ANSWERS AND EXPLANATIONS

To The

2016-2017 Preparing for the ACT Student Bulletin

Sample Test

Prepared By

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HOUSTON, TEXAS

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The Optional Written Essay is not covered in this document. The Written Essay has no answer or answers. It is scored, by two graders, using a 1-6 scoring system. This results in a score range of 2-12. The ACT Student Bulletin discusses each of the six scoring categories (1-6 scale), suggests how to write the essay, and provides practice for the interested student.

NOTE: The ACT has changed the format for the optional written essay. Students are encouraged to read about these changes in the 2015-2016 ACT Student Bulletin and use the information therein for practice prior to taking the actual ACT.

COURSE PRESENTERS: There are a few minor changes to the ACT:

1. In the Science Reasoning section (4), the number of questions remain the same (40), but the number of passages given may vary. We expect there to be 5-7 passages. This year’s sample test has one less than in previous years.
2. In the Optional Written Essay, not to be outdone by the College Board that extended their Written Essay to 50 minutes, the ACT has expanded theirs to 40 minutes (from the old 30 minute time frame) AND they have changed the format to give students three (3) perspectives about a topic and ask them to discuss these three perspectives in light of their own perspective, which may or may not agree with any of the perspectives given. Please see an ACT Student Bulletin Sample Test for more information about these changes before you conduct your ACT class.

English Test – Section 1

1. A No change
2. J Similarly wrongly implies that the first statement also confounded scientists; however establishes the correct relationship between the two sentences. In other words, a contrast is needed.
3. D Clause following that must have a subject.
4. H The scientists re-created snowflake formation, not a discovery.
5. B There are several ways to correct this run-on sentence, but the only choice that works drops the pronoun subject it and changes causes to causing, thus converting the second sentence into a dependent clause.
6. J Singular bumps does not agree with plural molecules.
7. B Only choices A and B are relevant. Choice B is correct because the underlined phrase describes a detail, not the entire process.
8. J Singular forms does not agree with plural snowflakes.
9. C Use a colon to separate an independent clause from a word or phrase that expands or explains the statement. In this case dust expands and explains because it is the significant addition.
10. J Original statement seems to begin a cause and effect comparison that is not supported by the rest of the sentence. Easily corrected by removing the.
11. B Must be in adverb form to modify form. Use more quickly because ___ categories are compared: this edge and the rest of the snowflake.
12. G A comma is used after a long introductory dependent clause. See our "ACT Supplement" Book" for additional information about the use of dashes.
13. A No change.
14. H Note that the sentence under consideration begins with This growth. All of the choices refer to passages that describe the shapes of snowflakes, but only paragraph 2 specifically addresses growth.
15. D Final sentence establishes that the answer must be No; therefore, only C and D are possible correct answers. Choice C cannot be correct because the passage explains that scientists know how triangular snowflakes are formed.
16. H Introductory dependent clause is incorrectly followed by a conjunction. Use a conjunction when combining two independent statements.

17. B Tense error. Hike yet to take place; would have is confusing because it suggests that the hike may not happen, or that it had already happened.

18. J Only choice that does not have a redundant phrase.

19. C Incorrect preposition compromises meaning. Roof is not piled high on rocks.

20. H The only possible choice that corrects this run-on sentence removes which it was to create a dependent clause. A comma is used to separate the new dependent clause from the introductory independent clause.

21. A No change. Correct as is.

22. F No change. Correct as is.

23. B A few steps reinforces slowness. Compare to moving forward and climbing higher in the other choices.

24. H A comma is used after a long introductory dependent clause.

25. C Incorrect use of possessive form of cliffs.

26. F The correct answer cannot be choice D because nothing is contradicted, and it cannot be J because the hikers cannot see well in the half light. Only F and G are possible answers. G can be eliminated because the phrase does not introduce the idea of waiting, and the following paragraph describes the sunrise, not the waiting.

27. D Only finally conveys the intended meaning that the sun has at last begun to cover the landscape.

28. H A case could be made for choice H; however, smothered usually indicates a dampening or squelching. Shattered over is a better choice because it presents the image of the ruggedness of broken glass.

29. A Hikers started their journey at sunset. Sentence could only be placed in the first paragraph.

30. F Only a Yes answer makes sense, as the hike was described as very difficult. Choice G can be eliminated because the need for walking sticks and tools was not the primary focus of the story.

31. B Not an appositive and nothing to set off with commas.

32. H Changing the phrase to parenthetical would eliminate the commas, as the sentence must be grammatically correct with or without the parenthetical phrase. If Choice H is read without the parenthetical phrase, the sentence contains a comma splice.

33. B Comma splice. "When in doubt, leave it out."

34. H Paragraph begins with Juan beginning to work with clay. Only Choice H makes sense in this context.

35. A No change.

36. F Juan's work was close enough to traditional pots to confuse an anthropologist. Choice H is incorrect because the passage mentioned his own complex geometric patterns.

37. A No change.

38. F No change. Eventual is the only choice that suggests that the partnership did not happen right away.

39. C United States is a single place, and art dealers are not places. The sentence only conveys intended meaning when where follows United States.
40. J Simply using more is correct. More so is used to mean furthermore or to elaborate on a previously mentioned adjective or adverb.

41. C Around does not specify a place, and the author is clearly referring to Juan Quezada's hometown.

42. G When referring to people, use who or whom rather than which or that. Whom is correct in this case because it is the object of a preposition.

43. D They're is a contraction for they are. Only Choice D is a possible correct answer.

44. J Sentence should be placed after it has been established that Quezada taught people in the village to make the pots.

45. C The answer must be "No" because this passage has a narrow focus on one artist and his people who descended from one group of native Indians. Choice D can be eliminated because the ancient culture of the Casas Grandes was not the focus of the passage.

46. J It's is a contraction for it is. There is no apostrophe in the possessive.

47. D Fill is the correct form of the verb, and adding a comma would create a comma splice.

48. H However is used to indicate a contrast or something different. In the passage, some people are there for some other reason than a performance.

49. B They come creates a run-on sentence. Whom cannot be used because it is objective case and renaming buffs would require who.

50. F No change. Here the semicolon is used as a strong pause that substitutes for a conjunction. Other choices do not offer a better option.

51. D The passage is primarily about architecture. A discussion about theater would be out of place in this context.

52. J Gray is redundant, it was previously mentioned above, and should be deleted.

53. A No change.

54. F No change.

55. B Marred and gaudy in Choice C are negative terms, and Choice D has no elaborate style.

56. G The sentence refers to the interior decor and does not specifically address architectural elements or trends.

57. C Point C begins the discussion of the interior of the building and would be a logical place to divide the paragraph.

58. F No change.

59. D Using enhancing simplifies the wording and rids the sentence of the awkward phrase adding enhancement to.

60. G Answer must be Yes because the passage is about a building that represents a specific architectural style. Choice F can be eliminated because other theater buildings are not discussed.

61. C Inaccurate is an adjective.

62. G Use a colon when explaining or expanding the preceding independent clause.

63. D Agreement in this sentence requires a present tense, plural verb: untruths matter.

64. F No change.
65. C  Note the preceding sentence says that the autobiography isn't about the life of Mary Harris Jones. Only C and D could be correct answers. Choice C is the best answer because the essay is about the persona of Mother Jones the labor activist, and not Mary Harris Jones as a historical figure.

66. H  Advocates is not possessive.

67. D  Comma after herself creates a comma splice.

68. G  The statement is definitely related to the topic and contributes to the understanding of how Jones created and marketed her public persona.

69. D  Use a semicolon as a strong punctuation mark to substitute for a conjunction and to distinguish an area from areas elsewhere in the sentence punctuated by commas.

70. J  The sentence that immediately precedes the underlined area states, "Jones subversively redefined the boundaries of home and family." The underlined area refers directly to this sentence, and only Choice J makes the connection.

71. A  By changing to the phrase "her family of workers," the mother image is enhanced. Both "No" choices are factually inaccurate, and Choice B is not supported by the passage.

72. F  No change. Colon used when clause following the punctuation mark expands or explains the previous independent clause.

73. B  Only choice that conveys the intended meaning of the sentence.

74. H  Need possessive form their.

75. D  Because no other women in the labor movement were discussed, the answer must be "No." Choice C can be eliminated because it inaccurately describes the passage as pertaining to law reform.

Math Test – Section 2

1. (D). To find the probability, add the number of Type A and Type AB people (67 + 6 = 73) and compare this number (73) to the total number of people (150). The answer is (D).

2. (H). Key Word: mean. From our class, you should recall that "mean" is "like your grades." Simply add up the amounts given and divide by 5. You should get 1,710 divided by 5 equals 342. An alternate way to do this one is notice that all the dollar amounts are in the $300s. Thus, you could just add up $70, $10, $80, $40, and $10 to get $210 divided by 5 equals 42. What answer ends in 42? Either way, you get answer (H).

3. (E). There are 5 halves (½) in 2½. If ½ equals 18 miles, then 5 of them would equal 5 x 18 or 90. Answer (E) is correct.

4. (F). Just Plug-In what is given for each of the variables. The equation $f = cd^3$ becomes $450 = c(10)^3$ or $450 = 1000c$ or $c = 450/1000$ or $c = 0.45$. Answer (F) is correct.

5. (E). Once again, from our class, recall that $f(x)$ means "How does $x$ work?" Circle the definition of the function $(3x + 7)^2$ and then plug in the value of $x$ given in the expression $f(1)$ or $x = 1$. This results in $f(x) = (3(1) + 7)^2$ or $f(x) = 10^2$ or 100. Answer (E) is correct.
6. (H). **ATQA!** If Jorge's current hourly wage is $12 and he gets a 6% raise, he would get 6% of $12 or .06 x $12 = $0.72 added to $12. This would be answer (H).

7. (E). Kind of deep for #7. In a geometric sequence, you must first find the "common ratio." This can be done by dividing the first number in the sequence into the second number. In this question divide -3 by 1 to get -3 as the common ratio. Note that the second number, -3, multiplied by the common ratio of -3 results in the third number, 9. Multiplying 9 by -3 equals -27, or the fourth number in the sequence. The question asks for the 7th number, so you can keep multiplying each subsequent number by -3 to reach the 7th number. For example: -27 x -3 = 81 (the 5th number in the sequence). 81 x -3 = -243 (the 6th number in the sequence). And, finally, -243 x -3 = 729 (the 7th number in the sequence). Answer (E) is correct.

Of course, if you happen to remember the equation to find any number in a geometric sequence, which is \( a_n = a_1 \cdot r^{n-1} \), then you could just plug in what is given. \( a_n \) is the number of the term to find; \( a_1 \) is the first number in the sequence; and in \( r^{n-1} \), \( r \) is the common ratio raised the number (\( n \)) in the sequence you seek. In this case, \( n = 7 \). So, putting this altogether, we get, 7th number = 1 times \(-3^6\) or \( a_n = 1 x 729 \) or 729. The answer is still (E).

8. (H). The weight being shipped is 15 pounds. From the table, this would fall in the 10-15 pound range which is $10 plus the price per pound of 15 pounds x $0.65 per pound or 15 x .65 = $9.75. Adding this amount to the Fee of $10 for 10-15 pounds, we get $19.75. Answer (H) is correct.

9. (A). If the top and bottom layers of the computer chip are 0.03 cm thick, this means they, combined are 0.06 cm in thickness. Subtract this from 0.32, the total thickness, to get 0.26 cm for the thickness of the inner layer. This thickness, 0.26, is made up of layers that are each 0.02 cm thick, so to find how many there are, divide 0.26 by 0.02 to get 13. Answer (A) is correct.

10. (K). Another "Table" question...but one we covered in class when we discussed mean, mode, and median. Careful, though, this one could be a Time Bandit if you let it. There are several ways to do this one, but we just rewrote the numbers in the table given in ascending order to get: 13,15,16,19,19,22,25,25,26,27,28,29 and found that 22 and 25 are in the middle of this set. We added these two numbers together to get 47 and divided by 2 to get the median. 47 divided by 2 is 23.5. Answer (K) is correct.

11. (C). Use the **P-I Tactic**. The easiest solution is to plug in the answers to see which one works. For example, answer (E) would be \( d = 34t \) or (from the table using the first time of zero) \( 14 = 34(0) \) or \( 14 = 0 \). Since this does not work, we eliminate answer (E). Answer (D) would be \( d = 14t + 6 \) or \( 14 = 14(0) + 6 \) or \( 14 = 6 \). Since this does not work, we eliminate answer (D). Answer (C), \( d = 6t + 14 \) would be \( 14 = 6(0) + 14 \) or \( 14 = 14 \). This works! But to be sure, we try the next numbers in the table, \( d = 20 \) and \( t = 1 \) to get \( 20 = 6(1) + 14 \) or \( 20 = 20 \). This works, so we mark answer (C).

There are a couple of other ways to get this one, but using the P-I Tactic worked well enough for us.
12. (K). **Draw it! Put the facts on the figure.** If the length is 9 and the total area is 54, then the width of the rectangle is 6 \((6 \times 9 = 54)\). To ATQA, we add up the lengths of the perimeter, \(6 + 9 + 6 + 9 = 30\).

![Rectangle Diagram]

Answer (K) is correct.

13. (B). **Put The Facts on The Figure.** Where two straight lines cross, resulting angles that look equal in size, ARE equal in size. Angle \(DCE\) is 45°, so this means that angle \(BCA\) is also 45°. In triangle \(ABC\), there are 180°. Two of the angles, are 35° and 45° which sum 80°. Since there are 180° in a triangle, angle \(BAC\) would be 100° \((180° - 80° = 100°)\). Answer (B) is correct.

**Note:** This figure is not drawn to scale. The ACT clearly states that their figures are "illustrative" and not necessarily drawn to scale. Never assume a figure is drawn to scale. Remember, all you can rely on are the facts given in the question or on the figure itself.

14. (H). In this question, we can see the number of hours on the circle graph add up to 9. This means that 360° (the number of degrees in a circle) divided by the number of hours (9) would yield each hour of the 9 being equal to 40° \(\left(\frac{360°}{9} = 40°\right)\). Since the Core subjects take 4 hours, the central angle for that amount would be \(4 \times 40° = 160°\). Answer (H) is correct.

15. (B). There are a couple of ways to do this one. You could set up an algebraic expression and solve it. Or, use the **P-I Tactic** like we did. Normally, we would start with answer (E) and plug it in to see if it would work. However, since the answers are in ascending order, we use the advanced tactic we discussed in class and went to Answer (C) first to see what would happen. Answer (C) is 35, so if 35 large and 35 small were sold, would the total amount received for each be equal? Let's do the math. 35 x $12 = $420 and 35 x $8 = $280. The amounts are not equal. We eliminate Answer (C). Since 35 was too big to make the amounts equal, we next try Answer (B). 28 x $12 = $336 and 42 x $8 = $336. These amounts are equal as stated in the question. To clarify this answer, recall that the question stated that a total of 70 figurines were sold. In Answer (B), we subtracted 28 from 70 to get the second number, 42. Answer (B) is correct.

16. (H). WOW! This seems more like a physics question than a math question on the ACT. To find the car's acceleration (which is stated as constant), subtract 88 \(fps\) from 220 \(fps\) to get a total of 132 \(fps\) gained. This occurs in 3 seconds, thus the constant acceleration would be \(132 \div 3\) \(seconds\) to yield 44 \(fps per second\). Answer (H) is correct.
17. (D). **Draw It!**

![Diagram](image)

If line $CD$ is a distinct line, then line $CD$ is $180^\circ$. Subtracting $47^\circ$ from $180^\circ$ would give us the measure of angle $BAD$. $180^\circ - 47^\circ = 133^\circ$. Answer (D) is correct.

18. (F). This one could be a "Time Bandit" for JAS; especially if he take the time to find the lowest common denominator and then rearranging the given fractions into ascending order (from smallest to greatest value). To get this one, note that $\frac{1}{2}$ is the smallest of the fractions given (the other two have numerators that are over halfway to the denominators). This means the smallest fraction would be $\frac{1}{2}$. Only answer (F) has $\frac{1}{2}$ as the smallest fraction! Answer (F) is correct.

19. (D). In scientific notation, move the decimal point to the left (for positive numbers) until there is only one significant digit to the left of it. Thus, $670,000,000$ becomes $6.7 \times 10^8$ and $700,000,000$ becomes $7.0 \times 10^8$. Adding these numbers results in $13.7 \times 10^8$, so we move the decimal point one more place to the left to get $1.37 \times 10^9$. Answer (D) is correct.

20. (F). To get this one quickly, put your pencil on $A$ and extend line $AB$ to the left a little. Do the same at $D$. See our figure below.

![Diagram](image)

This gives up our classic "railroad tracks run over by a road" as mentioned in class. The angle labeled $x^\circ$ outside the trapezoid at $A$ would be the same size as the angle $x^\circ$ inside the trapezoid (at $D$) because "alternate interior angles are congruent." To get the measure of the the interior angle at $A$, all we have to do is note that $AB$ is a straight line or $180^\circ$ and $180^\circ - x^\circ$ would be the measure of that interior angle at $A$.

21. (B). "**Eat The Sandwich...**" First bite: If there are 1000 applicants and 80% pass the written test, then $0.80 \times 1000 = 800$ pass the written test. Second bite: Of the 800, 60% pass the driving test or $0.60 \times 800 = 480$ pass the driving test. Mark (B).

**This was a good question to remind students to be able to convert percentages to decimal forms.**
22. (H). Good MNL question. First, if you use 1, 2, 3 for \(a, b, \text{ and } c\), you will get two answers that seem correct. In the question, if you make \(a = 1\), \(b = 2\), and \(c = 3\), then \(a^b = x\) becomes \(1^2 = 1\) or \(x = 1\). \(c^b = y\) becomes \(3^2 = 9\). In this case, \(x = 1\) and \(y = 9\) so \(xy\) would be \((1)(9) = 9\). Which answer equals 9 when \(a = 1\), \(b = 2\), and \(c = 3\)? Plugging these values into the answer choices, beginning with (K), answer (K) becomes \(3^4\) which is clearly too big. Eliminate it.

Answer (J) also becomes \(3^4\) so we eliminate it. Answer (H) becomes 9 so we keep it and try the remaining answers just to make sure we are correct. Answer (G) becomes \(3^4\) so we can eliminate it. But, answer (F) becomes \(3^2\) or 9 so we have two answers that appear correct. To resolve this situation, we change \(a = 1\), \(b = 2\), and \(c = 3\) to \(a = 2\), \(b = 2\), and \(c = 2\) to see what happens. We can do this because the question states that \(a, b, \text{ and } c\) are positive integers...it does not say they are different! This changes \(xy\) to \((4)(4)\) or 16. So we go back and plug in 2, 2, and 2 into each answers choice to see what happens. Answer (K) becomes \(4^4\) which is clearly too big to be 16. Eliminate it. Answer (J) becomes \(4^4\) so we eliminate it. Answer (H) becomes \(4^2\) so we keep it. Answer (G) becomes \(4^4\) so we eliminate it. And, answer (F) becomes 2(2^2) or 2(4) or 8, so we eliminate it. Answer (H) is correct.

Note: This one took a while to explain, but in actual computation, it took only a few seconds to compute using the MNL. Also, this question obviously can be done by good algebra students using what they should have learned in class.

However, we did this one using the MNL to demonstrate a couple of things. First, the MNL helped us eliminate three answer choices almost immediately. Second, this question demonstrates that "words mean things!" in that the variables given could be the same integers since the question did not state they were distinct or different integers. Finally, this question can be used to demonstrate how plugging in simple numbers will solve algebra questions most of the time.

Answer (H) becomes \((2\cdot2)^2\) or \((4)^2 = 16\). Answer (H) is correct.

23. (A). We could use the MNL, but let's do this one algebraically just to be fair. If you use algebra and work quickly though, it can lead you to the trap answer (B). Note that the expression has plus and minus \(2y\) in the parentheses. You can eliminate them from the expression. It now should read: \(\frac{1}{2}y^2(6x + 12x)\) or \(\frac{1}{2}y^2(18x)\). This is where some students may run into the trap answer. If they take \(\frac{1}{2}y^2\) to be \(y\), they will multiply \(y\) times 18x to get 18xy, which is answer (B). If they consider \(\frac{1}{2}\) and \(y^2\) to be discreet, then they can multiply \(y^2\) times 18x to get 18x\(y^2\) and then take \(\frac{1}{2}\) of it to get \(9xy^2\) which is the correct answer. Answer (A) is correct.
24. (H). The P-I Tactic solves this one quickly...but it is tricky...we will explain in a minute. **Use your calculator, if necessary.** Plug in answer (K) into the expression given. This becomes (500(600) - 600^2) or 300,000 - 360,000 or -60,000. Eliminate answer (K). Plug in answer (J) to get (500(300) - 300^2) to get 150,000 - 90,000 = $60,000. Most students would stop here. **BIG MISTAKE!** Answer (H) becomes (500(200) - 200^2) or (100,000 - 40,000) or $60,000. This seems to work, too! Answer (G) becomes (500(150) - 150^2) or (75,000 - 22,500) or 52,500, so we eliminate it and answer (F) which would clearly be even lower than 52,500. **NOW...ATQA...the question states "What is the fewest..." to get $60,000 profit?"** The fewest would be answer (H). Tricky question if a student does not read carefully. Answer (H) is correct.

25. (B). From the pie chart, it can be seen that the greatest expenditure was for clothes ($254). To find the percent that this was of the total spent ($900), just divide $254 by $900 to get 28.22 percent. Answer (A) is correct.

26. (G). To find this one quickly, just subtract (x +20)° from 90° to get 90° - (x° - 20°) or 90 - x - 20 = (70 - x)°. Mark (G)

27. (E). This is a "special" right triangle. Since this triangle is isosceles, with two sides of equal length, with a hypotenuse of 8√2, we know that it is a 45-45-90 right triangle. From “s-s-√zs” for the properties of this special right triangle, we can see that s = 8. To find the perimeter, we add the length of the sides (8 + 8) to get 16 and then add this to the length of the hypotenuse to get 16 + 8√2. Answer (E) is correct.

28. (H). There could be a somewhat complicated explanation to this one, but we chose to look at the figure given and note that when y = 0, the line crossed the x-axis twice: one time as a positive real number and one time as a negative real number. Mark H.

29. (C). In this question, you have to know how to multiply complex numbers. Multiplying two complex numbers is accomplished in a manner similar to multiplying two binomials. You can use the FOIL process of multiplication or distributive multiplication. To multiply (-3i + 4)(3i + 4), our first step was this: -3i(3i + 4) + 4(3i + 4) to get -9i^2 -12i +12i +16 = -9(-1) + 16 = 9 +16 = 25. Mark (C).

By the way, just looking at what is given we could have probably guessed that the answer to this one would be greater than 16. Can you see why?
30. (G). We liked this question because it allowed us to use \( \text{OH} - \text{AH} - \text{OA} \) from class. To make this one simple, write what is needed to obtain the trigonometric function next to each answer. For example, answer (K) would require \( \frac{a}{h} \) for \( \cos \Theta \). To be correct, from the figure given, \( a = 5 \) and \( h \) is not given. Thus, answer (K) is incorrect because it is 7 over 5 (opposite over adjacent) which is the definition of the \( \sin \Theta \). Eliminate (K). In answer (J), \( \sin \Theta \) would be 7 over hypotenuse (not given in the figure). What is given in answer (J) is the definition of \( \tan \Theta \) (opposite over adjacent). Eliminate (J). Answer (H) is wrong because it refers to the hypotenuse but the numbers given is adjacent over opposite. Eliminate it. Answer (G) requires opposite over adjacent for the \( \tan \) and this is what is given numerically. Mark (G).

From class, you should have been able to eliminate answers (K), (J), and (H) immediately because there is no value for the hypotenuse given. From the numbers given, you should have immediately seen that only \( \frac{5}{7} \) or \( \frac{7}{5} \) can be determined. Only \( \frac{7}{5} \) defines \( \tan \Theta \).

31. (D). The total number of pieces from the first opened box would be 755. If you randomly selected one piece from the 755 pieces, you would have a 5 in 755 chance that the piece would be one of the 5 extra pieces. Simple logic. Mark (D).

32. (K). Use the P-I Tactic or your calculator to solve this one. We chose our calculator just because we had not used it in a while. \( \frac{2}{3} = .666 \) on our calculator and \( \frac{3}{4} = .750 \). We subtracted .666 from .750 to get .084 and divided this by 2 to get .042. We added .042 to .666 to get .708, the halfway point between the two fractions given. If we plug answer (K) in to our calculator, we get \( \frac{17}{24} = .708 \). Mark (K).

You could have gotten this one by using the common denominator of the two fractions given. This would have gotten you to notice that only answers (K) and (H) seem probable.

Note: Questions 33-35 fall into the category of "extended" math questions. This is nothing more than two or more questions being asked about a set of data, a chart, a graph, or a table. This question type has become popular with the ACT and SAT companies.

33. (B). From what is given in the question, if 0.25 inch equals 2 feet, then 1 inch would equal 8 feet. This question asks "how many inches would 15 feet be?" The good estimate answer would be "a little less than 2 inches." What answer is a little less than 2 inches? Mark (B).

*It may help students to notice that if 0.25 inches equals 2 feet, 0.125 inches would equal 1 foot.

34. (H). First, find the area of the room available to put tile on. The total area of the room is 15 x 12 or 180 square feet. Next, subtract the areas of the cabinets. The area of the one on the far right is 2 x 12 = 24 feet square and the one in the center is 2 x 2 = 4 square feet for one such cabinet....BUT, the question states there are 4 of these (The given figure does not depict this!), so the total area of the cabinets in the center is 16 square feet...NOT 4 square feet! Thus, the total square footage of the cabinets is 24 + 16 = 40 square feet. Subtract 40 square feet from 180 square feet to get 140 square feet of the room that will NOT be covered by cabinets. Mark (H).
35. (D). This question is tricky tricky! So much so that it smacks of the SAT! The key is to notice that the charge for labor is fixed at $650. Student may be fooled into thinking that if they divide the total number of cabinets (5) into the cost of $2150, they would get a cost of $430 per cabinet installed...and this is true. However, to get the cost of 10 cabinets, it is not a simple matter of multiplying $430 times 10 to get the trap answer of (E). The key is to notice that the labor cost is fixed at $650 and that for the original number of 5 cabinets, the cost for the cabinets was $2150 - $650 or $1500. If this cost per cabinet were double (to 10 cabinets), then the cost per cabinet would be $3000. $3000 added to the cost of labor ($650) would result in a total charge of $3650. Mark (D).

36. (J). Note that the sum of $x + y$ is greater than 1 and less than 2. Only graph (J) would have any value of $x$ and $y$ whose sum is between 1 and 2. Answer (J) is correct. There is a mathematical way to do this one, but we prefer to look at what is given, answer the question, and move on. To demonstrate what we saw, take answer (K) for example. From the figure, we can see that the value of $x$ would be between 1 and 2 and the value of $y$ would be between -1 and -2. Adding any values of $x$ and $y$ in these ranges would not fall between 1 and 2 and given in the question. For simple example, if $x$ were 2 and $y$ were -1, then their total would be +1 and this is not in the range of $1 < x + y < 2$.

37. (A). The mean of the numbers given is the total of these numbers divided by 4. This would be 36 divided by 4 = 9. The median of these numbers would be the sum of the two middle numbers divided by 2 = 9. There is no difference between 9 and 9. The answer is (A).

38. (F). Another "Use The Drawing (figure)" to solve this one. Note that there are only two places where the two graphed functions coincide (meet). Both of these are in the "$x$ is positive" area of the graphed functions. This means that $f(x)$ and $g(x)$ are equal at these two points. Answer (F) is correct.

Note: Questions 39-41 is another set of "extended" math questions.

39. (B). First, from the figure we can see that line $CD$ is a negative slope, so we eliminate answers (E), (D), and (C). Next, we know that $\frac{\Delta y}{\Delta x}$ equals the slope of the line. We can tell from the values given for points $C$ and $D$ that the change in $y$ is 3 units and the change in $x$ is 3 units. From this, $\frac{\Delta y}{\Delta x}$ would be $\frac{-3}{3} = -1$. Mark (B).

40. (F). Reflected over the $y$ - axis just means "flipped to the left." Note that even when the figure is flipped to the left, the value for $y$ does not change. How many answers have a +1 value for $y$? Mark (F). It will help if students label the numbers in the parentheses with $x$ and $y$. We always do this!
41. (E). **Putting the Facts on the Figure is KEY to this question!** The area of a trapezoid is found by the formula \( A = \frac{(b_1+b_2)h}{2} \). From the figure, the length of \( b_1 \) is 10 and \( b_2 \) is 6 and the height is 3. Thus, plugging in what we know, we get \((16)(3)\) or 48 divided by 2 = 24. So, the area of the trapezoid is 24. Half of this would be 12. We need a \( b_1 \) and \( b_2 \) to sum 8 so that when multiplied by 3 (the height of the trapezoid) and divided by 2, it would equal 12. We use the P-I **Tactic and plug in answer (E).** "What if," we asked ourself, "\( x \) equaled 6.5?" We note that the length of the base of the trapezoid is from \( x = 2 \) to \( x = 12 \) or a length of 10. If \( x = 6.5 \) then this means that on the left of 6.5 there would be 4.5 units and on the right of 6.5 there would be 5.5 units \((4.5 + 5.5 = 10 \text{ total units width})\). At the top of the trapezoid, that "base" is 6 units in length \((9 - 3 = 6)\). If we mark a line at 6.5 on the top base, we can see that from there to the left end of that top base, it would be 3.5 units and to the right to the end of the top base, it would be 2.5 units.

Take a look at the left trapezoid formed by \( b_1 \) of 4.5 and \( b_2 \) of 3.5 and add those two numbers together to get 8. Now, multiply them by 3 (the height of the trapezoid) and divide that result by 2 to get 12. If this trapezoid area is 12, then the other must be 12 in area, too. By using answer (E), 6.5, we have ATQA. Mark (E). (This one was harder to explain than to actually do!)

42. (K). A classic \( f(x) \) within an \( f(x) \) question...and to throw us a curve-ball, they use an \( f(g) \). Let's work this one from right to left and remember to work within the parentheses first. If \( f(g) = \frac{1}{x} \) and \( x \) is given as \( \frac{1}{2} \), then \( f(g) = \frac{1}{x} \) becomes \( f(g) = \frac{1}{\frac{1}{2}} = 2 \). Take the 2 and go back to the first \( f(x) \). Insert 2 for \( x \) to get \( f(x) = x - \frac{1}{x} \) or \( f(x) = 2 - \frac{1}{2} \) or \( f(x) = 1\frac{1}{2} \). Which answer equals 1\(\frac{1}{2}\)? Mark (K).

43. (D). Logic says that when you double the amount of the loan, the payment will be doubled. This can be proven by using the MNL in the formula given. Let \( a = 2 \) dollars borrowed, \( r = \) the interest rate of 10% or 0.1 and the number of years is 3 \((y = 3)\). Plug all this into the formula given:

\[
p = \frac{\frac{2}{3}(2)(0.1)(3)+4}{12(3)} = \frac{2.3}{36} = 0.0638.
\]

Now, double the value of \( a \):

\[
p = \frac{\frac{2}{3}(4)(0.1)(3)+4}{12(3)} = \frac{4.6}{36} = 0.1276 \text{ which is twice the origin payment.}
\]

Mark (D).

44. (G). Hmmm, another "special right triangle" if you think about it. Note that the change in \( x \) is from 6 to 14 or 8 units. The change in \( y \) is from 4 to 12 or 8 units. If you draw a line straight down from \( F \) and a straight line to the right from \( E \), you would create a special right triangle with sides 8 and 8 and a hypotenuse of \( 8\sqrt{2} \) or length of 11.31. If you take one-fourth of these length of 8, you get 2. Add 2 to the coordinates of \( E \) to get \( (8,6) \). This means we have a smaller special right triangle with sides 2 and 2 and a hypotenuse of \( 2\sqrt{2} \) or 2.828. If 2.828 is one-fourth of 11.31, then we have the correct coordinates of \( D \). 4 x 2.828 = 11.31. Thus, the coordinates of point \( D \) must be \( (8,6) \). Mark (G).

45. (D). The \( a \) is a scalar multiplier, so the matrix equation simplifies to

\[
\begin{pmatrix} 2a & 6a \\ a & 4a \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix} \begin{pmatrix} 27 \\ 6 \end{pmatrix}.
\]

Thus, \( 6a = 27 \), and \( a = \frac{27}{6} = \frac{9}{2} \). From here, \( x + y = 2a + 4a = 6a = 6 \left(\frac{9}{2}\right) = 27 \).

Answer (D) is correct.
46. (J). Let's solve this one using some basic algebra: \( \frac{1}{8}x + 10 = \frac{3}{4}x \) or \( \frac{1}{8}x + 10 = \frac{6}{8}x \). Subtracting \( \frac{1}{8}x \) from both sides of the previous equation, we get \( 10 = \frac{5}{8}x \) or \( x = \frac{10}{\frac{5}{8}} \) or \( x = 16 \). Answer (J) is correct.

47. (B). The key to this question: the words "most likely." Ratios can be turned into percentages by dividing the left number by the right number. Thus, the 10th grade population represents 86/255 or about 33.73% of the student population. The 11th grade population represents 18/51 or about 35.29% of the student population. Not that it matters, but the 12th graders would be 100% - (33.73% + 35.29%) = 30.98% of the population. Therefore, if one student were selected at random from the entire school, that student (most likely mathematically) would be an 11th grader. Answer (B) is correct.

48. (G). Simplifying, we get \( \frac{4}{\sqrt{2}} + \frac{2}{\sqrt{3}} = \frac{4\sqrt{3} + 2\sqrt{2}}{\sqrt{2} \cdot \sqrt{3}} = \frac{4\sqrt{6} + 2\sqrt{2}}{\sqrt{6}} \). We cross-multiplied to get the numerator and multiplied straight across to get the denominator.

49. (A). The shading is below the line, so \( y < -x + 2 \). Since the shading is also inside the circle, the radius must be less than 3. Thus, \( (x - 1)^2 + (y - 2)^2 < 9 \).

50. (F). WOW...an Archimedes' Principle question...this is seeming more and more like a physics test by the minute! The total volume of the rectangular tank can be found by multiplying 40 x 30 x 20 = 24,000 cc. If the water level goes up by 0.25 cm, the height of the water in the tank, which was originally 20 cm, is now 20.25 cm. Recalculating the volume with this new water level would be 40 x 30 x 20.25 = 24,300 cc. Thus, the volume of the object displaced 300 cc. Answer (F) is correct.

51. (E). We solved this one like this: \( \frac{5}{2} \cdot \frac{3}{2} = \frac{15}{4} \). Obviously, there are other ways to do this one.

52. (H). Use the **P-I** Tactic to solve this one. In answer (K), if \( x = -3 \) then the inequality would read \( -5 < 1 - 3(-3) < 10 \) or \( -5 < 1 - 9 < 10 \) or \( -5 < -8 < 10 \). Since this is not correct (-8 is not greater than -5), we can eliminate answer (K). We eliminate answer (J) by plugging in -2 and 3 for \( x \) (in the same manner as we did in answer (K)) and find that (for \( x < 3 \)) we get \( -5 < -8 < 10 \) which is incorrect. In answer (H), we find that plugging in the values possible for \( x \) works. Mark (H).

53. (B). Use the **MNL** and label the dimensions of the box as \( w = 2, l = 3, \) and \( h = 10 \). Plug these numbers into the formula given in the question to get: \( A = 2(3)(2) + 2(3)(10) + 2(2)(10) \) or \( A = 12 + 60 + 40 \) or \( A = 112 \). Next, double 2,3 and 10 to get \( w = 4, l = 6, \) and \( h = 20 \) and recalculate the \( A \) to get \( A = 2(6)(4) + 2(6)(20) + 2(4)(20) \) or \( A = 48 + 240 + 160 \) or \( A = 448 \). From this, we can see that 448 is 4 times 112. Answer (B) is correct.
54. (K). This is an excellent MNL question. To solve this one quickly, just make \( d = 3 \). If a dog eats 7 cans in 3 days, it would eat 14 cans in 6 days. What answer equals 14 when \( d = 3 \)? Start with answer (K) to get \( 7 + \frac{7(3)}{3} = 7 + 7 = 14 \). When plugging in \( d = 3 \) into the other answer choices, none equal 14. Mark (K).

55. (E). This one will take longer to explain than to actually do mathematically. This is one of those classic questions where some people or things belong to two individual groups or to one large group made up of both the groups and where there is some overlap in the two distinct groups. Look at the table. It shows the following: 73 skied (downhill = 28 + cross-country = 45; these added equals 73 total skied in some form) but 65 skied either cross-country or downhill...but not both. To find the number that skied both, subtract 65 from 73 to get 8. Mark (E).

56. (K). Read this one very carefully and ATQA! Each row in the square represents \( \frac{1}{3} \) of the total area of the square. Take one row at a time. The top row has two areas labeled \( A \) and \( B \). Each of these areas represents \( \frac{1}{6} \) of the area of the top row. Or, the top row equals \( \frac{1}{2} \times \frac{1}{3} = \frac{1}{6} \) of the total area of the square. The second row has three equal sized areas, each equal to \( \frac{1}{6} \) that row's area with each area (\( A, B, \) and \( C \)) equal to \( \frac{1}{9} \) of the total area of the square. Finally, the bottom row has 4 equal sized areas each represents \( \frac{1}{4} \times \frac{1}{3} = \frac{1}{12} \) the area of the square. The question asked is "What fraction of the square's area is in a region labeled \( A \)?" In the top row, the region labeled \( A \) is \( \frac{1}{6} \) of the square; in the middle row, the region labeled \( A \) is \( \frac{1}{9} \) of the square. On the bottom row, the region labeled \( A \) is \( \frac{1}{12} \) of the square. Adding up these three parts, after finding the common denominator of 36, we get \( \frac{6}{36} + \frac{4}{36} + \frac{3}{36} = \frac{13}{36} \). Mark (K).

57. (A). The function that intersects the origin is \( y = \sin x \). The other equation is \( y = \sin(x + a) + b \). Since both equations have a sinusoidal axis along the \( x \)-axis, \( b = 0 \), as it controls the vertical shift. In addition, \( a \) could be either positive or negative, as \( a \) controls horizontal shift, and the graph can shift in either direction to get the same sinusoidal curve. Only answer (A) contains \( b = 0 \). Mark (A).

58. (K). This one seemed a little too obvious to us at first glance, so we were very careful with it. In absolute values, anything between the "goal posts" (recall that from class) is positive. If this is accepted as true, then anything in the inequality given that is to the left of the < sign and between the "goal posts" is positive. If this value is positive, then the inequality cannot be determined because there are no solutions that are positive that can be < -1. The only answer that has no solutions is answer (K). It is an empty set which means no solutions are possible. Mark (K).

59. (E). This is a "classic probability" question. For each of the four multiple-choice questions mentioned in the question, there are 3 possible answers. Thus, the possibility of randomly answering each question and getting it correct is 1 out of 3 or \( \frac{1}{3} \). Each of the four questions has this same possibility. Thus, the probability of his answering all four of the questions correctly would be \( \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} = \frac{1}{81} \). Mark (E).
60. (J). The Law of Sines is only useful if we know either of the two angles and a side or an angle and two sides. Since we have three sides and no angles, this rules out the use of the Law of Sines. On this one, we will have to rely on the Law of Cosines. The side squared on the left side of the formula is the side opposite $\theta$. Since the question is labeling $\theta$ as the smallest angle, side $c$ needs to be the smallest side, 14, by the triangle inequality theorem.

**Note:** It has also been noted that when the ACT includes a definition of the Law of Cosines, its form will be in the correct answer. Only answers (K) and (J) are in this form, thus, if we had to guess, we would have guessed (E) or (D). And, since the previous answer was (E), our best guess would have been (J). This would have been correct. However, it was a lucky guess on our part. Thanks again to our friend Corey for helping on these last few!

**Reading - Section 3**

**NOTE:** This is the first time we have seen a "Paired-Passage" in the ACT. Reminder: On "paired-passages," answer all the questions about passage one first and then answer all the ones about passage two second. Save the "compare and contrast" questions for last.

Note: Students should underline the key words in the questions and answer those that refer to line numbers or paragraphs first. The answers to other questions are often found when a student is looking for a line number or paragraph question.

**Passage 1 - Bombay**

1. (A). Key Words: passage as a whole. This question should be saved for last. We would have done questions #9 and #6 first. The answer can be found in lines 32-39. The city of Bombay was his parent's other love and as the narrator grew older, he formed an attachment to all the trappings of the city.

2. (J). Key Words: photos of Bombay, primarily inspiring, narrator to. The answer to this question can be found in lines 60-75. These older photographers "showing me what I did not want to do." These older photographers took panoramic pictures. The narrator wanted to "get back down to ground level." Particularly, lines 70-71 answers this question: "I yearned for the city streets..."
3. (C). Key Words: **narrator muses over then rejects.** Use the 2-L-2 technique. Go to line 25, back up a couple of lines (In this case, it would be to the beginning of the paragraph.) read down through the lines specified. In line 29, he says, "No, no, I don't really think along such solipsistic (So much for these test-makers doing away with "big" words!) lines..." The narrator rejects the idea that the city was finished being built in anticipation of his birth when he concludes, "Me, I'm the under-attached type." That is, he has no connection to the city.

**solipsistic - the belief that the only thing somebody can be sure of is that he or she exists, and that true knowledge of anything else is impossible.**

4. (H). - Key Words: **narrator uses which...to describe Bombay.** In lines 35-36, the author says, "they loved her." This is personification of the city. That is, referring to the city as a human "her."

5. (B). - Key Words: **which captures parent's balance parental duties with work.** In lines 36-39, the narrator says, "It was on account of their romance with the city that they drew up that weekly list of shared parental responsibilities." Continuing down through line 46, the narrator clearly states his mother was "the master builder." She balanced her parental duties with the duties of her construction work.

6. (J). Key Words: **word "sweep" most nearly means.** This is the first question we would have done. Go to line 9 and 2-L-2. Going back to line 6 and reading through line 11, the narrator gives a broad picture of the geography and structures of Bombay.

7. (A). Key Words: **primary function of lines 6-10.** In answering the previous question, we have found the answer to this one, too. In these lines, the narrator compares landmarks in Bombay with those elsewhere. For example, "the Brabourne Stadium was our Colosseum..." "something not even Rome could boast."

8. (H). Key Words: **child viewed work parents did with a strong sense of.** In lines 40-43, the narrator states, "when I was riding on my father's shoulders...she was out there with her..." The italicized word "her" indicates a resentment or jealousy the narrator felt toward the city.

9. (B). Key Words: **phrase "drew up" most nearly means.** This is the second question we would have done. Since we have already encountered line 38 back in question 5, we know that "drew up" meant to "list." This is best described in answer (B).

10. (J). Key Words: **last paragraph father shows photos in order to.** Read lines 80-83 and note the quotation "See where people lived and worked and shopped...and it becomes plain what they were like." This quotation shows that his father believed that photos of places (where people lived and worked) can reveal as much about people as photos of the people themselves.
Passage 2 - The Sargasso Sea

11. (A). Key Words: author's attitude toward main subject of passage. The line above the first paragraph gives us the subject of the passage: The Sargasso Sea. This question is answered in lines 4-8. The author's description, "This vast...uniform sea, deceives." This is supported in lines 7-8 with the words, "no hint of the grand and sweeping energies hidden below." Clearly, the author is in awe and fascination about the Sargasso Sea.

12. (J). Key Words: passage makes clear names was (were) actually. The answer to this question is in lines 48-49. "Hidden beneath the waves is an immense submerged mountain range." This question misleads students into the third paragraph where they can easily see the names given in the question. Students will spend time reading the third paragraph and some may even take answer (G).

13. (C). Key Words: In first paragraph author describes stillness to emphasize. We actually got the answer to this one when we answered #11. This demonstrates why we read the questions first. If we have done so, often we can see the answers to other questions as we read for the question we are working on at the moment. In lines 5-8 (which we already read for #11), the author clearly states that "the unperturbed surface offers no hint...of the energies below."

14. (J). Key Words: compared to Grand Canyon, canyon in Atlantic's basin is. To get this one, we scan the passage looking for the words "Grand Canyon." In lines 62-70, we find what we are looking for. In these lines, it is stated that a "canyon" in the Atlantic basin is 11,000 miles in length compared to the 280 mile length of the Grand Canyon. Pay attention to lines 66-67.

15. (B). Key Words: main purpose, information, lines 71-76, is to. This question is actually answered in lines 75-76: "in this otherworldly setting after distant, lifeless planets." This describes the rift valley as an "alien, barren place."

16. (H). Key Words: main purpose, last paragraph. This question is actually answered in lines 79-81: "The floor of the rift valley is torn; from the gashes has sprung the seafloor underlying all of Atlantic."

17. (B). Key Words: author implies people assume deepest waters are. Lines 9-13 answer this question. "Contrary to what one might guess, Atlantic's deepest waters...are along her edges." The trap answer is (A). Can you see why?

18. (F). Key Words: line 19, phrase paid out most nearly means. In lines 17-21, the author states that "Early efforts to plumb Atlantic's depth...concluded the sea had no bottom." The line that was "paid out" (extended) 8 miles did not reach the bottom. Thus, paid out most nearly means dispensed. This, by the way, would be the first question we would have answered.

19. (D). Key Words: mountain range in Atlantic's basin, nearly same as. In lines 51-52, it is stated that "it (the Atlantic's basin) covers almost as much of earth's surface as the dry land of continents." This is answer (D).
20. (F). Key Words: **white cover of mountains in Atlantic basin is.** See lines 55-59. "Its mountains are stark and black...patchy covering of white...the skeletal remains of tiny microscopic animals..."

**Passage III - Ray Bradbury on Writers**

Note: This is the first "paired passages" reading assignment we have ever seen in the ACT. Luckily, each passage is clearly marked as well as the questions for each passage, individually, and then for the "both passages" questions.

21. (A). Key Words: **When Bradbury claims surprise, he's most nearly referring to.** Talk about misdirection! Line 46 has very little to do with this question. Go back to lines 8: "I floundered into a word-association process..." This is also reinforced by lines 38-39: "Along the way I came upon and collided, through word-association..."

22. (G). Key Words: **Bradbury believes all beginning writers think they can.** See lines 2-4, "like every beginner, I thought you could beat, pummel, and thrash an idea into existence." In these lines he is saying beginning writers believe they can force and idea into existence.

23. (D). Key Words: **Bradbury's claim suggests during writing (he) would.** The answer is in line 14. Begin at line 12 and read about 4 lines. At line 14, we see "show me its meaning in my own life." This indicates he was struggling to find a word's meaning or significance.

24. (J). Key Words: **In seventh paragraph, Bradbury explains habit, of almost daily.** This question refers to a whole paragraph, but the key lines are 30-32 and 36. In lines 30-32 he states "hardly a day passed when I didn't stroll myself across recollection" and line 36 states "to remind him of his past." Thus, his daily habit was to think about his grandparents' property and hope something would arise to bring his past into focus.

25. (C). Key Words: **Paragraph A explains writing about John Huff, Bradbury had.** The answer to this question is in lines 39-42. This question is somewhat nebulous in that a case could be made for all the answers. However, the "best" answer is that Bradbury "shipped" his friend, John Huff, from Arizona to Green Town so he could say goodbye to him properly. The phrase "say goodbye to him properly" suggests that Huff was a character that he wrote about several times once he had displaced him from Arizona to Green Town.

26. (G). Key Words: **first paragraph narrator describes John Huff in a manner that.** As you scan-read the first paragraph of Passage B, the description of John Huff, through the eyes of Douglas Spalding were ones of exaggeration to show the clear awe that Spalding had about Huff. The description were ones of almost superhuman fetes. This is best described in Answer (G).
27. (C). Key Words: **Within Passage B, image functions figuratively to suggest.** Scan-read lines 64-68 and note that the day, at that point, was "as perfect as the flame of a candle." In lines 74-76, this "such a fine day" takes a 180° turn and becomes one where "a cloud crossed the sky, covered the sun, and did not move again." The imagery of the cloud covering the sun (snuffing out the candle previously mentioned) strongly suggests that the mood of the day, for Spalding, changed dramatically. This is clearly stated in Answer (C).

28. (J). Key Words: **Both passages highlight use of.** Lines 50-51 states it outright: "I learned to let my senses..." This is further bolstered by the third and fourth paragraphs in Passage B, where Bradbury paints the scene with sounds and visual imagery.

29. (C). Key Words: **Based on description, writing process, Passage A, which hypothetically depicts story in Passage B.** Taking what we have learned from answering the previous questions about Passage A and B, we know that Bradbury would take a word or two and then use it to let ideas coalesce into a story. Answer (D) says he would outline. We know he did not do this. Eliminate answer (D). Answer (C) suggest that he would have taken the words "train ticket" and let that develop a story about it. This is the correct answer. Answer (B) is incorrect because he did not start with two characters; he started with a word or two. Eliminate it. Answer (A) is incorrect because nothing is mentioned about his taking notes while interviewing old friends. Eliminate it and mark (C).

30. (G). Key Words: **how do these statements (given in the question) apply to both passages.** Before looking at the answer choices, we think about what we have learned from both passages. We know that Bradbury used a word or a couple of words to backtrack and form a story from it or them. We know that he used real characters from his boyhood and life in his stories, but would take literary license with them as needed. In other words, he would embellish or diminish the actual traits of a real childhood friend to fit the story as it developed. Now, let's look at each answer choice. Answer (J) is clearly opposite of what we know from the two passages. Eliminate it. In Answer (H), nothing about the two lines provided in the question "prove" that he was pained about his leaving to the point that he had to reverse events. The end of Passage B may lead students to believe that this answer is correct. However, the question refers to the statements in the question, NOT the end of Passage B. Eliminate (H). Answer (G) is clearly the answer. It states all that we know from both passages. There is nothing in either statement in the question that supports answer (A). Eliminate it.

**Passage IV - Trap-Jaw Ants**

31. (A). Key Words: **primary purpose of passage.** Definitely save this one for last! After we had completed the other questions, we know that the passage is about how the trap-jaw ants use their jaws for a variety of things. The second and third paragraphs detail the mechanics and operations of the ant's jaws. Answers (D), (C), and (B) do not describe the "primary purpose" for this passage.
32. (G).  Key Words: Lines 73-75, last sentence of passage, are examples of author's rhetorical technique of. We answered this one by process of elimination. Answer (J) is eliminated because the author did not use personal stories about trap-jaw ants. Some students might take this answer, however, due to the first sentence of the passage. The author did not use a "combative tone" into this passage AND this passage does not praise the work of the two ant expert scientists mentioned, so we can eliminate Answer (H). This passage is primarily a recount of technical data concerning trap-jaw ants, so when we saw the slight humor to the specified lines and, especially, the last sentence of the passage, we determined that this answer was best. Answer (F) is just plain wrong. This passage, as a whole, was not casual nor was it playful.

33. (A).  Key Words: lines 81-82, phrase most nearly means. Use the 2-L-2 method and back up to line 79 and read down to line 84, but slow down when you get to the words "storing energy in their jaws to penetrate..." This strongly suggests that the trap-jaw ants must "crunch" through the outer protective layer (skin, shell, etc.) of its prey. Answer (A) defines this process perfectly.

34. (J).  Key Words: main source, speed of the jaws is. The first sentence of the third paragraph answers this specific fact question: "The key to the jaws' speed...is that the release comes from stored energy produced by the strong but slow muscles of the jaw."

35. (D).  Key Words: analogy, trying to grab popcorn as it pops, to describe ability to. We scanned looking for "popcorn" and found it in paragraph 4. Lines 43-45 answer this question. It is clearly stated in these lines that "The insects bounced around in a dizzying frenzy and propelled themselves many times their body length when...intruders approached them." Lines 39-42 describe the act of trying to catch popcorn, but the answer to this question is in lines 43-45.

36. (H).  Key Words: main purpose of last paragraph to suggest, escape jump may have arisen though. The answer to this question is specifically stated in line 86, "perhaps, accidental kind of behavior." This is almost Answer (H) verbatim.

37. (B).  Key Words: word, domain, most nearly means. This would have been our first question. Read lines 30-33. In these lines, "The biomechanics of energy storage is the domain of ...." clearly indicates that this is the area of expertise for these two scientists.

38. (J).  Key Words: which characteristic, prevents ants' mandibles form harming themselves. This question is answered in lines 49-51 where it is specifically stated that it was observed that the ants' mandibles started to decelerate before they meet. This is what is stated in Answer (J).

39. (A).  Key Words: one benefit, escape jump. See lines 61-64. In these lines, it is specifically stated that the jump of the ant "may also get to a new vantage point from which to launch an attack." This sentence describes what is given in Answer (A).

40. (H).  Key Words: which creature(s), if any, will be propelled out of nest or in another direction. Read lines 64-70, but specifically lines 69-70 and note the words, "in one direction, out of the nest, and the ant in the other." This is defined by Answer (H).
Science Reasoning – Section 4

PASSAGE I - Fruit Flies

1. (C). Using Figure 2, the line with the circles indicates that the flies fed 5% SY medium had some (about 5%) still alive at the 75 days point. Look at the bottom right-hand corner of the figure to see this.

2. (G). Clearly stated in the second sentence of Study 1 and in the second sentence of Study 2 is that "200 virgin female Strain N fruit flies less than 24 hours old were added to each test tube." There were no males added in either study, therefore the birthrate was 0 because the fruit flies could not reproduce.

3. (D). To answer this one, look at the Key for each study's graph. In Study 1, there was a 15% SY (sugar-yeast) medium and in Study 2, there was a 5% SY medium. The percent sugar in Study 1 was higher than the percent sugar in Study 2.

4. (G). The answer to this one is just to the left of the question. Look at Table 1 in Study 3. In the last two rows of the figures given, 12% would fall between 10% and 15%. To the right of this (12%), the Average life span (days) would fall between 55.6 and 58.6.

5. (C). In the first sentence of Study 3, it is stated that these fruit flies were modified such that they could not detect odors. From Table 1, Strain N had a life span of 41.6 to 50.1 days. Strain X had a life span of 55.6 to 61.6 days. In sum, if the fruit flies could not smell, they lived longer.

6. (F). In Study 1 it is clearly stated that "no additional substance was added" to tube 1 but were added to the other tubes. To determine if the defect in not being able to detect odors affected life span, Study 1 should be repeated with Strain X fruit flies (the ones that cannot detect odors) subjected to the 15% mediums as listed in Study 1.

7. (A). Both studies state that Tube 1 and Tube 4 did not have anything additional added (such as live yeast and additional odors from live yeast. Comparing the results of these two tubes would determine how a reduced calorie diet affects life span. That is, comparing a 15% SY diet to a 5% SY diet.

PASSAGE II - Butterflies

8. (F). The answer is in the Hypothesis 1 paragraph. In the third line of the paragraph, it clearly states that the butterflies store lipids before they begin their migration and in the next to last line it states that they must store lipids again before beginning the overwintering period.

9. (D). All three Hypotheses mention that the butterflies require energy at some time either in the migration process or the overwintering process. This is directly stated in each paragraph.
10. (J). The answer is after the semicolon (;) in Hypothesis 3. Here, it clearly states "lipid mass continuously increases from the beginning of migration until the end of migration. Only Figure J shows a continual increase in lipid mass (a positive sloping line).

11. (C). The first sentence of Hypothesis 3 states that the butterflies need energy during overwintering, but not for migration. Hypothesis 1 and 2 state that lipids are used for energy during migration. Thus, for 1 and 2, the body mass is greater at the beginning of migration than at the end. The difference between 1 and 2 is 2 says they do not need lipid energy during overwintering.

12. (F). In Hypothesis 1, the last two sentences state "they must store lipids again before beginning the overwintering period." This implies that lipids, via nectar, must be present at the overwintering site.

13. (B). All three Hypotheses discuss the use or storage of lipids either in the migration period or in the overwintering period. The first two Hypotheses state that lipids are used during the migration period, thus changing the butterfly's body mass. Hypothesis 3 states that lipid storage is during migration; this would change the butterfly's body mass. Regardless of when, it can be said that the lipid mass changes for the butterflies during migration either through storage or continual use.

14. (F). A surprising question in that nothing in the verbiage discusses the breakdown of lipids for use as an energy source. From biology class, students should recall that amino acids are not broken down to provide energy. DNA is definitely not broken down to provide energy. Starch is first converted to sugar and then stored as fat and then later, if required, converted to energy. So, by process of elimination, only answer (F) is left. ATP (adenosine triphosphate) transports chemical energy within cells for metabolism.

**Passage III - Greenhouse Gases**

15. (C). From Figure 2, find 8,000 on the bottom line (it is two units to the right of 10) and look straight up to where that line intersects the squiggly line representing solar radiation intensity. Next, from this intersection point, look left to see 500 watts/m².

16. (F). The dotted line for solar radiation and the solid line for CH₄ concentration pretty much coincide all the way down until they diverge at about the 5 thousand year mark. From that point, the solid line increases and the solar radiation line continues to decrease to 450 ppb. Had the solid line continued to match the dotted line, at present it would be less than 500 ppb.

17. (B). At first, this question looks intimidating. However, the wording of the question tells you the answer. Which graph is a mirror image of Figure 2? Only (B) matches Figure 2.

18. (H). Put your pencil in the middle of Figure 1 horizontally and read 480 on the left side of the figure. Be sure to note that you are looking to the left of Figure 1 and not to the right.
19. (B). Note from the bottom of Figure 1 that the space between each "tick" mark on the bottom of the figure represents 10,000 years. Next, note that there is about two ticks between each peak on the dotted line. This represents about 20-25 thousand years. Which answer choice averages about 20-25 thousands years? Answer (D) is eliminated immediately. Answer (C) averages about 40,000 years. Eliminate it. Answer (B) averages about 25 thousand years. Mark it. Answer (A) is out of the range we are looking for.

20. (J). The first sentence of the opening paragraph answers this one.

**Passage IV - Friction**

21. (D). One common form of the third of Newton's laws of motion of classical mechanics states that if one object exerts a force on another object, then the second object exerts an equal and **opposite** reaction force on the first. Thus, if the block is being pulled east, the frictional force exerted on the block by the surface is opposite of this: west.

22. (F). First, look at the left side of the Figure and find 15 m/sec. Next, look to the right of this point along the line for it to see where each solid line intersects the dotted 15 m/sec line. The 2.00 kg block's line intersects at about 1.5 sec (see the bottom of the figure straight down from the point of intersection). The 2.5 kg block's line intersects at about 2 seconds and the 3.0 kg block's line intersects at about 3 seconds. To ATQA of the shortest to the longest time to reach 15m/sec, it would be the lightest block to the heaviest block, in that order. Common sense could have been used on this one to answer it; heavy things take longer to get up to speed than light things when friction is involved.

23. (B). Look at Figure 2 and note the bottom solid line that represents the 3.00 kg block. From the left at 0.00 speed and time, follow the line to where it intersect the graph at speed 5 and time 1, then on to speed 10 and time 2 and finally speed 15 and time 3. For each second, the block's speed increased by 5.0 m/sec.

24. (J). From Figure 1, find pulling force 5 N on the left and note where the line intersects the block masses at 1, 2, and 4 kg. At each of these points, the pulling force (N) is 5.0 times the block mass. For example, block mass 1 kg equals a pulling force of 5 N; block mass 2 kg equals a pulling force of 10 N; and block mass 4 kg equals a pulling force of 20 N. In each case, the pulling force (N) equals 5.0 x block mass (kg).

25. (B). Look at the end points of each solid line in Figure 2. It can be seen that as the weight of each block increased, the speed decreased. For example, the speed at 2.00 kg and 3 seconds is 30 m/sec. The speed for 2.5 kg and 3 seconds is about 21 m/sec. The speed for 3.0 kg and 3 seconds is 15 m/sec. This clearly shows the speed decreased.
26. (H). This is an "outside the box" question the ACT is famous for throwing in somewhere in this section. From Figure 1, we can see that block mass is equal to the pulling force (N) divided by 5. For example, take a pulling force of 10 N and divide that by 5 to get the block mass of 2.00 kg. Or, take the pulling force of 20 N and divide that by 5 to get the block mass of 4.00 kg. Thus, a pulling force of 30 N divided by 5 would give us a block mass of 6 kg needed to maintain a constant speed. You could probably get this one by extending the sloped solid line in the figure to the right and using the equal division of the left and right side of the figure.

**Passage V - Acid-Base Chemistry**

27. (A). In Experiment 2, the pH of the solutions added to the wells in the well plate were known values greater than pH = 8. In Experiment 3, it is stated that the students were given 4 solutions of unknown pH.

28. (J). See the last sentence of Experiment 1; blue and red are given there. It is logical that the well plate would NOT have a background color of black because some of the solution's colors would be hard to distinguish if there were a black background. A white background would make it possible to distinguish even slight color changes when indicator solutions were added to the solution being tested.

29. (C). From Table 1, we can see that Curcumin would have a Y (yellow) color up to and including a pH of 7. From Table 2, Curcumin has a R (red) color for a pH 9 or greater. Therefore, the transition range for Curcumin would be greater than pH 7 and less than pH 9. This is seen in answer (C).

30. (F). From Tables 1 & 2, we can see that Indigo carmine is Blue (B) from pH 0 to 11. Since both solutions are within this range (pH 1 and pH 6), there would be no color difference for these two pHs if Indigo carmine were used to try and distinguish the pH between these solutions.

31. (B). In Table 1, Resorcin blue is only Purple (P) for pHs over 4 and under 7 for its transition range. In the question, the range specified is pH 4.6 to 6.8. Resorcin blue would be purple in this range. Therefore, both Resorcin blue and propyl red have about the same transition range.

32. (G). From Table 3, we see that Solution III for Resorcin blue was red (R). From Table 1, Resorcin blue is red only from pH 0 to 4. The student claimed that Solution III had a pH of 7.3. For the Resorcin blue color to be pH 7.3, the color, according to Tables 1 and 2, would have to be blue (B). Then answer, then, is "No."

33. (D). From Table 3, we see that Metanil yellow is orange (O) at pH of 2 or less for Solution IV. Resorcin blue is red (R) at pH 4 or less for Solution IV. Curcumin is yellow (Y) at pH 7 or less for Solution IV. And, Indigo carmine is blue (B) for pH 12 or less. The question asked is, "Which of Solutions I-IV has the lowest pH?" At a pH of 2, Solution IV has the lowest.
Passage VI - Drilling Mud

34. (J). Logically, solar radiation is greatest at noon when the sun is directly overhead.

35. (A). The same vegetation present and the same density of vegetation cover were held as constants in the study. The variable being studied was the amount of DM sprayed on each of the the three areas. Variations in albedo and soil temperature would then be directly related to the amount of DM sprayed on a given area.

36. (H). From Figure 1, the only place there was a decrease in albedo was between July 25 and July 30. This eliminates answers (B) and (A). On July 28 the albedo was back on an upward trend, so this date can be eliminated. Only July 26 shows a downward trend in albedo.

37. (B). Careful reading will solve this one. In the question, it states "sensor every minute." In the paragraph above Figure 2, it states "For each plot, the sensor recorded the soil temperature every 5 seconds..." If the recording was being taken every 5 seconds for every minute (It's a math thing!), then 60 seconds divided by 5 seconds equals 12 such readings per minute.

38. (F). Check Figure 1. Find July 20 on the bottom of the Figure and look straight up at all three plotted lines. There are no albedo data points collected on July 15 through July 21. Therefore, the answer is "No."

39. (D). Just use common sense on this one. If there were a cover of DM, it would decrease albedo because the solar heat would be trapped beneath it. If the solar heat is trapped beneath the DM, then the soil temperature would be increased due to the heat being retained.

40. (J). In Figure 1, the solid black line represents plot 2. Find August 3 on the bottom of the Figure and look up to where the black is on that date. Next, look directly left to see that the albedo level is at 0.20 or 20%. Since 20% is being reflected, the amount NOT reflected is 80%.

Optional Written Essay Format

Following is a depiction of the new Written Essay format on the ACT. The time to write the written essay has been increased from 30 to 40 minutes. Students will be given 40 minutes to read the prompt, plan a response. Student are directed to use the unlined spaces in the test booklet to plan their essay. In other words, outline it. They will be provided 4 blank lined pages on which to write their essay.

Student will be expected analyze and evaluate multiple (3 will be given) perspectives on a "complex" issue. They will be expected to state and develop their own perspective on the issue and use logical reasoning and detailed examples to support their ideas. **Organization** will be an most important aspect in the grading process. The essay must be written in English.
FCC (Federal Communications Commission) Regulation of Internet Access To Teenagers

FCC should regulate the hours when teens can have access to the Internet. First Amendment rights should be curtailed in some cases.

FCC should not regulate the hours when teens can have access to the Internet. First Amendment rights should never be curtailed in our society.

Partial regulation, based on parental decision, should be made available to those who wish to utilize the Internet.

Essay Task

Write a unified, coherent essay in which you evaluate multiple perspectives on the conflict between Freedom of Speech and restricted access to the Internet for teenagers. (See the ACT Sample Test Booklet for complete details.)