, where would you go and why?

School trips do not occur very often, and they should always be carefully selected. If I were in charge of a school trip, I would take my fellow classmates to a place that is not only full of excitement and fun, but also must be educational. That is why I would take my class to the NASA Space Center in Houston, Texas. NASA would be the best possible trip because it is a historical place for the United States, extremely educational, and most importantly, we would have to go before there are even more budget cuts.

We must go to NASA before any more possible budget cuts that could potentially close down the Space Center occur. The cuts have stopped the manned missions to space and limited the number of unmanned missions. Most American astronauts now have to go to Russia in order to explore outer space. The Space Center in Houston was essential to the missions. I would hate to be one of the many students that did not get the chance to explore the amazing institution that put the first man on the moon.

The Space Center holds some of the most indispensable memories from our past. It is of great importance for any student to learn as much history as he or she can, and to be able to see the history firsthand will inspire students to learn even more. There are displays filled with some of the old space suits, equipment, and moon rocks. The Space Center even has simulation areas. Student can experience high speeds, fly in the old space crafts, or even pretend to be the first astronauts to walk on the moon. The history of NASA can show us how the race to the moon inspired the advancement of science and technology.

However, NASA is still developing new and exciting equipment and tools to help possible missions to Mars and other planets. In the past few years, they have launched numerous satellite missions, landed two rovers on Mars, and created countless of inventions to help space travel. All of these things can be seen at the Space Center, and

should be seen by all students. Just by observing these new gadgets and gizmos, student can be motivated to become future engineers, scientists, physicists, mathematicians, and so much more. What is more important than sparking a student's imagination?

Picking a school trip may seem simple to most, but for me it must meet specific requirements. It is important to think about opportunities that may be missed due to time. School trips should also consider important moments in our history. They should also inspire students to explore the fascinating world around us, and show the relevance of our studies. In the end, the school trip I would plan would be a mission to NASA, where my classmates and I could learn the history and future of space travels before it's too late!