Answer Explanations

Reading and Writing

Module 1

1. **(D)** "Building" is the most appropriate of these options to describe growing a group of viewers for social media content. "Manufacturing" and "fabricating" are better used when describing building physical, tangible objects. "Escalating" means to increase, not to necessarily build something.

2. **(A)** "In the company of" means to hang out with someone; that is the most logical meaning to have in this context, since Matsuo was hanging out with the lord's son. The other options all have to do with business practices.

3. **(A)** "Modify" means to "change," which makes the most sense given that the scientists changed the benzene reaction in a way that maintained the original product but did not add the undesired sidechains. "Expunge" and "oust" would be to "eliminate" the reaction, which is not what is expressed. It is not "proposed" because this was actually implemented, not just considered.

4. **(B)** Based on the context, "spurred" is most logical, since it means "inspired." Choice (D) is in the incorrect tense, and (A) and (C) do not convey the precise meaning needed.

5. **(A)** The text describes the transcription process, stating that the introns are "extracted and degraded" so choice (A) is the correct answer. The exons are translated, but the word excised is specifically referring to the introns. The exons are not "coded" into some sort of language, nor are they "mutated" or changed into something else.

6. **(D)** The text starts by introducing the initiative of the LEAP program, then proceeds to give national survey results that show the relevance of the LEAP program's goals to meeting the needs of employers, i.e., demonstrating the economic relevance of the program. It is not (A) because an outline of a liberal arts curriculum would require more details about coursework and timeframes. It is not (B) because a historical survey would look at multiple historical events over a period of time. It is not C because the writer is using statistics to support, not refute, the claim.

7. **(D)** Text 1 focuses on the shift from non-online learning to online learning especially in terms of the growing recognition of online professional certifications, and the information in Text 2 shows how any concerns about costs being a barrier are increasingly negated since there are so many free learning options. Thus, choice (D) makes sense because if the cost barriers to online education are reduced, the popularity of online certifications will likely increase. It is not (A) because having inexpensive learning options would be a plus, not a potential threat. It is not (B) because the focus is on online education, not in-person. It is not (C) because it can reasonably be inferred that if more people have access to free educational opportunities to learn relevant job skills, this would likely help businesses because they would have more access to qualified workers.

8. **(B)** In considering his legacy, the narrator notes that he will not leave a "wealthy bequest" or a "labor-saving machine," but will instead leave "carols" for "comrades and lovers." So, the narrator has apparently prioritized making human connections instead of achievements like wealth and inventions that are more tangible. It is not (A) because the narrator is not suggesting that one of these options is better than another; instead, he is noting what he himself

has done. It is not (C) because this would not represent a main idea of the text. It is not (D) because the narrator has evidently created "carols" "vibrating through the air" and makes no reference to technology being needed to create these.

9. **(B)** Joe Dillon is the character who introduces the narrator to the Wild West stories. He is described as playing fiercely with the other children and consistently winning their war games, making choice (B) correct. He doesn't ever allow the enemy side to win, so choices (A) and (C) can be ruled out. No evidence is provided to support choice (D).

10. **(A)** The teacher claims that the narrator expresses a deep personal feeling of melancholy, which the quotation in choice (A) clearly shows. This selection mentions the "freezings" the narrator has felt, the "dark days" seen, and a sense of "bareness everywhere." The other options use language that is more positive or at least neutral—they do not approach the negativity found in (A).

11. **(D)** A major issue that astronauts have, as described in the text, is that they "suffer from cardiac atrophy as a response to immobility." The author explains that bears do not suffer from cardiac atrophy even after months of hibernation. The author therefore thinks that bears may be the key to solving cardiac atrophy in astronauts. If, however, bears have the same response to time in space that humans have, then this line of scientific inquiry would not be helpful. This makes (D) the best answer. Choice (A) is incorrect as this would be a good reason to further study bears and how they might help astronauts. Choice (B) is incorrect as the author is not a proponent of human hibernation. Choice (C) is incorrect as this does not relate to the study of bears to help astronauts.

12. **(B)** The consumer researcher makes the claim that the prices of organic crops can often be substantially higher than those of conventionally raised crops. Choice (B) best supports this claim, since it accurately notes that between 2010 and 2014, organic soybeans are consistently about twice the price of conventional soybeans. It is not (A) because this doesn't mention a price differential. It is not (C) or (D) because these options only discuss organic crops.

13. **(C)** In choice (C), we learn that because of Daisy's visit to the school, a young man was suspended indefinitely because of his actions against the minority students. This makes choice (C) the best option as it shows that Daisy convinced the administration to make this suspension. Choices (A) and (B) simply show Daisy's beliefs and the facts of the situation, not that she persuaded anyone of them. Choice (D) shows that the president is willing to visit, not that Daisy has convinced him of anything.

14. **(C)** The political scientist wants to show that even if a presidential candidate wins more popular votes than any other candidate, but still has less than an outright majority, the candidate can still win a majority of the electoral votes. Choice (C) demonstrates this because it shows how Wilson won a plurality of the popular vote but a large majority of the electoral vote. Choice (A) does not tell us anything about the election winner. Choice (B) focuses on parties that only won a small percentage of the votes. Choice (D) talks about the second-place candidate instead of the winner.

15. **(C)** The final sentence of the text is elaborating on specific examples of extrinsic motivators. Based on the previous sentence, "avoiding consequences" could be an extrinsic motivator, making "following the law to avoid being arrested" an excellent option. The other options are all examples of intrinsic motivators as described earlier in the text.

16. **(C)** "But" provides a transition between the two independent clauses in the sentence, making a single comma an appropriate way to join these two clauses. Choice (A) is too choppy, choice (B) places the comma after the "but" instead of before, and choice (D) needs a pause partway through the sentence.

17. **(D)** "Their" goes along with "cats" in showing the possession that the cats have for "way." Choices (A) and (B) are used for singular substitutions, and choice (C) is used to show a location.

18. **(D)** The colon provides the best option to give a pause before the clarification is provided. Also, the apostrophe in "it's" is used correctly since this stands for "it is." Choices (A) and (C) incorrectly use the possessive form "its." Choice (B) gives a comma splice—a comma by itself is not sufficient to join two complete sentences.

19. **(C)** "Took off" is the only option that correctly uses the past tense, which is correct given the past tense of other nearby verbs like "founded," "started," and "believed."

20. **(D)** No commas are needed to break up this phrase, making choice (D) correct. Choice (A) uses a semicolon without a complete sentence after it. Choice (B) inappropriately breaks up the phrase "provide . . . with." Choice (C) is far too choppy.

21. **(C)** The subject in the sentence is "process," which is singular. Choice (C) is the only option that provides a singular verb to make this a complete sentence.

22. **(B)** Choice (B) uses dashes to set aside the definition of what a stage is. Choice (A) only punctuates one side of the definition. Choice (C) does not provide any punctuation. Choice (D) inconsistently punctuates the definition.

23. **(D)** "Since" is the only transition that shows a cause-and-effect relationship between the fact that platypuses break down their food using gravel and dirt from the water and the fact that grinding plates in their bills enable this to take place. The other options do not show a cause-and-effect relationship.

24. **(C)** "Instead" is the only option that provides a contrasting transition between the statement that soap does not merely kill lethal bacteria and the statement that it removes all germs. "Also" and "additionally" both transition into continuations of the same idea, while "granted" would transition into an acknowledgement of an objection.

25. **(C)** Since the student wants to present general information about Dayton to an audience that does not know much about Dayton, it makes the most sense for the student to focus on broad facts about the city. Choice (C) accomplishes this goal since it generalizes about how Dayton is home to many useful inventions. The other options are all too specific in focusing on particular Daytonian inventors and inventions instead of on providing a broad introductory overview.

26. **(A)** The student wants to show how a common assumption that people have about piranhas only eating animals is incorrect. Stating that some piranhas do in fact eat only plants would directly address this misconception. Choice (B) does not address the piranha diet. Choice (C) does not make sense because blood would also be an animal product. Choice (D) is inconsistent with the information in the text.

27. **(B)** The astronomers are concerned about the "dangers of a large asteroid strike on Earth." A constructive strategy dealing with this problem would be to have a plan in place to prevent such a strike from happening. Based on the notes, a constructive strategy would be to build upon the success that NASA had in modifying the orbit of a small asteroid. After all, if a small asteroid could be manipulated, it is possible that a larger one could also be manipulated. It is not (A) because this is too extreme in its negativity. It is not (C) because this is more alarmist than constructive. It is not (D) because this would dismiss instead of addressing the concerns of the astronomers.

Module 2A

1. **(D)** In this sentence, Juan is "ignoring" the jealous comments of his friends; the word "dismissed" would be an excellent substitute. It is not "reduced" or "forgot," because he devotes some thought to what they said. It is not "conceded" because that would mean he would admit the truth of the jealous claims of his peers.

2. **(D)** Camouflage would prevent potential prey from spotting the approaching servals since the prey would not be able to "detect" the servals. "Pictured" and "envision" involve more hypothetical visualization, and "ignored" is the opposite of the intended meaning.

3. **(C)** The spectators are bringing up ideas for consideration—thus "raised" would make sense, since the spectators are sharing ideas, not physical objects. It is not "increased" because someone cannot increase a speaking point. It is not "elevated" because while elevate can be used to refer to raising things in other contexts, it cannot properly be used here to refer to bringing up a point. It is not "nourished" because the spectators are not feeding several points—they are stating them.

4. **(C)** The text refers to "breaking the fat into three different chains," so separating is the closest word meaning. "Flouting" means "defying." "Elimination" would imply that the fat was removed instead of divided. "Categorizing" is a close synonym but indicates a classifying of parts.

5. **(C)** "Landscape" most appropriately describes the land in which the platypuses were prevalent. A panorama is more of a scenic view. A perspective is more of a point of view. Agriculture would not have been associated with the nonhuman activities so long ago.

6. **(D)** "Troubled" is the best choice since the narrator is thinking about a "most miserable thing." Choice (A) is too strong of a word since there is no evidence that the narrator has become physically ill. (B) and (C) inaccurately portray the narrator's shame as a power or strong point.

7. **(A)** The text refers presents that influenza remains a viable threat, and because of its unique disposition, is likely to stay that way. Choices (B) and (D) state the opposite, arguing instead that the virus is likely to be killed off and is essentially harmless. Choice (C) is not correct because influenza's inability to be conquered, not its severity is what makes it unique.

8. **(B)** The text starts with the phrase "The wheel of progress moves onward." This part of the topic sentence sets up the rest of the text to talk about what Stanton sees as inevitable progress and the embrace thereof. This makes choice (B) the best option. Andrew Johnson is only an example, not the main message, so choice (A) is incorrect. Choice (C) is the opposite of her message—she believes that people should embrace change and shift the status quo. Choice (D) is incorrect as she is not discussing animal examples.

9. **(C)** The court observed that if students are in segregated schools, they face an inherent disadvantage when compared to students at integrated schools. Choice (C) directly and specifically illustrates this claim by connecting legal segregation to a delay in educational and mental development. It is not (A) because it is too vague. It is not (B) because this refers to earlier thinking that separate facilities could be equal. It is not (D) because the disposition is not clarified.

10. **(C)** The researcher claims that probiotics that must be refrigerated are ill-suited for stomach digestion. Choice (C) would directly support this claim since it gives specific reasons why the bacteria that prefer a cold environment would be harmed by the stomach conditions. It is not (A) because this option does not relate to probiotics that need to be kept cold. It is not (B) because the warmth from a beverage may not be the same as the warmth in a stomach. It is not (D) because antibiotics are not the same as probiotics, so generalizations about antibiotics would not necessarily be applicable to probiotics.

11. **(A)** To support the idea that traumatic brain injuries are more likely to come from less dramatic, home-based injuries, choice (A) is the best option, as it refers to "falls and unintentional blunt trauma" that cause the majority of traumatic brain injuries. It is not (B) because this does not refer to less dramatic injuries. It is not (C) because it does not consider other sources like unintentional blunt trauma. It is not (D) because both of these sources of injuries are rather violent.

12. **(A)** The final sentence contrasts with the previous sentence, which states that there are times when handwashing is quite necessary. Therefore, acknowledging that living in a constantly sterile environment is "not necessary" makes the most sense. Choices (B) and (D) state the opposite of the needed meaning, and choice (C) is ambivalent.

13. **(D)** The text refers to MLM as a "new type of scheme" that was "designed to pad the pockets of a select few." So, the narrator clearly has a negative opinion of MLM; thus, choice (D) makes sense because it describes MLM quite skeptically. Choices (A) and (B) express a more positive attitude towards MLM, which is not supported by the text. Choice (C) incorrectly connects the present-day MLM to its introduction in the World War II era.

14. **(B)** The text is outlining the evolution of the concept of a chemical element. The final sentence alludes to how Boyle's long-lasting definition was eventually replaced after dominating scientific thinking for 300 years. Referring to "the discovery of subatomic particles in the 20th century" would make the most sense as an option, since it aligns with the chemistry focus of the text and matches the timeline coming 300 years after the 17th century. The other options do not connect to either chemistry or to the timeline.

15. **(A)** "Has" is both consistent with the singular subject of "it" and with the timeframe of the past leading up to the present day, making the present perfect tense correct. Choices (B) and (D) are plural, and choice (C) would use the past perfect, which would not indicate that this sport continues up to the present day.

16. **(C)** Use a comma to separate the complete sentence from the phrase that follows. It is not choices (A) or (D) because what follows is not a complete sentence. It is not (B) because a brief pause is needed.

17. **(D)** "It can be quite demoralizing" is the only option to put the words in a logical sequence. The other options place the subject, "it," later in the phrase, making the phrase confusing to the reader.

18. **(D)** Since just two questions are asked, there is no need for any punctuation to break up the sentence. All the other options inappropriately incorporate extra punctuation.

19. **(D)** "Feel" works along with the future tense to say they will feel; "felt" is in the past tense and would be inconsistent with the other verbs in the sentence. Also, the correct phrase is to "feel overwhelmed," i.e., that one is intimidated by all the work one has to do. "Overwhelming" can be used to describe a situation—my work load is overwhelming—but not to describe how one feels.

20. **(C)** No punctuation is required in this sentence. Choice (A) does not have a complete sentence after the semicolon. Choice (B) uses the dash to provide an unnecessary, awkward pause. And (D) unnecessarily sets aside "engineer" with commas, suggesting a parenthetical that is not needed; without "engineer," the sentence would not make sense.

21. **(C)** The difficult part here is that the correct answer simply looks odd, despite being flawless. A possessive form of understanding of the class is needed: "class's" understanding is the proper way to illustrate this. Choice (A) is both plural and lacking an apostrophe. Choice (B) is an improper way to indicate possession. (D) indicates multiple "classes," whereas there is actually only one class.

22. **(B)** We need a possessive word to serve as a stand-in for Truman and MacArthur. Eliminate choices (C) and (D) for being singular possessives. Eliminate (A) for not being a possessive at all. "Their" is the correct answer.

23. **(C)** The semicolon prevents a run-on sentence or comma splice; there is a complete sentence both before and after the semicolon. In addition to the key error of not breaking up two complete sentences, the other options have different problems: choice (A) has no breaks whatsoever, (B) has an unnecessary comma after "standing," and (D) does not have an apostrophe with "Edith" to show possession.

24. **(D)** "As" provides the needed transition to show cause-and-effect in this situation—the chef wants to work on a part-time basis because they could have more flexible scheduling. The other options do not show a cause-and-effect relationship.

25. **(C)** "However" is the only option that provides a contrast between the idea that laws may be in place and the opposite idea that guest workers can't take action when they experience unfair treatment.

26. **(D)** This option is the only one to specifically mention the leaders of the two armies at Gettysburg: Meade and Lee. Choice (A) is incorrect because Lincoln was not a general in command at the battle—Meade was. Choice (B) does not refer to the leaders. Choice (C) only mentions Lee.

27. **(D)** To calm a friend who is worried about psoriasis, the student would want to give the friend hope that if they had psoriasis, it should not be a cause for concern. Choice (D) correctly incorporates information from the notes, namely that "there are many treatment options." The other options would all highlight negative aspects of psoriasis, contributing to the friend's anxiety.

26. **(B)** Be sure to pick up on the "not" in the question—we want something that would not likely be part of the public domain. According to the notes, it will take 70 years after the death of a work's author to be in the public domain. Also, if something is created privately it is not in the public domain. Therefore, a newly created private work would not be in the public domain, as in choice (B). It is not (A) because this is a publicly created work and would be in the public domain. It is not (C) or (D) because these options both suggest things that would be in the public domain. (Choice (C) is correct in terms of such a novel being in the public domain, while choice (D) is incorrect.)

27. **(C)** According to the notes, free will is when someone's first-order desires and second-order desires align. For example, someone may have a first-order desire to eat junk food, but this would not align with a second-order desire to want to eat healthfully. If what the person wants to do aligns with what the person genuinely desires, then the person is acting freely. So, if someone genuinely wanted to eat more healthfully and actually feels like eating healthier foods, the person would be acting freely according to Frankfurt. A plausible reason why Frankfurt would not consider an animal to possess free will is that an animal may only be able to have straightforward wants without the ability to reflect on whether those wants are what it truly desires. So, choice (C) would make sense. It is not (A) because this would support that the animals have free will given their ability to reflect. It is not (B) because first-order desires would be needed to have second-order desires. It is not (D) because this would place humans and animals in the same category as far as having no capacity to reflect on whether certain wants are genuinely desirable.

Math

Module 1

1. **(C)** Distribute the $\frac{1}{2}x^3$ to simplify:

$$\frac{1}{2}x^3(x^2 - 4) \rightarrow$$

$$\left(\frac{1}{2}x^3\right)(x^2) + \left(\frac{1}{2}x^3\right)(-4) \rightarrow$$

$$\frac{1}{2}x^5 - 2x^3$$

2. **(210)** 5% of 200 is found as follows:

$$0.05 \times 200 = 10$$

Then, add 10 to 200 to find the number that would be 5% greater than 200:

$$10 + 200 = 210$$

3. **(A)** In 1970, the value of the price is clearly less than \$500. The only option that is less than \$500 is choice (A), \$245.

4. **(D)** Use elimination to solve for a, which is the value of x in this series of equations. First, eliminate the x by multiplying the second equation by -2 and adding it to the first equation.

$$\begin{aligned} 2x - 5y &= 3 \\ x + 2y &= 6 \rightarrow \\ 2x - 5y &= 3 \\ +-2x - 4y &= -12 \\ \hline 0 - 9y &= -9 \end{aligned}$$

Then, solve for y:

$$-9y = -9 \rightarrow$$

$$y = 1$$

Now, plug 1 in for y to one of the equations to solve for x. Use the second equation since it is simpler.

$$x + 2y = 6 \rightarrow x + 2(1) = 6 \rightarrow x = 4$$

5. **(B)** Call x the original price of the book prior to the discount. Since there was a 10% discount, the price after the discount is applied is 90% of the original price. So, set up an equation to solve for the original price:

$$0.9x = 18 \rightarrow$$

$$x = \frac{18}{0.9} = 20$$

So, the original price is $20.

6. **(A)** First, find the height of the actual Statue of Liberty in centimeters by multiplying 93 meters by 100 centimeters per meter:

$$93 \times 100 = 9{,}300$$

Then, find 1/500th of 9,300 to find the height of the model in centimeters:

$$9{,}300 \times \frac{1}{500} = 18.6$$

18.6 rounds up to 19 whole centimeters.

7. **(C)** Use easily visible points on the function to plug in values to determine the correct equation. First, try the point (0, 1) into the equations to see what can be eliminated.

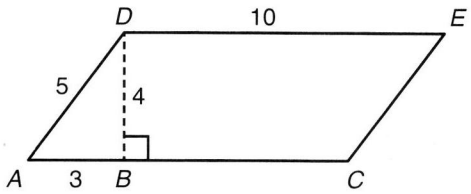
(A) $f(x) = x^2 \rightarrow 1 \neq 0^2$ so (A) is incorrect.
(B) $f(x) = x^2 + 1 \rightarrow 1 = 0^2 + 1$ so (B) is a possibility.
(C) $f(x) = 2^x \rightarrow 1 = 2^0$ so (C) is a possibility.
(D) $f(x) = 3^x + 1 \rightarrow 1 = 3^0 + 1 \rightarrow 1 \neq 2$, so (D) is incorrect.

Now, try the point (2, 4) with options (B) and (C):

(B) $f(x) = x^2 + 1 \rightarrow 4 \neq 2^2 + 1$ so (B) is incorrect.
(C) $f(x) = 2^x \rightarrow 4 = 2^2$ so (C) is correct.

Alternatively, you could graph each of the answers using the Desmos calculator embedded in the math test to visualize the different functions.

8. **(40)**



The area of a parallelogram is the base multiplied by the height. The base of the parallelogram is 10, and the height is 4 since it is part of a 3-4-5 special right triangle. Therefore, the area of the parallelogram is $4 \times 10 = 40$ square units.

9. **(B)** Manipulate the equation to get R by itself:

$$A = \frac{v^2}{R} \rightarrow A \times R = \frac{v^2 R}{R} \rightarrow A \times R = v^2 \rightarrow R = \frac{v^2}{A}$$

10. **(B)** Plug in 2 for x and 17 for y, then solve for b:

$$y = bx^2 + 5 \rightarrow$$

$$17 = b(2)^2 + 5 \rightarrow$$

$$17 = 4b + 5 \rightarrow$$

$$12 = 4b \rightarrow$$

$$b = 3$$

11. **(300)** Divide 3,000 miles by 10 hours to solve for the speed in miles per hour:

$$\frac{3000 \text{ miles}}{10 \text{ hours}} = 300 \text{ miles per hour}$$

12. **(1)** Use elimination to solve for y. Multiply the top equation by -2 so you can eliminate the x values when you add the equations together:

$$-2 \times (2x - 3y = 5) \rightarrow -4x + 6y = -10$$

Then, add this equation to the second equation to eliminate the x values:

$$\begin{aligned} -4x + 6y &= -10 \\ +\ 4x + y &= 17 \\ \hline 0 + 7y &= 7 \end{aligned}$$

Then, solve for y:

$$7y = 7 \rightarrow y = 1$$

So, the value of y is equal to 1.

13. **(D)** Use x as the capacity for the smaller bag, and y as the capacity for the larger bag. Set up two equations to solve. First, make an equation that expresses the capacities in terms of each other:

$$x = \frac{1}{3}y$$

Then, make an equation expressing the total capacity of the two bags:

$$x + y = 80$$

Then, simplify and use substitution to solve for the capacity of the smaller bag, x:

$$x = \frac{1}{3}y \rightarrow 3x = y$$

Plug $3x$ into the second equation to solve:

$$x + y = 80 \rightarrow x + 3x = 80 \rightarrow 4x = 80 \rightarrow x = 20$$

So, the capacity of the smaller bag is 20 liters.

14. **(B)** Use the fact that $f(2) = 8$ to find what the constant C is. According to the table, $f(2) = 2^C$. So, solve for C:

$$\begin{aligned} f(2) &= 2^C \rightarrow \\ 8 &= 2^C \rightarrow \\ 2^3 &= 2^C \rightarrow \\ C &= 3 \end{aligned}$$

Now that we know that $C = 3$, we can solve for $f(3)$:

$$f(3) = 3^C = 3^3 = 27$$

15. **(10)** Let h represent the height of the triangle and let b represent the width of the base of the triangle. Express the idea that the height of the triangle is twice its width with this equation:

$$h = 2b$$

The formula to calculate the area of a triangle is $A = \frac{1}{2}bh$. Substitute 25 for the area and $\frac{h}{2} = b$ from manipulating the above equation, then solve for the height:

$$A = \frac{1}{2}bh \rightarrow 25 = \frac{1}{2}\left(\frac{h}{2}\right)h \rightarrow 25 = \frac{h^2}{4} \rightarrow 100 = h^2 \rightarrow 10 = h$$

The height is therefore 10 units.

16. **(A)** Look at the differences among the answer choices to save yourself time. We need a function that will show an exponential increase over time. In the function $I(T) = 2 \times (1.5)^T$, as T increases, $I(T)$ would also increase at an exponential rate. With all of the other options, however, as T increases, the value of $I(T)$ would consistently *decrease*. Choice (B) would involve multiplying by an ever-smaller fraction, and choices (C) and (D) would involve dividing by ever-larger numbers. So, the only logical option is choice (A).

17. **(D)** Take the 300 cubic meters and multiply it by the density for steel, 7,850 kilograms per cubic meter, to get the total mass of the wall:

$$300 \times 7{,}850 = 2{,}355{,}000 \text{ kilograms}$$

18. **(65.8)** Calculate the total height of the seven boys by using the mean formula and solving for the sum:

$$\frac{Sum}{7} = 67 \rightarrow Sum = 469$$

Now, subtract the height of 74 from the total:

$$469 - 74 = 395$$

Finally, find the mean of the six boys using 395 as the sum:

$$\frac{395}{6} \approx 65.8$$

19. **(B)** $\angle X$ and $(90 - \angle X)$ are complementary angles, since they would add up to 90 degrees. Recall that the sine of one angle is equal to the cosine of the angle that is complementary to it; similarly, the cosine of one angle is equal to the sine of the angle that is complementary to it. Thus, the sine of $(90 - \angle X)$ will simply be the same as the cosine of $\angle X$: $\frac{\sqrt{2}}{2}$.

20. **(B)** Factor the expression to determine what *would* be factors:

$$x^3 + x^2 - 20x \rightarrow$$
$$x(x^2 + x - 20) \rightarrow$$
$$x(x - 4)(x + 5)$$

So, choices (A), (C), and (D) would all be factors. Choice (B), $x - 7$, would not be, so choice (B) is correct.

$$x^3 + x^2 - 20x$$

21. **(B)** Since the cards are returned to the set after each selection, the total number of choices will remain at 10. So, the probability that someone would pick a 9 on this selection would simply be $\frac{1}{10}$.

22. **(D)** Simplify the equation to visualize what is happening:

$$3x - 6 = 3(x - a) \rightarrow$$
$$3x - 6 = 3x - 3a$$

If the constant a is greater than 2, then $3a$ would be greater than 6. This would result in an absurd situation since the equation would no longer express an equivalence. For example, if a were 3 (a value greater than 2), look at what happens to the equation:

$$3x - 6 = 3x - 3a \rightarrow$$
$$3x - 6 = 3x - 9 \rightarrow$$
$$-6 \neq -9$$

Thus, the equation would have no solutions if the constant a is greater than 2.

Module 2A

1. **(A)** Put the equation into slope-intercept form, $y = mx + b$ to solve for the value of the y-intercept, b:

$$y + 5 = 7x \rightarrow$$
$$y = 7x - 5$$

So, the value of the y-intercept is -5.

2. **(C)** Since there are 20 students, find the number of the servings by the 10th and 11th students to see the median of the set. The values are already in order, so you can see that the 10th and 11th terms are both 6. Therefore, the median of the set is 6.

3. **(B)**

$$\frac{x^2 - 81}{x + 9} \rightarrow$$
$$\frac{(x + 9)(x - 9)}{x + 9} \rightarrow$$
$$\frac{(x + 9)(x - 9)}{x + 9} \rightarrow$$
$$x - 9$$

4. **(B)** Two points that are easy to identify are $(-6, 0)$ and $(0, 4)$. So, take the slope using these two points.

$$slope = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 0}{0 - -6} = \frac{4}{6} = \frac{2}{3}$$

5. **(A)** Since the total distance of the trail is 300 and Walter has already traveled 100 miles, he has $300 - 100 = 200$ miles remaining on his journey. Use the equation $\text{Distance} = \frac{\text{Rate}}{\text{Time}}$ to solve.

He has to travel a total of 200 miles in D days, and we are solving for the m miles per day he is travelling. So, the equation will be:

$$\text{Distance} = \frac{\text{Rate}}{\text{Time}} \rightarrow$$
$$m = \frac{200}{D}$$

6. **(A)** Distribute and simplify:

$$2(x - 4) + 4 \rightarrow$$
$$2x - 8 + 4 \rightarrow$$
$$2x - 4$$

7. **(D)** In the function $C(m) = 10m + 10{,}000$, the 10,000 represents the fixed cost to run the restaurant, and the 10 represents the additional cost to the restaurant for each additional meal. If no meals were served, the total cost would be \$10,000. If one meal were served, the total cost would be \$10,010. If two meals were served, the total cost would be \$10,020. So, the cost is going up by \$10 for each additional meal sold.

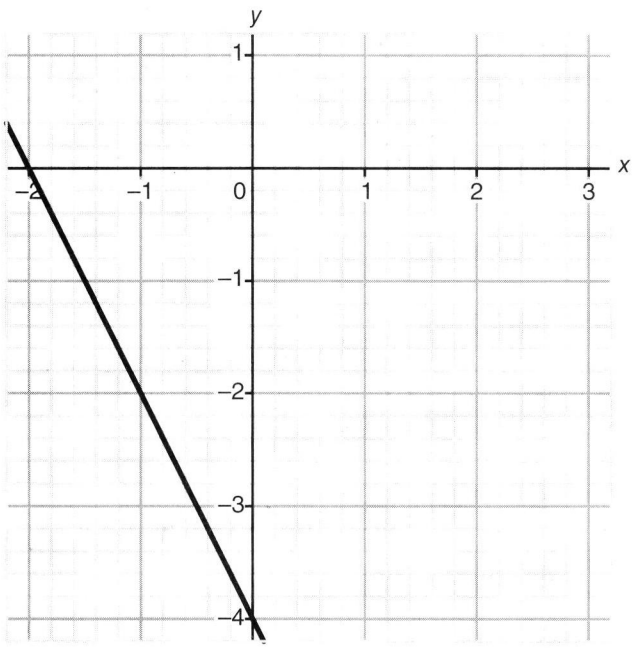
8. **(A)** Put the equation $\frac{1}{2}y + 2 = -x$ in slope-intercept form, $y = mx + b$:

$$\frac{1}{2}y + 2 = -x \rightarrow$$

$$\frac{1}{2}y = -x - 2 \rightarrow$$

$$y = -2x - 4$$

The equation therefore has a slope of -2 and a y-intercept of -4. This corresponds to choice (A), as graphed below:



9. **(B)** Subtract the fractions from 1 (which represents the total set of voters) to find the fraction of voters who do not like either candidate:

$$1 - \frac{1}{2} - \frac{1}{3} \rightarrow$$

Put everything in terms of the least common denominator, 6:

$$\frac{6}{6} - \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$$

So, the probability that a randomly selected voter will like neither candidate is $\frac{1}{6}$.

10. **(50)** Let x represent the number of forks, and y represent the number of spoons. The first equation could be for the total number of forks and spoons:

$$x + y = 80$$

The second equation would show the ratio of forks to spoons:

$$\frac{x}{y} = \frac{5}{3}$$

Now, simplify the second equation and substitute into the first equation to solve for x.

$$\frac{x}{y} = \frac{5}{3} \rightarrow 3x = 5y \rightarrow y = 0.6x$$

Plug $0.6x$ in for y in the first equation:

$$x + y = 80 \rightarrow x + 0.6x = 80 \rightarrow 1.6x = 80 \rightarrow x = \frac{80}{1.6} = 50$$

So, there are 50 forks in the drawer.

11. **(A)** Between the hours of 7 a.m. and 9 a.m., the traffic density increases from 20 vehicles per mile per lane to 40 vehicles per mile per lane. This is the largest increase in traffic density between any of the intervals.

12. **(B)** Plug the second inequality $x \leq -y - 2$ into $y + 10 \leq 3x$ and simplify:

$$\begin{aligned} y + 10 &\leq 3x \rightarrow \\ y + 10 &\leq 3(-y - 2) \rightarrow \\ y + 10 &\leq -3y - 6 \rightarrow \\ 4y + 10 &\leq -6 \rightarrow \\ 4y &\leq -16 \rightarrow \\ y &\leq -4 \end{aligned}$$

So, the largest possible value for y is found when $y = -4$.

13. **(C)** Since the cashier accidentally subtracted the sales tax from the price of the meal, the new percentage will be $100\% - 7\% = 93\%$. Therefore, the price of the meal in terms of x will be $0.93x$.

14. **(35)** Call x the number of minutes for Ken's morning commute. The commute in the evening would be $x + 25$. So, add the morning and evening commute times together to equal the 95 total minutes, then solve for x:

$$\begin{aligned} x + (x + 25) &= 95 \rightarrow \\ 2x + 25 &= 95 \rightarrow \\ 2x &= 70 \rightarrow \\ x &= 35 \end{aligned}$$

So, the number of minutes for the morning commute is 35.

15. **(B)** Plug 2 in for x to find the value of $f(2)$:

$$f(x) = \frac{x^3}{4} + 3 \rightarrow$$

$$f(2) = \frac{2^3}{4} + 3 = \frac{8}{4} + 3 = 2 + 3 = 5$$

16. **(3)** The volume formula for a right rectangular prism is $L \times W \times H = V$. Since we already know the volume of the prism and the product of the length and width, we can set up a formula like this to solve for the prism's height:

$$\begin{aligned} L \times W \times H &= V \rightarrow \\ 30 \times H &= 90 \rightarrow \\ H &= \frac{90}{30} = 3 \end{aligned}$$

So, the height of the prism is 3 inches.

17. **(1)** Factor the equation to solve for the possible values of x:

$$x^2 - x - 20 = 0 \rightarrow$$
$$(x + 4)(x - 5) = 0$$

The possible values of x are therefore -4 and 5 since each of these would make the entire left-hand side of the equation equal to zero. Then, add -4 and 5 to find the sum:

$$-4 + 5 = 1$$

18. **(B)** Set up a proportion to solve for the number of residents, x, who voted no. There are 360 degrees total in a circle, so make the proportion have degrees on one side and residents on the other:

$$\frac{45}{360} = \frac{x}{800} \rightarrow$$
$$x = \frac{45 \times 800}{360} = 100$$

So, there are 100 residents who voted no on the levy.

19. **(B)** Use the density formula $Density = \frac{Mass}{Volume}$, plugging in 2 kilograms for the mass and 8 liters for the volume:

$$Density = \frac{Mass}{Volume} \rightarrow$$
$$Density = \frac{2}{8} = \frac{1}{4}$$

20. **(B)** Take 35, divide it by 70, and multiply the result by 100 to determine what percentage 35 is of 70:

$$\frac{35}{70} \times 100 = 50\%$$

21. **(5)** Find the equation of the new line by calculating is slope—we already know that the y-intercept is 4. Take the negative reciprocal of the slope of the first line, -3, by flipping it and changing the sign.

$$-3 \rightarrow \frac{1}{3}$$

So, the equation of the new line is $y = \frac{1}{3}x + 4$. Calculate the value of a point on this line when the x value is 3 by plugging 3 in for x:

$$y = \frac{1}{3}x + 4 \rightarrow$$
$$y = \frac{1}{3}(3) + 4 \rightarrow$$
$$y = 1 + 4 = 5$$

The y value will thus be 5 for this point.

22. **(A)** While you could solve for the length of $\overline{AB}$ by using the Pythagorean triple, it will be easier if you recognize that this triangle represents a Pythagorean triple: 7, 24, and 25. With the hypotenuse at 25, the cosine of $\angle ABC$ will be:

$$\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{7}{25}$$