2011: Form 64E

English Test

1. Answer: D. *E120 Parallel Structure*
In a comparison, it's important that the compared items follow some level of parallel structure. The first compared article is the action *unbricking a kiln*. It should be compared to an action of the same tense: *uncovering buried treasure*. Note that omission is often correct when available.

2. Answer: H. *E112 Word Choice: Tone*
The key word in the question is *pace*. Only one answer addresses the *pace*, while they could arguably show caution and anticipation. **J** uses the word anticipation specifically, however does not illustrate the cautious pace of the action.

3. Answer: A. *E101 Verbs: Agreement/Tense*
Don't be confused by the subject of this sentence. While *gleaming shapes* is plural, the actual subject is *an expanding view*, which is singular. Thus, a singular present verb is necessary.

4. Answer: G. *E113 Short and Simple*
This modification of *my friend Ellen* is best worded as in **G** because it is concise and clear, as well as sensible. The preposition *for* does not work in this context. The word *more* is redundant, and *mostly* is just unnecessary.

5. Answer: D. *E113 Short and Simple*
Omission is very often correct when provided as an option. In this case, the phrase *as time goes by* is redundant and unnecessary because this passage is implied by the preceding phrase *over many weeks*.

6. Answer: H. *E104 Nonessential Information: Commas, Dashes, Parentheses*
The underlined portion begins an additional clause which is a modification of the noun *kiln*. The clause is non-essential, and serves as an expanded description.

7. Answer: B. *E110 Relevancy: Adding, Deleting, and Replacing Information*
It does not actually matter whether the phrase should be kept or deleted. The correct answer is that which best supports its argument. In this case, **B** correctly identifies the focus of the essay and relates it to the essay. This is the best evidence provided, and thus is correct.

8. Answer: F. *E113 Short and Simple*
The phrases offered in **G-J** all include a synonym for *crouch*, which is already used in the sentence. This redundancy is better left out.

9. Answer: B. *E104 Nonessential Information: Commas, Dashes, Parentheses*
The additional clause *using twigs for kindling* should be nested between commas to show that it is not a functioning part of the sentence. Any others are extraneous or incorrect because they cause the clause to be incorrectly subdivided.

10. Answer: F. *E112 Word Choice: Tone*

The descriptive noun *inferno* is much stronger than the neutral words in options **G** and **H**, and the unsure *a kind of* leading option **J** nulls any strength the words may have had.

11. Answer: D. *E114 Transition Words/Phrases*

Note that this is a *NOT* question. The incorrect answer, **D**, is wrong because the expression should use the conjunction *and*, not *or*. If it said *time <u>and</u> again*, it could be correct. As it stands, though, it is not.

12. Answer: F. *E111 Word Choice: Correct Word*

Answer **F** is incorrect because the prepositions do not suit the sentence. Due to the nature of modifications, *in the night sky* does not describe where the sparks shoot, but rather the chimney. *The chimney in the night sky* is not the intended subject, and is incorrect.

13. Answer: C. *E112 Word Choice: Tone*

The most appropriate answer is **C** because it matches the tone of the essay. While **D** is more informationally accurate, it does not suit the narrative tone of the essay. Similarly, **A** and **B** are *too* casual, failing to even provide meaningful information.

14. Answer: J. *E101 Verbs: Agreement/Tense; E115 Modification: Dangling Modifiers*

As-written, this sentence makes the statement that Ellen dies down before bricking up the firebox. The use of *having* creates a modification of *she*, the antecedent being Ellen. **G** creates a new independent clause and fails to separate it correctly from the following independent clause. **H** is possessive, stating Ellen has a flame that dies. All of these are subtle faults which prove **J** correct.

15. Answer: A. *E104 Nonessential Information: Commas, Dashes, Parentheses*

Here, a modification of *results* is being made. The results are belonging to both Ellen's labor and the fire's magic. A new clause should <u>not</u> be created here, particularly an incorrectly joined independent clause.

16. Answer: J. *E113 Short and Simple*

When omission is an option, always consider it carefully; it is often correct. In this case, the underlined portion is redundant because the phrase *business trip* already informs the reader of the work connection.

17. Answer: C. *E114 Transition Words/Phrases*

The introductory clause leading this sentence is a modification which provides a context of chronology. The preposition *as* is comparative, and cannot be used in this context without a parallel for comparison (*as soon as…*). This is not provided, however, so it is incorrect.

18. Answer: F. *E102 Commas*

There is no need for a comma or other form of punctuation here. *Aunt said* is the simple noun-verb relation of the sentence, and to interfere would be incorrect.

19. Answer: B. *E110 Relevancy: Adding, Deleting, and Replacing Information*

The word *but* can serve as an important indicator here. *But* is generally used to show <u>contrast</u>, which is the key word in option **B**. Making this connection should quickly signal the correct path to take in answering the question.

20. Answer: F. *E101 Verbs: Agreement/Tense*

Answers **H** and **J** should be ruled out IMMEDIATELY. *Must of* is not correct! Never, never *ever*, say *must of/could of/might of/etc.* It is wrong, and should be a free answer! **G** is incorrect because it would imply Rosie heard not the talking itself, but rather had heard elsewhere about the talking.

21. Answer: C. *E114 Transition Words/Phrases*

Option **C** may be the shortest, but this time it isn't correct! Beginning the sentence this way would create an independent clause, and the rest of the sentence is not set up to accommodate one.

22. Answer: F. *E117 Moving Sentences*

This is the most appropriate place for the sentence for two main reasons. The first is the usage of the name *Rosie* for each following sentence; the name must be introduced first. The other main hint is the pronoun *this*, which needs an antecedent. Where is an appropriate antecedent? These two questions should easily direct you to sentence **1**.

23. Answer: B. *E104 Nonessential Information: Commas, Dashes, Parentheses*

The clause *it turns out* is non-essential; it serves no grammatical function in the sentence. As such, it should be punctuated with a comma before and after to separate it from the functioning clauses, and naught else.

24. Answer: H. *E101 Verbs: Agreement/Tense*

The preposition *up* here is unnecessary. The common phrase *to start up* is not grammatically valid. The fact that the other options are easily verifiable should clue you in that this is the imposter.

25. Answer: B. *E101 Verbs: Agreement/Tense*

It would only make sense given the context for the aunt to have already checked with the speaker's parents. While the others choices are grammatically viable, they make seemingly nonsensical implications. **B** is simple and sensible.

26. Answer: G. *E114 Transition Words/Phrases*

There must be a means to transition from the narrative to a presentation of facts about tortoises. The sensible option is the narrator seeking information in the narrative, in this case by asking her aunt. The information can follow, presumably as heard from the aunt, and remain relevant.

27. Answer: D. *E113 Short and Simple; E112 Word Choice: Tone*

The best option here is the short, simple, sensible approach. While **A** and **B** may well be true, they do not pertain adequately to the context, nor address each other's point. **C** does not have an appropriate tone for the passage.

28. Answer: F. *E110 Relevancy: Adding, Deleting, and Replacing Information*

The simple and precise phrase already provided is specific enough for this context. In fact, it's *more* specific than the other options, all of which unduly imply other potential foods.

29. Answer: A. *E106 Apostrophes: Possessive, Plural, and Contractions*

Because *parents* is plural already, the apostrophe must be placed *after* the *s*. If t is before, it becomes a singular possessive. Without any, it is plural but not possessive. The comma in **D** is nonsense to confuse you.

30. Answer: G. *E111 Word Choice: Correct Word*

The tortoise is a family *of* reptile, not *in*. While this can be confusing due to the abstract nature of nomenclature, fluency in English should help find the sensible answer by what just sounds correct.

31. Answer: B. *E106 Apostrophes: Possessive, Plural, and Contractions*

The singular *family* should be followed by an apostrophe-s in order to make it possessive. There is no need to pluralize the noun.

32. Answer: F. *E115 Modification: Dangling Modifiers*

The incorrect choice is **F**. An independent clause should be placed in the underlined portion, made dependent by the leading word *though*. **F** is dependent, and the subsequent clause is incorrect.

33. Answer: B. *E105 Pronouns: Agreement/Case*

This isn't a relative pronoun because it refers to her grandmother. It is used as a modification *relative* to the subject. *Who* is correct because it refers to a person, and as it is not paired with a preposition it does not need to be *whom*. Note that in this case, omission is incorrect.

34. Answer: J. *E110 Relevancy: Adding, Deleting, and Replacing Information*

Although the detail can be connected to the preceding sentence, the fact that it is not built upon further and effectively provides no depth of understanding to the passage renders it unnecessary and best left out.

35. Answer: C. *E103 Independent Clauses: Period, Semicolon, Comma and FANBOYS*

Two independent clauses can be joined many ways. If a comma is used, it must also have a conjunction. One without the other, as used here, is incorrect.

36. Answer: H. *E102 Commas*

This is a difficult question. In general, it is best to consider what the active verb is in order to determine how to arrange a complex predicate. In this case, the important action is the *displaying*. The additional parts are modification, telling what and how he displayed.

37. Answer: C. *E106 Apostrophes: Possessive, Plural, and Contractions*

The possessive form should be used because the *components* are possessed by the pocket watch. As there is no conjunction, and thus no *missing* letters, no apostrophe is necessary.

38. Answer: H. *E101 Verbs: Agreement/Tense*

The past-tense *kept* is appropriate here, as the action took place in the simple past.

39. Answer: D. *E112 Word Choice: Tone*

The additional exclamations are not only unnecessary, but inappropriate for this passage. They are very informal, and should not be included in this informative piece.

40. Answer: F. *E103 Independent Clauses: Period, Semicolon, Comma and FANBOYS*

These sentences are best kept separate. The transition *in addition* is more sensible than *therefore* because it introduces a new point, rather than analyzes a consequence.

41. Answer: A. *E110 Relevancy: Adding, Deleting, and Replacing Information*

It's easiest to answer this question through elimination. There is no direct link, ruling out **B**. There is neither humor present nor an *extensive* digression, as it is short and concise. The only reasonable answer is that it supports his love of learning.

42. Answer: G. *E105 Pronouns: Agreement/Case*

The use of a pronoun here is ambiguous and confusing. It would be far more appropriate to simply address the calculations directly.

43. Answer: D. *E113 Short and Simple*

It is redundant to use any of these options because the word *annual* is used immediately beforehand, already dictating the yearly nature. Redundancy is always best omitted.

44. Answer: J. *E119 Writer's Goal*

How would one best summarize the entirety of the essay? Your answer should be neither too broad nor too specific. The other options provided fail to capture the entirety of Banneker's description, instead focusing on specific aspects.

45. Answer: A. *E118 Moving Paragraphs*

This is a sensible place for the paragraph to be placed. Banneker has been introduced, his character illustrated, and this development led into by the preceding information. It also is naturally followed by the conclusion, which further builds upon his love of education, as exemplified by this paragraph.

46. Answer: J. *E113 Short and Simple*

As is often the case, omission is the correct answer. It's redundant to describe the wilderness as *wild*. The best option is to delete the statement and begin a new sentence.

47. Answer: C. *E105 Pronouns: Agreement/Case*

As the sentence refers to *kayaks* as a whole, a plural pronoun is appropriate. *Which* is incorrectly relative, when a direct pronoun is correct in this context.

48. Answer: G. *E110 Relevancy: Adding, Deleting, and Replacing Information*

The yes-or-no portion here is not what is important, particularly as this one could go either way. Instead, choose the answer with the best supporting evidence. As it does not differentiate types of kayaks, nor is it wordy or irrelevant, the best option is **G** because it *does* provide a visual description.

49. Answer: C. *E103 Independent Clauses: Period, Semicolon, Comma and FANBOYS*

Do not be confused by this, as it seems to begin a list. There is no need for punctuation here, as the sentence is actually of simple construction (*these-are-these*).

50. Answer: J. *E103 Independent Clauses: Period, Semicolon, Comma and FANBOYS*

As the size is being compared between only two objects, *larger* is correct. The *-est* suffix is used in groups of more than two.

51. Answer: C. *E104 Nonessential Information: Commas, Dashes, Parentheses*

This clause is not functionally necessary to the sentence. It provides detail and clarification, however, so is still worth including. These non-essential clauses are best punctuated with a comma on each end so as to differentiate it from the rest of the sentence.

52. Answer: J. *E114 Transition Words/Phrases*

Although not at the start of the sentence, this is still a transition word. The correct choice is *nevertheless* because it presents a fact which would seem to be contrary to the previous statement: that kayakers wear safety gear even though the kayaks are quite safe.

53. Answer: D. *E103 Independent Clauses: Period, Semicolon, Comma and FANBOYS*

The use of *yet* as a transition word makes **D** the *least* viable option. The sentence would be an independent clause without it, but with it becomes dependent on the prior sentence, and is thus a fragment

54. Answer: F. *E112 Word Choice: Tone*

The most appropriate name for the people in this sentence is *nature watcher*, because it adequately describes what they do as well as why this is relevant to them.

55. Answer: C. *E118 Moving Paragraphs*

The break would be most appropriate here because this is where the second topic, the sea kayak, is introduced. There is no transitional word or phrase, so the ideas are best separated down the middle.

56. Answer: G. *E101 Verbs: Agreement/Tense*

The subject of this sentence is *equipment*, NOT *kayaks*. As such, a singular verb conjugation is necessary.

57. Answer: B. *E103 Independent Clauses: Period, Semicolon, Comma and FANBOYS*

These two independent clauses already have a comma between them, so the conjunction *and* is necessary. Of course, it does not need to be *and*, but that is the only appropriate option provided.

58. Answer: J. *E116 Modification: Moving Modifiers*

The best way to organize this sentence is to consider it one piece at a time. The start is, of course, *the paddler*. Next, the paddler does what? Pulls. Pulls what? One end. Of what? The paddle. Through where? The water. What water? On alternating sides of the boat. It's a bit of a convoluted process, but it will almost always find the right answer.

59. Answer: B. *E203 Adjectives and Adverbs*

There is no need to punctuate here. Despite the *but*, this is still just the use of adjectives to modify *boat*.

60. Answer: G. *E110 Relevancy: Adding, Deleting, and Replacing Information*

Process of elimination is the best route for answering this question. It is not difficult to determine this paragraph is not a detailed description of muscles, nor a scientific explanation, nor a plea of safety. The only reasonable answer is **G**.

61. Answer: C. *E104 Nonessential Information: Commas, Dashes, Parentheses*
This latter portion of the sentence is a long modifier. *Seams* is modified by *of burning rock miles beneath Earth's surface.* There is no reason to punctuate within this modification.

62. Answer: J. *E103 Independent Clauses: Period, Semicolon, Comma and FANBOYS*
When given an independent and a dependent clause, it is easy to combine them. When separating them, however, one must be careful not to strand a dependent clause. **J** incorrectly uses a period to separate the dependent clause without making it independent.

63. Answer: C. *E101 Verbs: Agreement/Tense*
The simplest way to check if a verb agrees with the sentence is to compare it to another verb when available. In this case, *to feed* can be assumed correct, so the same conjugation should be applied to the second *to breed*.

64. Answer: H. *E112 Word Choice: Tone*
Phrases such as *to a tee* or *all right* are casual and inappropriate for a formal, informative essay. Instead, the clear, concise, professional option **H** is appropriate

65. Answer: B. *E120 Parallel Structure*
The list here should, first and foremost, be corrected to use *too* instead of *to*. This should also rule out option **D**. The difference between is the remaining answers is the concluding comma, which should not be included as it incorrectly separates the modifications from their subject.

66. Answer: G. *E104 Nonessential Information: Commas, Dashes, Parentheses*
The additional clause here, which provides the name (an extra detail), should not be a functional part of the sentence. As such, a comma on each end denotes it as separate.

67. Answer: D. *E103 Independent Clauses: Period, Semicolon, Comma and FANBOYS*
The two independent clauses provided can be separated in a number of ways. It should immediately stand out as incorrect to provide *no* punctuation or other change in order to separate these ideas.

68. Answer: J. *E101 Verbs: Agreement/Tense*
The simple present-tense conjugation *flourish* is appropriate because the action is continuing in the present; had thermophiles all died off, the past could have been applicable. They did not, however, and still flourish in the present.

69. Answer: D. *E113 Short and Simple*
This additional information is irrelevant and should be deleted. The same is true for the replacement options. When one answer is so notably longer than the others, it should immediately catch your eye.

70. Answer: G. *E110 Relevancy: Adding, Deleting, and Replacing Information*
Remember, it is not the affirmative or negative that matters. Determine your answer based on the supporting evidence. The options are all easily verified as incorrect *except* **G**, which is true. While it is not a fantastic reason in and of itself, it is the only viable option.

71. Answer: A. *E112 Word Choice: Tone*

The other options do not actually describe the terrain. They mention the cause, however only option **A** meets the question's request for *specifically and vividly* describing the underwater terrain.

72. Answer: J. *E116 Modification: Moving Modifiers*

It is important that each modification is clearly matched to its subject. The modification *from cracks* best modifies the verb *gush*, so should follow it. This also shifts the remaining words into a sensible order.

73. Answer: A. *E114 Transition Words/Phrases*

This answer is LEAST correct because it does not specify the psychrophiles' affinity for cold. This is a necessary detail to provide a contrast to the previous paragraph, creating a transition.

74. Answer: G. *E110 Relevancy: Adding, Deleting, and Replacing Information*

This portion of the sentence is important to making a real connection to the scientific conjecture which follows. Option **G** is the only answer which accurately connects its support to both the question *and* the context.

75. Answer: D. *E114 Transition Words/Phrases*

Options **A-C** imply some sort of contradiction or seemingly contrary evidence, whereas this is in fact introducing an idea in total agreement with the preceding sentence. Only *indeed* builds off of the former sentence without implying something to the contrary will follow.

Mathematics Test

1. Answer: D. *M204 Absolute Value*

$|7 - 3| - |3 - 7| = ?$

$|4| - |-4| = ?$

$4 - 4 = 0$

D. 0

Tip: *Absolute value works like parentheses or grouping symbols. You must do the work inside BEFORE taking the absolute value.*

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2. Answer: G. *M212 Linear Function: Rate*

$\$45/hour \ + \ \$30 \, flat \, fee$

$210 = 45(hours \, worked) + 30$

$210 = 45x + 30$

$-30 -30$

$180 = 45x$

$\div 45 \div 45$

$4 = x$

G. 4

3. Answer: C. *M109 Rate & Proportion*

$Vehicle \, A : \ \frac{1008 \, mi}{14 \, mi/gal} = 72$

$Vehicle \, B : \ \frac{1008 \, mi}{36 \, mi/gal} = 28$

$72 - 28 = 44$

C. 44

4. Answer: J. *M201 Algebraic Operations*

$t^2 - 59t + 54 - 82t^2 + 60t \qquad combine \, like \, terms$

$-81t^2 + t + 54$

J. $-81t^2 + t + 54$

5. Answer: C. *M308 Multiple Figures*
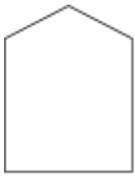
$5 \times 6 = 30$

C. 30

6. Answer: J. *M217 Factoring & FOIL*

$(4z + 3)(z - 2)$

$4z^2 - 8z + 3z - 6$

J. $4z^2 - 8z + 3z - 6$

7. Answer: C. *M110 Percent*

Given number $= x$

$40\% \ of \ x = 8$

$.4x = 8$

$x = \frac{8}{.4} = 20$

$(.15)(20) = 3$

C. 3

8. Answer: H. *M103 Properties of Integers*

$x - 2$

$x - 1$

x

$x + 1$

$x + 2$

$+ \ x + 3$

_____

$6x + 3$

$6x + 3 = 447$

$\quad -3 \qquad -3$

$6x = 444$

$\div 6 \qquad \div 6$

$x = 74$

H. 74

9. Answer: D. *M208 Coordinate Geometry & XY-plane*

Draw a picture!

(3,5)

(5,4)

2

(7,3)

2

OR

$$\frac{7+x}{2} = 5 \qquad\qquad \frac{3+y}{2} = 4$$
$\times 2 \qquad \times 2 \qquad\qquad\quad \times 2 \qquad \times 2$

$$7 + x = 10 \qquad\qquad 3 + y = 8$$
$-7 \qquad -7 \qquad\qquad -3 \qquad -3$
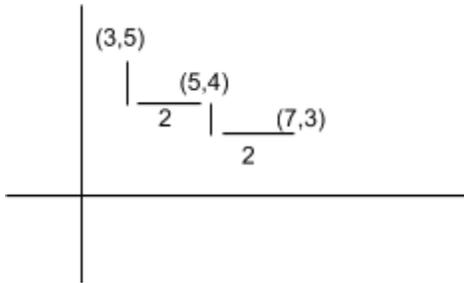
$$x = 3 \qquad\qquad\qquad y = 5$$

D. $(3, 5)$

Tip: *Midpoint means average of x and y.*

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10. Answer: F. *M208 Coordinate Geometry & XY-plane*

Draw the 4th point

4
(5,4)

3

6

4
(10,-3)

3

(6,-6)

-6
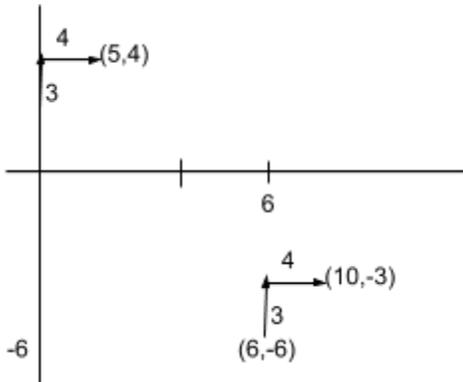
F. $(10, -3)$

11. Answer: E. *M220 Matrix*

$$
\begin{array}{ccc}
\ \ A & B & C
\end{array}
$$

$$
\begin{array}{c}
x \\
y
\end{array}
\begin{bmatrix}
100 & 200 & 150 \\
120 & 50 & 100
\end{bmatrix}
\qquad
\begin{array}{c}
A \\
B \\
C
\end{array}
\begin{bmatrix}
5 \\
10 \\
15
\end{bmatrix}
$$

$x = 100 \times 5 + 200 \times 10 + 150 \times 15 = 4750$
$y = 120 \times 5 + 50 \times 10 + 100 \times 15 = 2600$

$4750 + 2600 = 7350$

E. 7350

12. Answer: J. *M301 Lines & Angles; M302 Triangles*
$y = 180 - 72 = 108$
$x = 180 - 57 = 123$
$z = 180 - 51 = 129$

$108 + 123 + 129 = 360$

J. 360

Tip: *The sum of the EXTERIOR angles of a triangle is 360.*

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13. Answer: A. *M110 Percent; M506 Tables*
Whitney $= 30$
$\frac{30}{200}x100 = 15\%$

A. 15%

14. Answer: H. *M508 Sampling*
$Lue = \frac{80}{200} = \frac{x}{10,000} = 4,000$

H. $4,000$

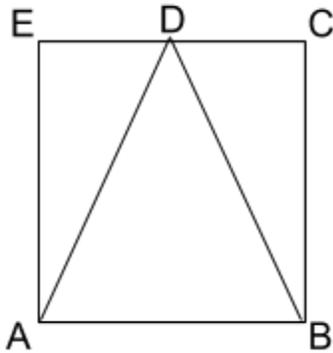**15. Answer: B.** *M306 Sectors & Arcs*

$\frac{40}{200} = \frac{x^o}{360}$

$\frac{40 \times 360}{200} = x^o$

$72 = x^o$

B. 72°

Tip: *The ACT loves 360÷5=72°; it is one of their favorite angles! Memorize!*

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16. Answer: G. *M308 Multiple Figures; M108 Ratio*

Plug in your own numbers

$\overline{AB} = 4$

$area\ \Delta ADE = (\frac{1}{2})(2)(4) = 4$
$area\ \Delta ADB = (\frac{1}{2})(4)(4) = 8$

$4 : 8 = 1 : 2$

G. $1 : 2$

17. Answer: E. *M207 Linear Functions: y=mx+b*

$y = \frac{2}{3}x - 4$

E. $\frac{2}{3}$

Tip: *Parallel lines have the SAME slope.*

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18. Answer: H. *M108 Ratio*

Trick: Use the ratio box!

2	:	3	=	5	
*x*6		*x*6		*x*6	*multiplier*
12		18		30	

H. 12

19. Answer: C. *M103 Properties of Integers; M205 Exponents & Roots*

$\sqrt{58} = 7.6157$

C. 8

20. Answer: G. *M303 Quadrilaterals*

Area of walls:

$4 \times (10 \times 15) = 600 \; sq \, ft$

$600 - window - door$
$600 - (3 \times 5) - (3.5 \times 7) = 560.5 \; sq \, ft$

$\frac{560.5}{300} = 1.8$

G. 2

Tip: *Question #20 is going to be easy. When doing easy problems, estimate and don't be afraid to think it through. Usually you get to the answer quickly, saving precious time for harder problems.*

21. Answer: A. *M217 Factoring & FOIL*

$x^2 + 2x = 8 \qquad factor$
$ -8 \qquad\quad -8$
$x^2 + 2x - 8 = 0$
$(x + 4)(x - 2) = 0$
$x = 2, \; -4$

A. $-4 \; and \; 2$

Tip: *For quadratic solutions there are words that are similar: factor, solution, root, zero, and x-intercept(s). Look at lesson M218 for a detailed explanation.*

22. Answer: K. *M205 Exponents & Roots*

$\frac{3a^4}{3a^6} = \frac{a^4}{a^6} = a^{4-6} = a^{-2} = \frac{1}{a^2}$

K. $\frac{1}{a^2}$

Tip: *KNOW the rules of exponents and roots. You ARE going to see them on the ACT. Watch lesson M205 on YouTube.*

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23. Answer: E. *M208 Coordinate Geometry*

M has *x* and *y* that are opposite: $(-x, y)$ or $(x, -y)$

Trick: Plug in your own numbers.

$(-2, 3)$ or $(2, -3)$

```
   II                    I
      (-3,2)
        •

  ─────────────┼─────────────

                    •
   III           (2,-3)    IV
```

E. *II or IV only*

24. Answer: K. *M212 Linear Function: Rate*

$fixed = \$1,400$
$variable = \$5.25$

K. $\$1,400 + 5.25b$

Tip: *This is a common problem. Variable rate is <u>slope</u> (m). Fixed cost is <u>y-intercept</u> (b) in slope form y=mx+b.*

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25. Answer: B. *M302 Triangles; M109 Rate & Proportion*

$\frac{3}{7.5} = \frac{\overline{AB}}{12.5} = \frac{\overline{BC}}{15}$ solve for AB, BC

$\overline{AB} = 5, \overline{BC} = 6$

$Perimeter\ of\ ABC = 3 + 5 + 6 = 14$

B. 14

Tip: *Similar means congruent angles with sides in proportion to each other.*

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26. Answer: G. *M205 Exponents & Roots*

$$\frac{3\sqrt{7}}{a\sqrt{7}} = \frac{3\sqrt{7}}{7}$$

solve:

$$a\sqrt{7} = 7$$

$\div \sqrt{7} \qquad \div \sqrt{7}$

$$a = \sqrt{7}$$

G. $\sqrt{7}$

27. Answer: C. M*212 Linear Function: Rate*

$$70 \; meters \; - \frac{6\;meters}{second}(\times \; seconds) = 10 \; meters - \frac{15\;meters}{second}(\times \; second)$$

$$70 - 6x = 10 + 15x$$

-10   **-10**

$$60 - 6x = 15x$$

$+6x \qquad +6x$

$$60 = 21x$$

$\div 21 \quad \div 21$

$$x = 2.85$$

C. 2.9

Tip: *"Constant rate" means slope of a linear function.*

---

28. Answer: J. *M504 Counting, Permutations, & Combinations*

4 roads, 2 paths, 6 trails

$$4 \times 2 \times 6 = 48$$

J. 48

29. Answer: E. *M307 Solids; M101 Word Problems - Translation & Vocabulary*

Side of cube 4 is 2 inches. Cube B is <u>double</u>.

Side of cube B $= 2 \times 2 \; inches = 4 \; inches$
Volume of B $= 4^3 = 64 \; cubic \; inches$

E. 64

Trap: Volume of A = 8 cubic inches. Double the <u>volume</u> of A is 16, Answer **C.** You must double the <u>side</u>, not the volume.

30. Answer: G. *M205 Exponents & Roots; M110 Percents*

Plug and chug!

$A = 10,000(1 + .04)^5$ *calculator!*
$A = 12,166.52$
G. 12.167

31. Answer: D. *M307 Solids*

$2\pi r^2 + 2\pi rh$
$r = \frac{20}{2} = 10$ $h = 20$
$2\pi(10)^2 + 2\pi(10)(20)$
$200\pi + 400\pi = 600\pi$

D. 600π

32. Answer: H. *M214 Functions f(x)*

$f(x) = 4x + 1$ $g(x) = x^2 = 2$

$f(g(x)) =$?

$4(x^2 - 2) + 1 = 4x^2 - 8 + 1 = 4x^2 - 7$

H. $4x^2 - 7$

Tip: *The ACT loves this question. Evaluating a function is on every test.*

---

33. Answer: B. *M501 Mean, Average*

$0.4 + 1.10 + 2.5 + 3.9 + 4.7 + 5.5 + 6.1 + 7.2 = 120$

$\frac{120}{43} = 2.79$

B. 2.8

34. Answer: H. *M301 Lines & Angles*

Supplementary means adds up to 180° or forms a straight line.
Because *A* is parallel to *B*, but *C* is not parallel to *D*, only the top part matters: *C* cutting *A* and *B*.
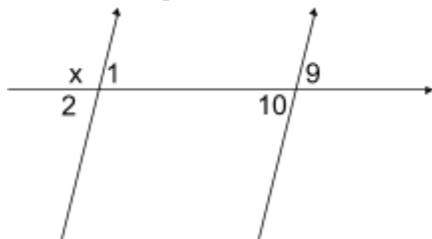
H. {1, 2, 9, 10}

35. Answer: E. *M205 Exponents & Roots*

$(3x^3)^3$

Tip: Distribute exponents.

$(3)^3(x^3)^3 = 27x^9$

E. $27x^9$

36. Answer: F. *M203 Inequalities*

$4x - 8 > 8x + 16$

$-4x \qquad\quad -4x$

$-8 > 4x + 16$

$-16 \qquad\quad -16$

$-24 > 4x$

$\div 4 \quad\ \div 4$

$-6 > x$

F. $x < -6$

37. Answer: C. *M208 Coordinate Geometry & XY-Plane; M210 Systems of Equations*
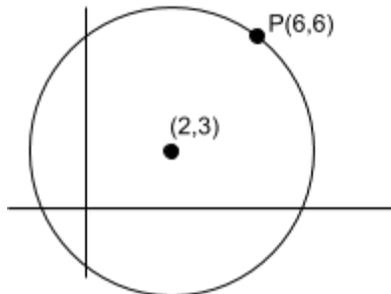
First of all, there are <u>many</u> ways to solve this problem. Plot the answer choices on the xy graph. Answer choices **A** and **B** are not even on the circle! Wrong! **E** (7,3) is way off. So the only choices are **C** and **D**. Pick one and find the slope.

Slope of $\overline{PO} = \frac{6-3}{6-2} = \frac{3}{4}$

The right answer will have a slope of $-\frac{4}{3}$.

Slope of $\overline{XO} = \frac{-1-3}{5-2} = -\frac{4}{3}$

C. $(5, -1)$

Trick: Use the corner of your answer sheet to measure a 90° angle. Put the corner on (2,3) and the top edge on (6,6). Draw a line from (2,3) to the circle and you will hit answer **C**!

38. Answer: K. *M401 SOHCAHTOA; M302 Triangles*

First solve for $\overline{KL}$ using the Pythagorean Theorem.

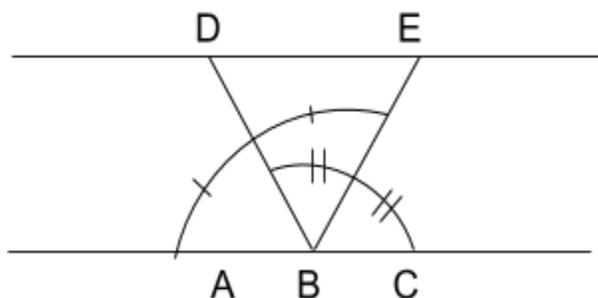$$10^2 + \overline{KL}^2 = 12^2$$
$$100 + \overline{KL}^2 = 144$$
$$-100 \phantom{+ \overline{KL}^2 = 14}-100$$

$$\overline{KL}^2 = 44$$
$$\overline{KL}^2 = \sqrt{44}$$

$$sin = \frac{opp}{hyp} = \frac{\sqrt{44}}{12}$$

K. $\frac{\sqrt{44}}{12}$

39. Answer: B. *M301 Lines & Angles*

Angle DBE is half of both $\angle$ABE <u>and</u> $\angle$DBC. That makes $\angle$ABD$\cong\angle$EBC. It logically flows that they are all congruent.

$$\frac{180}{3} = 60^o$$

B. 60°

Tip: *E. Cannot be determined* is <u>almost</u> always wrong on the second half of the test (questions higher than 30).

---

40. Answer: H. *M205 Exponents & Roots*

molecules per cm^3 means divide

$$\frac{8\times10^{12}}{4\times10^4} = 2 \times 10^{12-4} = 2 \times 10^8$$

H. 2×10^8

41. Answer: B. *M404 Law of Sines/Cosines*

Trick: First look at the answers! The only thing that is different is the <u>angle</u>!! Find the angle opposite the "question mark".

To find the unknown angle subtract 170 from 300.

$300 - 170 = 130^o$

Yup, that's it.

B. $\sqrt{20^2 + 30^2 - 2(20)(30)cos130^o}$

Tip: *Watch the video lesson on the Law of Sines and Cosines. The ACT only asks you to fill in the equation, NOT actually solve the problem. These are easy to do with just a little practice!*

---

42. Answer: J. *M102 Operations - Order of Operations, Number Theory; M104 Fractions*

$\frac{\frac{1}{5}+\frac{1}{3}}{2} = \frac{1}{2}(\frac{1}{5} + \frac{1}{3})$

If ever there was a time to use your calculator, it is now.

$\frac{1}{2}(\frac{1}{5} + \frac{1}{3}) = \frac{1}{2}(\frac{3}{15} + \frac{5}{15}) = \frac{1}{2}(\frac{8}{15}) = \frac{4}{15}$

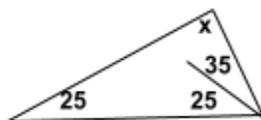**J.** $\frac{4}{15}$

Tip: *Halfway means average.*

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43. Answer: B. *M303 Quadrilaterals*

An isosceles trapezoid has 2 pairs of equal angles and the slanted sides are congruent.

$\angle$ADC≅$\angle$BCD

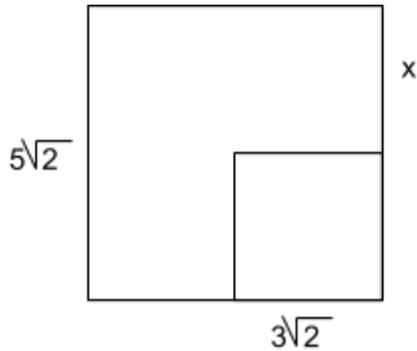$\angle$BDC≅$\angle$ACD, which is 25°

Therefore, $\angle$DBC looks like:

$x + 25 + 25 + 35 = 180$

$x + 85 = 180$

$x = 95$

B. 95

44. Answer: G. *M303 Quadrilaterals; M308 Multiple Figures*

Area of large square is 50. $s_L = \sqrt{50} = 5\sqrt{2}$
Area of small square is 18. $s_S = \sqrt{18} = 3\sqrt{2}$

$x = 5\sqrt{2} - 3\sqrt{2} = 2\sqrt{2}$

G. $2\sqrt{2}$

45. Answer: E. *M102 Operations - Order of Operations, Number Theory; M205 Exponents & Roots*

A rational number is any number that can be written in the form $\frac{a}{b}$, where a and b are integers. Rational numbers are the *ratio* of integers.

$$\sqrt{\frac{64}{49}} = \frac{\sqrt{64}}{\sqrt{49}} = \frac{8}{7}$$

E. $\sqrt{\frac{64}{49}}$

46. Answer: K. *M204 Absolute Value*
$a < b$, so PLUG IN YOUR OWN NUMBERS!
$a = 2, \; b = 3$
$|2 - 3| = |-1| = 1$

Plug $a = 2, \; b = 3$ into every answer to find which one is equal to 1.

$-(2 - 3) = -(-1) = 1$

K. $-(a - b)$

47. Answer: A. *M501 Mean/Average*

This is a classic average problem.

$$\frac{[sum\ of\ first\ 5\ tests]}{5} = 78$$
$$sum = 5 \times 78 = 390$$

$$\frac{[390 + 6th\ test]}{6} = 80$$
$$390 + 6th\ test = 6 \times 80 = 480$$
$$6th\ test = 480 - 390 = 90$$

A. 90

48. Answer: F. *M219 Complex Numbers; M208: Coordinate Geometry & XY-plane*

Note: The complex plane is an obscure topic. If you have never seen it, don't panic. It is rarely tested on the ACT.

Trick: *Modulus* just means the distance from the origin. Notice that it looks exactly like the solution for the hypotenuse of a right triangle—because it is!
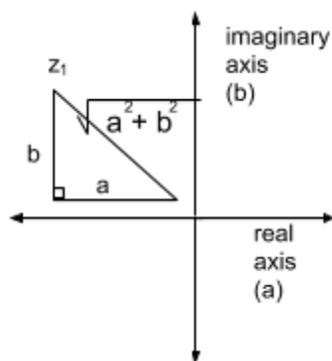
z_1 forms a right triangle with one leg (a), the real axis, and the other leg (b), the imaginary axis. Its hypotenuse is the longest; therefore, it has the greatest modulus.

F. z_1

49. Answer: C. *M205 Exponents & Roots*

Trick: $8 = 2^3$ and $4 = 2^2$, so substitute a base 2 for both sides.

$$8^{2x+1} = 4^{1-x}$$
$$(2^3)^{2x+1} = (2^2)^{1-x}$$
$$2^{6x+3} = 2^{2-2x}$$

The bases are now equal; thus, the exponents are also equal.

$$6x + 3 = 2 - 2x$$
$$\underset{+2x}{} \qquad \underset{+2x}{}$$
$$8x + 3 = 2$$

$$^{-3 \quad -3}$$
$$8x = -1$$
$$_{\div 8 \quad \div 8}$$
$$x = \frac{-1}{8}$$

C. $-\frac{1}{8}$

50. Answer: F. *M403 Trig Function; M214 Functions f(x)*

Note: This question is <u>ALL</u> about even and odd functions. It even gives the definition of even and odd functions in the answer choices. To solve, simply plug in and evaluate for x.

$$2cos(\tfrac{1}{2}\pi) = 0$$
$$2cos(\tfrac{1}{2}(-\pi)) = 0$$

The function is even because the value of π and $-\pi$ give the same output.

F. *Even*

> **Tip:** *An <u>even</u> function is y=x² and an <u>odd</u> function is y=x³.*

51. Answer: D. *M503 Probability; M504 Counting, Permutations, & Combinations*

This problem requires making a list of all possible numbers that have *0* as one if its digits.

100	106	130	190
101	107	140	
102	108	150	
103	109	160	
104	110	170	
105	120	180	

There are 19 numbers in each set of hundreds that contain at least one zero, and 9 sets of hundreds.
$19 \times 9 = 171$

D. $\frac{171}{900}$

52. Answer: F *M207 Linear Functions: y=mx+b*

First find the slope of line *q*.
$$-2x + y = 1$$
$$_{+2x \qquad +2x}$$
$$y = 2x + 1$$
The slope of line *q* is positive 2.
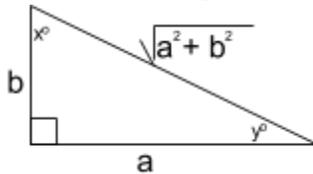
Since $\angle a \cong \angle b$, the line reflects about the line $x = -\frac{1}{2}$, the x-intercept.
Reflected lines have opposite slopes, so line *r* has a slope of -2.

F. -2

Tip: *"Cannot be determined" is never a correct answer for a hard problem. If the question number is >30, the answer can be determined!*

53. Answer: D. *M401 SOHCAHTOA*
Redraw the triangle:

$tan(x^o) = \frac{a}{b}$, all the question asks is what is $cos(x^o)$?

$$cos(x^o) = \frac{b}{\sqrt{a^2+b^2}}$$

D. $\frac{b}{\sqrt{a^2+b^2}}$

54. Answer: J. *M305 Circles*
$A = \pi r^2$
$A = \pi(52)^2$
$A = 8494.86$

J. 8500

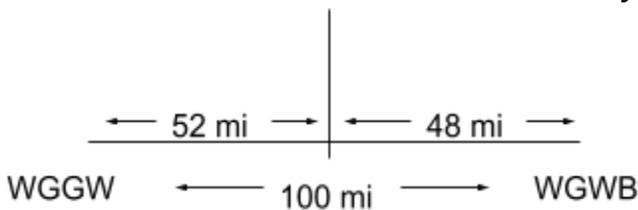### 55. Answer: E. *M215 Equation of a Circle*
The equation of a circle is $(x - h)^2 + (y - k)^2 = r^2$ where (h, k) is the center and r is the radius.

E. $x^2 + y^2 = 52^2$

56. Answer: G. *M208 Coordinate Geometry & XY-plane; M305 Circles*

WGGW can be heard 48 miles away from WGWB, which transmits for 60 miles.
$60 - 48 = 12$

Trap: $60 - 52 = 8$, which is choice **F**!

G. 12

57. Answer: E. *M210 Systems of Equations*
The question asks to solve for the solutions, or intercepts, of the two equations. Obviously the x-intercept for both equations is $x = 1$.
The second solution is $x = 2$; BACKSOLVE.
$$x - 1 = (x - 1)^4$$
$$2 - 1 = (2 - 1)^4$$
$$1 = 1$$
So the solution set is $1 < x < 2$. This is the region where the line has a greater y-value than the polynomial.

E. $1 < x < 2$

58. Answer: F. *M102 Operations - Order of Operations, Number Theory*
PLUG IN! Pick a number t, u.
$$x = 31 \quad t = 3 \quad u = 1$$
reverse: $y = 13$

$$x - y = 31 - 13 = 18$$
Plug in the values for t and u to find 18.

F: $9(3 - 1) = 18$

F. $9(t - u)$

59. Answer: A. *M302 Triangles*
$Area = \frac{1}{2}bh$

$base = 5 - 1 = 4$
$height = 5 - 3 = 2$

$A = \frac{1}{2}(2)(4) = 4$

A. 4

60. Answer: F. *M106 Sequence*
First solve for a, because it is the first term.
$$\frac{a}{1-.15} = 200$$
$$\frac{a}{.85} = 200$$
$$a = (.85)(200)$$
$$a = 170$$

The second term is found by multiplying the first term by .15.
$$a_2 = (.15)(a)$$
$$a_2 = (.15)(170)$$
$$a_2 = (25.5)$$

F. 25.5

Reading Test

1. Answer: B. *R104 Big Picture*
To answer these *big picture* questions, think about the passage of the whole. **A** can be eliminated because both women are not sharing their dreams. **C** can be eliminated because the narrator is one of the two people in the text. **D** can be eliminated because the narrator does not describe several dreams in detail, only one. **B** is the only reasonable answer.

2. Answer: F. *R104 Big Picture*
You should be able to answer this question without taking the time to go back to the passage. The narrator is helpful towards her friend, so **G** and **H** can easily be eliminated. There is no evidence to support *lonely* or *optimistic*, so **F** is the best answer.

3. Answer: B. *R201 Detail*
Skim the passage to find the woman's thoughts on her lack of dreaming. The paragraph in lines 25-30 states that not dreaming *robs her of parts of herself*, which describes a lack of self-awareness.

4. Answer: J. *R201 Detail*
Skim the passage for the first mention of the door. The text states in lines 1-6 that the woman doesn't dream, stands at the threshold, and doesn't have the *door of dreams*. These lines all support **J**, that the door is the metaphorical boundary between not-dreaming and dreaming. **G** is trying to trick you because it mentions dreams, but the woman has neither dreams nor nightmares.

5. Answer: C. *R201 Detail; R101 Line Number*
For questions like these, always refer to the given lines. The first paragraph states that the closed door of not dreaming is a nightmare in itself. Lines 10-13 mention that the door cannot be opened and even knocking doesn't make a sound, which emphasizes the hopelessness of trying to get in the door.

6. Answer: G. *R201 Detail*
When the question refers to a specific section of the text that is easy to find, go back to the text to check details, since you won't be spending too long finding the right place. The start of the paragraph about the amniotic dream, line 71, states that she likes this dream best. **J** is the trick, but the text talks about the amniotic dream right after talking about how the woman liked hearing dreams, and right before a description of a dream the woman would rather have.

7. Answer: D. *R201 Detail*
Read the answer choices first, then skim the passage to find which one is mentioned. The paragraph in lines 31-34 mentions the woman's fear that she is different from others.

8. Answer: J. *R201 Detail*
The text states that the woman dreams the narrator's dreams in the *privacy of her room*, and *hiding*, which can be described as secretive.

9. Answer: C. *R202 Vocabulary in Context*

Always go back in the text to find the answer for vocabulary in context questions. The narrator describes the woman's *envy and bad humor* being brought out, which suggests that *humor* is temporary and similar to envy. The closest answer choice is **C**, mood.

10. Answer: H. *R201 Detail*

Skim the passage to find the description of Kafka, which is in lines 61-64. Kafka is described as the only author able to properly describe dreams.

11. Answer: A. *R104 Big Picture*

You should be able to answer this question without taking the time to go back to the passage. If you have extra time, skim the passage to find the answer stated explicitly in the text, which can be found in lines 62-66.

12. Answer: H. *R204 Main Idea/Function: Paragraph*

Refer back to the first paragraph to remind yourself which one it was, but it isn't necessary to reread it. A quick skim shows the first paragraph talking about all the ways the climate shifted frequently during the Little Ice Age.

13. Answer: D. *R201 Detail; R101 Line Number*

Look back in the passage at the stated line, but consider that the answer will likely be found before or after the examples. Evelyn's words are described as *invaluable*, but with *limited* usefulness. **A** is trying to trick you, but the writing is not completely useless.

14. Answer: F. *R201 Detail; R101 Line Number*

The answer is not in the given lines, but is found right before it. The text states that the Little Ice Age occurred *during times of remarkable change*. The em dash here suggests that what follows is a further description of these times.

15. Answer: A. *R201 Detail; R101 Line Number*

Look back in the text to read the given lines. The answer is clearly stated in that the effects of food occurred *continent-wide*, or widespread, and *could take decades to unfold*, or are long-lasting.

16. Answer: J. *R203 Inference/Assumption; R101 Line Number*

The answer is not directly stated in the text, but can be inferred pretty easily. The given lines list examples of food crises, which may or may not have been caused by the climatic shifts during the Little Ice Age, as explained in lines 83-86. These examples are followed up with a statement that the events were important in producing modern Europe, implying that the Little Ice Age may have had an impact on modern Europe.

17. Answer: D. *R201 Detail; R401 Least/Not/Except*

For questions like these, always refer back to the text, because the line should be easy to find after answering the previous question, and you can then answer with 100% certainty. The answer is explicitly stated in lines 83-85.

18. Answer: G. *R201 Detail*

Rather than skim the entire passage, take a moment to think about where in the passage you might find the answer. The cause of the climate shifts is discussed at the very beginning; the rest of the passage talks about its effects. The answer is explicitly stated in lines 6-7.

19. Answer: D. *R201 Detail; R401 Least/Not/Except*

While questions that look like this are usually better answered from memory, this particular question clearly refers to a specific, easily found portion of text. The incorrect answers are all explicitly stated in lines 8-12.

20. Answer: G. *R203 Inference/Assumption*

It can be time consuming to skim the entire passage to find the word anomaly, so you can skim the answer choices for a hint. If you remember that the text mentioned today's prolonged warming as an anomaly, you're done. If you need to skim for the word anomaly, try to do so quickly. It is found in lines 14-15.

21. Answer: C. *R104 Big Picture*

This big-picture question is not too difficult to answer if you read carefully. You just read an entire passage about how great Louis Armstrong was and all his influences, which is best summarized by choice **C**. Choices **A** and **B** try to trick you because in each answer, the first half is praising Armstrong but the second half is inaccurate.

22. Answer: J. *R104 Big Picture; R401 Least/Not/Except*

Try to answer this question without rereading the entire text. Answer choices **F** and **G** should be easily eliminated from memory. Answer choice **J** is correct because none of Armstrong's recorded pieces was ever mentioned, which you can confirm with a fast skim of the passage if you need.

23. Answer: B. *R203 Inference/Assumption; R104 Big Picture*

This question is tricky because the answer is not stated clearly and must be inferred. The passage begins with a description of Armstrong's improvisation, and as you learned in English class, the introduction paragraph should describe your thesis.

24. Answer: G. *R204 Main Idea/Function: Paragraph*

In questions like these, always refer back to the given paragraph. This paragraph appears to be a timeline of the 1920s and 1930s in Armstrong's life, only listing events.

25. Answer: C. *R203 Inference/Assumption; R401 Least/Not/Except*

You should recognize the answer choices as being mostly listed explicitly in the passage. If you skim looking for them, you will find all except for one listed between lines 49-53.

26. Answer: F. *R203 Inference/Assumption; R102 Paragraph Number*

Although the answer is not stated explicitly in the paragraph, a reread of the paragraph shows enough evidence to eliminate choices **G**, **H**, and **J**. **G** can be eliminated with information in lines 78-80 and 85-85, **H** can be eliminated with information in lines 75-78, and **J** can be eliminated with information in line 74-75.

27. Answer: C. *R201 Detail; R102 Paragraph Number*
The answer is explicitly stated in the text. The last paragraph states that Armstrong wanted to provide *the kind of pleasure music gave him* in lines 79-80.

28. Answer: G. *R201 Detail*
The text states in line 28-29 that Armstrong finally settled in New York in 1929, which implies he lived there last.

29. Answer: A. *R203 Inference/Assumption; R101 Line Number*
Always go back to the text for questions like these. The given lines discuss an example of how Armstrong was so talented that other musicians were skeptical. We can infer that the author used this example to highlight Armstrong's skill.

30. Answer: H. *R201 Detail; R102 Paragraph Number*
Skim the given paragraph to find the specific detail mentioned. Lines 67-68 state that Armstrong got the orchestra swinging *without them even knowing it*, which means unconsciously.

31. Answer: C. *R103 Keyword; R401 Least/Not/Except*
This question requires going back to the passage to skim for the word qi, then see which of the answer choices is not explicitly stated. **A** and **B** are mentioned as causing sickness in lines 28-30. **D** is mentioned in lines 12-15.

32. Answer: F. *R201 Detail*
The answer to this question requires a careful rereading of the given paragraph, but the answer is explicitly stated in pieces throughout the paragraph.

33. Answer: C. *R203 Inference/Assumption*
You may have missed the key detail needed to answer this question, so look back at the paragraph you reread for the last question. In lines 42-45, the text mentions that endorphins block pain signals. From this, we can infer that this process is helpful for treating pain.

34. Answer: J. *R201 Detail*
The answer to this question is a little tricky to find because it requires information from two different paragraphs. First, go back to the paragraph describing the fMRI, and find where it mentions the visual cortex lighting up. It lights up when volunteers are shown a flashing light and when the vision-related point on the foot is stimulated. Since flashing light is not an answer choice, skim backwards to find the description of the vision-related point on the foot, which is described in lines 58-59 as on the outside of the foot.

35. Answer: B. *R201 Detail; R201 Paragraph Number*
By rereading the last paragraph, you will see that the research has *demonstrated new functional effects of acupuncture* but *raises more questions than it answers*. This is closest to answer choice **B**.

36. Answer: J. *R201 Detail*
Reread the paragraph that discusses yin and yang. The text states that yin reflects a lack of qi, and yang reflects an excess of qi. From this information, it is clear that the balance between yin and yang depends on qi.

37. Answer: A. *R201 Detail*

For questions like these, skim the passage for the word mentioned to find the answer quickly with 100% certainty. Line 31 mentions all of the answer choices as yang except for **A**.

38. Answer: H. *R202 Vocabulary in Context*

Always go back in the text to find the answer for vocabulary in context questions. The text refers to acupoints where nerves are concentrated. The only answer choice that makes sense is **H**.

39. Answer: D. *R201 Detail*

Although this question sounds like it's asking about science, it's really asking you to go back and reread the line about the placebo effect. The text explicitly states that Cho eliminated the placebo effect by stimulating a nonacupoint.

40. Answer: G. *R203 Inference/Assumption*

This question is tricky because the answer is not explicitly stated in the text. The author states that this *study raises more questions than it answers*, like many other reports, suggesting that additional studies may also raise more questions than they answer.

Science Test

1. Answer: D. *S206 Figure*

125º falls between 103º and 142º on Figure 1, which is labeled *shadow zone: neither p-waves nor s-waves received at seismographs*. 125º would not receive either type of wave.

2. Answer: G. *S206 Figure; S108 Text to Data*

In Figure 1, p-waves are represented by the solid lines. When the p-waves move from the mantle to the core, they continue moving (the s-waves do not), but bend slightly. The text states that the waves move and are refracted (bent) as they travel through the layers, so p-waves most likely enter the core and are refracted.

3. Answer: D. *S317 XY Graph: Extrapolate*

At 10,000, the s-waves are above 23 min and the p-waves are 13 min. Since both lines are increasing as distance increases, the time between them would be more than 10 min at 10,500.

4. Answer: F. *S318 XY Graph: Infer*

The text defines focus as the point of origin, which would be represented by the origin on the graph in Figure 3 (0 km, 0 min).

5. Answer: A. *S206 Figure; S201 Science Math*

Amplitude is the strength or intensity of a wave, which is shown on the seismograph as the highest points. The first s-waves reach a higher point than the first p-waves, so the first p-waves have a lower amplitude than the first s-waves.

6. Answer: F. *S314 XY Graph: Data Point*

In Figure 2, the clay is represented by the lighter gray area. The clay is thinnest at Winnipeg (about 10 m) compared to any other location.

7. Answer: C. *S314 XY Graph: Data Point*

In Figure 3, the dot representing the data point for the lowest $\delta^{18}O$ value is the point furthest to the left of each graph, which falls at around -25 and at a depth of between 25 and 30 m.

8. Answer: J. *S316 XY Graph: Increase/Decrease*

In Figure 2, the lake clay (lighter gray) increases in thickness from Grand Forks to Site 3 (right to left), while the glacial till (stripes) gets thinner.

9. Answer: C. *S320 XY Graph to Bar Chart*

In Figure 2, the top glacial till (stripes) is around 200 at Site 1, 203 at Site 2, and 190 at Site 3. The only graph that shows Site 2 as the highest elevation is **C**.

10. Answer: J. *S314 XY Graph: Data Point*

The question is asking for the $\delta^{18}O$ value around 3 m below the surface. In each graph in Figure 3, when the depth is between 0 and 5 m, the $\delta^{18}O$ value is between -14 and -16.

11. Answer: B. *S105 Text: Infer*
Experiment 3 is the only experiment that mentions visible bubbles, so the students likely used plastic bottles so they could see the bubbles in the liquid.

12. Answer: J. *S302 Table: Data Point*
In Table 1, the time before shaking is the same (1.75) in Trials 1, 3, and 5.

13. Answer: D. *S304 Table: Increase/Decrease*
In Table 2, the roll time increased after shaking in both trials.

14. Answer: H. *S306 Table: Infer*
In Experiment 3, the text states there were no bubbles visible after 2 hours. In Experiment 2, Trial 5 was done after waiting 2 hours, when the bubbles created in Trial 4 were likely no longer present.

15. Answer: A. *S305 Table: Extrapolate*
In Experiment 3, the text states there were no bubbles visible after 2 hours. Trial 5 should have had no bubbles before shaking, which gave a roll time of 1.75. Two hours later, there would also be no bubbles before shaking, so the roll time would also have been around 1.75.

16. Answer: H. *S305 Table: Extrapolate*
In Experiment 3, the text states that bubble were present after 15 min, but not after 2 hr. Similarly, Trial 4 (after 15 min) shows an increase in roll time compared to water, but Trial 5 (after 2 hr) doesn't. Thus, it likely would have taken between 15 min and 2 hr for the bubbles to become too few to affect the roll time.

17. Answer: A. *S314 XY Graph: Data Point*
In Figure 1, chlorophyll b (solid line) hits the highest absorption around 85 absorption, which is around 480 nm wavelength. In Table 1, 480 nm falls within the blue category.

18. Answer: F. *S200 Science Knowledge*
The chemical equation in the passage describes photosynthesis, because carbon dioxide, water, and energy are converted into glucose (sugar), oxygen, and water.

19. Answer: B. *S302 Table: Data Point*
In Figure 2, the rate of photosynthesis at 670 nm is around 95%. The only areas of the graph where the rate of photosynthesis is higher than that is 420-460 nm and 670-690 nm.

20. Answer: G. *S200 Science Knowledge*
In the chemical equation, carbon is represented by **C.** The **C** on the left side of the equation is in CO_2 (carbon dioxide), and the C on the right side of the equation (the products) is in glucose, a sugar.

21. Answer: C. *S314 XY Graph: Data Point*
In Figure 2, the highest rate of photosynthesis (around 100%) occurs at 440 nm wavelength. In Figure 1, 440 nm wavelength occurs near the maximum of chlorophyll (dotted line).

22. Answer: G. *S302 Table: Data Point; S108 Text to Data*
In Table 1, the density of ethanol was 0.793, because liquid 1 was entirely ethanol and no water.

23. Answer: C. *S302 Table: Data Point; S200 Science Knowledge*
An object will sink in a liquid with a lower density, but float in a liquid with a higher density. PA-11 sank in liquids 1-5 and floated in liquids 6-10, so has a density between 0.999 and 1.05.

24. Answer: H. *S305 Table: Extrapolate*
In Table 2, the mass of the solution increases as density increases. For every 3-4 the mass increases, the density increases around 0.05. When the mass is 64.64, the density is 1.29. When the mass is 67.54, the density will likely be around 1.35. (Density can also be calculated directly using the formula density = mass/volume, and using a mass of 67.54 and volume of 50 mL.)

25. Answer: B. *S101 Text: Experimental Design; S200 Science Knowledge*
Liquids 1 and 2 had a lower density than liquids 3 and 4. An object will sink in a liquid with a lower density, but float in a liquid with a higher density. Object B shows an impossible scenario, because the object would be floating in less dense liquids and sinking in more dense liquids.

26. Answer: F. *S101 Text: Experimental Design*
In experiment 1, the text defines taring as resetting the balance to 0. This allows the students to accurately measure the mass of the liquids in the cylinder.

27. Answer: B. S301 *Table; S200 Science Knowledge*
An object will sink in a liquid with a lower density, but float in a liquid with a higher density. PA-6 floated in liquids 8-10 and polycarbonate floated in liquids 9-10. Polycarbonate was "harder" to float (floated in fewer liquids), and so must be denser.

28. Answer: H. *S301 Table; S108 Text to Data*
According to the first paragraph of the text, fermentation produces either CO_2 and acid or only acid. In Table 1, B makes acid and CO_2, and D makes acid, so both B and D are undergoing fermentation.

29. Answer: C. *S301 Table; S108 Text to Data*
According to Table 1, B produces acid and CO_2 in lactose, and C produces acid and CO_2 in sucrose. If both species were present, there would be acid and CO_2 in both sucrose and lactose.

30. Answer: G. *S302 Table: Data Point*
In Table 1, B did not produce anything in sucrose but produced acid and CO_2 in lactose. The species is likely B.

31. Answer: D. *S301 Table*
In Table 1, neither C nor D produced CO_2 in lactose. In Table 2, C and D did produce CO_2 in lactose, so they must have acted synergistically.

32. Answer: G. *S206 Figure; S200 Science Knowledge*
According to Table 1, species D in sucrose produces acid but no CO_2. The text states that *if acid was produced, the solution was yellow* and *if CO_2 was produced, a gas bubble was observed at the top of the Durham tube*. Species D in sucrose would produce yellow coloration but no gas bubble.

33. Answer: D. *S301 Table*

In Table 1, neither A nor C produces acid or CO_2 in lactose, but C produces acid and CO_2 in sucrose. A and C together (in Table 2) produced nothing in lactose, but in sucrose produced acid and CO_2, which is the same as what C would have done alone.

34. Answer: H. *S108 Text to Data*

Scientists agreed that genetic material (genes) were in chromosomes in the nucleus. If genes are made only of DNA, which is the first sentence in the DNA Hypothesis, DNA would increase as chromosomes in the nucleus increased.

35. Answer: D. *S105 Text: Infer*

The first paragraph of the text states that in the 1940s, chromosomes had only been found in the nucleus of the cell. By stating that DNA is found only in the nucleus, the scientist is suggesting that genes are made up of only DNA because protein is also found elsewhere in the cell.

36. Answer: J. *S100 Text*

The second paragraph of the text describes the subunits that compose both DNA and proteins.

37. Answer: A. *S100 Text*

The Protein Hypothesis is summed up by comparing the small number of combinations in DNA to the large number of combinations in protein, which is due to the fact that DNA is composed of only 4 types of nucleotides whereas protein is composed of 20 amino acids.

38. Answer: F. *S107 Text: Explain*

The text states that in the 1940s, chromosomes had only been found in the nucleus. The DNA Hypothesis mentions a key argument that DNA is only found in the nucleus, so must be the source material for genes. However, if DNA was found outside the nucleus, this would contradict the DNA Hypothesis, because it would show that genes/DNA were found outside the nucleus.

39. Answer: B. *S100 Text*

The DNA Hypothesis adds on the argument that the amount of protein in a cell differs from cell type to cell type.

40. Answer: J. *S108 Text to Data*

The text states that DNA is composed of subunits called nucleotides, which would be a string of only N.