March 2023 SAT QAS

Section 1: READING

Questions 1-10 are based on the following passage.

This passage is adapted from Erin Rose Belair, "A Place Like This." ©2017 by Erin Rose Belair. The narrator and her friend Andy are teenagers on their way to meet a group of people at a swimming hole.

Line

In the Yaak fall is so colorful; those seas of green become swirling basins of oranges and yellows. Sometimes it feels right to invent new words for shades I've never seen before. Then the winds whip down the rivers to remind everyone of the chill that will swallow everything whole. The winters are so frozen and so long you can nearly forget there was another season before, and start to believe there may never be another after. It separates us from everyone else who could never live in a place like this, making us hard, strong, and proud. Spring comes too late and just in time to remind us that everything has a way to keep on going, and so do we. And in the summertime the sky is the biggest, bluest sky, as if it has the chance to expand while you sleep. And the few clouds shift and shape into creatures living only in the imagination as they roll toward the horizon.

It is just that kind of summer, hot in the day and hot in the night and filled with bugs that force you to slap yourself and leave welts along the fat parts of your thighs. The rivers are low enough to swim, and the huckleberries have grown fat enough to eat, and the days are so long they get to feeling like a lifetime.

I stop along the path every so often to pick handfuls of lilacs and Indian paintbrush. And then I have to run a bit to catch up with Andy. He's grown so tall over the past year, I take two or three steps to his every one. Everything about him seems larger, from his voice to his hands to the space he takes up in my world. I want him to not just look at me but to really look at me, and I haven't the slightest clue how to go about it.

We cut across the open field of the O'Connor place. The one-room house his daddy's daddy built by hand has a For Sale sign posted out front, not that many people would ever see it. His homestead will fall back into the hands of the forest and in years to come start to slide and slope under the pressures

of snow and sun, forgotten like a lot of the other places up here.

Many summers from now I will come back and stand at the end of this drive. I will try to imagine how it once looked, and try to imagine it still lived in. Imagine Andy and me, in a different lifetime, having stayed in the Yaak, living in a place like that. I leave my bundle of wildflowers at the edge of the drive and make the sign of the cross again.

We pick up an old overgrown logging road and walk for a while longer. The forests are crisscrossed with them, left behind from when this was a profitable and somewhat popular place to live and work. I like to imagine the Tavern filled with men after a long day, covered in dirt and smelling of timber, and the talks that must have taken place in every crew cab across the county. I will always wonder what kind of man Andy might have grown into if life up here still looked like that. And what kind of life the two of us might have made had he never left.

"You excited?" I ask.

"'Bout? Just another hole. Though Daniel says it's the highest jump they found yet. Knowing him it means something."

"No. You excited for next week?"

Andy shrugs, looks up at the sky, his green eyes squinting from the high sun, and keeps on charging forward through the thicket. When school starts next week it will be the first time we've ever been separated. He will start at the high school in Troy down the hill and meet all sorts of new people, new girls. And although he doesn't seem to give it much thought it is the only thing I've thought about all summer. He will take new classes and meet teachers who will confirm what I already know to be true about him: he is far brighter than he lets on and it will be at some point impossible to keep him here. And pretty soon Andy will start talking about college, talking about leaving, talking about a life beyond these county lines.

As we near the jumping spot there's the hush of moving water and the hollered laughs of Andy's older brothers and their friends as they egg each other on to climb higher and jump farther. A break in the oak groves opens to a landing of smooth rocks and a bend in the river. The waters rush and fall over an old logjam, spilling into a perfect pool below. Trees tower over us, the sunlight passing through them in sharp ribbons. There has never been a time I am not reminded of my smallness while standing on the edge of a river.

1) Which choice best describes how the narrator's focus shifts over the course of the passage?

A. She moves from a description of her childhood home to a discussion of how she and another child became friends.
B. She moves from a discussion of the area in which she grew up to considerations about possible changes in one of her friendships.
C. She moves from a description of the natural beauty of an area she used to visit frequently to a description of the town in which she grew up.
D. She moves from a discussion of the harshest aspects of a town in which she lived to a recollection of the aspects of the area she remembers most fondly.

2) The passage most clearly indicates that the narrator sees a parallel in the Yaak between the

A. clarity of the sky and the creativity of the people.
B. beauty of the fall scenery and the beauty of the winter scenery.
C. harshness of the winter and the hardiness of the people.
D. temperature of the wind and the temperature of the rivers.

3) Which choice best describes the main purpose of the second paragraph (line 13-17)?

A. To emphasize that the narrator wished for a particular experience to last longer
B. To expand on an analysis introduced earlier in the passage
C. To introduce the time frame in which an important experience occurred
D. To foreshadow the unease that the narrator will feel during the event that follows

4) As used in line 26-27, "fall back into the hands of" most nearly means

A. retreat from.
B. be protected by.
C. be overtaken by.
D. cause damage to.

5) The passage most strongly suggests that the narrator believes if the Yaak had remained a somewhat profitable and popular place to live

A. Andy might not have left.
B. Andy would have worked at the Tavern.
C. she wouldn't have worked at the Tavern.
D. logging wouldn't have been an important part of the economy.

6) Which choice provides the best evidence for the answer to the previous question?

A. line 35-36 ("We . . . longer")
B. line 36-37 ("The forests . . . work")
C. line 37-40 ("I like . . . county")
D. line 40-42 ("I will . . . left")

7) What can most reasonably be inferred from the dialogue between Andy and the narrator in line 43-46 ("You . . . week")?

A. Andy was annoyed with the narrator for asking him questions about high school.
B. Andy was eager to get to the swimming hole, but the narrator was nervous about swimming there.
C. Andy was anxious about going to the swimming hole, but the narrator failed to notice that he was.
D. Andy was thinking about the swimming hole, while the narrator was asking about his going to high school.

8) In context, the phrase "it means something" (line 45) serves mainly to

A. imply that Andy doesn't know what Daniel was trying to tell him.
B. convey that Andy believes he can trust Daniel's opinion on the subject.
C. suggest that Andy thinks there is a hidden meaning to what Daniel said.
D. indicate that Andy thinks the narrator does not believe what Daniel said.

9) The passage most strongly suggests that one of the main concerns the narrator has about Andy is that he will

A. want to leave the Yaak when he recognizes his capabilities.
B. not be receptive to teachers' opinions of his abilities.
C. not take advantage of the opportunities to socialize in his new school.
D. begin thinking about college when he should be concentrating on high school.

10) Which choice provides the best evidence for the conclusion that being at the site of the swimming hole makes the narrator feel humble?

A. line 58-60 ("As . . . farther")
B. line 60-61 ("A break . . . river")
C. line 61-63 ("The waters . . . ribbons")
D. line 63-65 ("There . . . river")

Questions 11-20 are based on the following passage and supplementary material.

This passage is adapted from Jaewon Yoon, Ashley Whillans, and Ed O'Brien, "How to Make Even the Most Mundane Tasks More Motivating." ©2019 by Harvard Business School Publishing.

Line

People want purposeful work, and managers know it. That's why companies try to inspire employees with mission statements about the impact their work can have. Ikea tells employees they're "creating a better everyday life"; Microsoft says they're "empowering every person and organization on the planet to achieve more in the world." Managers often encourage employees to think about why they do the work they do, hoping to give them a sense of purpose and fight against demotivation.

But our latest research, of nearly 4,000 working adults in the U.S., suggests that this hyperfocus on purpose can backfire. Workplaces today promise sweeping impact, yet most employees' daily tasks are mundane and disconnected from these lofty goals. In one of our surveys, assessing 700 employees across 22 industries, all but one could quickly name an unimportant and meaningless task they regularly do at work.

Constantly hearing messages about impact can lead employees to ruminate about their work's lack of impact. When we asked employees in our research to reflect on the "purpose" of their unimportant and meaningless tasks, they reported lower levels of enjoyment, meaning, and motivation than when we asked employees to rate these tasks without any mention of purpose. If reflecting on purpose backfires, how should managers help employees derive satisfaction from mundane work?

Our research offers a solution. According to classic principles in psychology, people perceive objects as being more valuable when they belong to a set. Most work tasks—even the most menial—belong to a broader set of tasks that achieve a singular purpose. Responding to client emails might feel like a waste of time, but combined with data analysis and report writing, it plays an important role in solving clients' most pressing concerns. Thus, thinking about how seemingly unimportant work belongs to a set of tasks contributing to a broader goal could help employees see its true value.

To test this idea, we asked employees to list two other tasks that build on their unimportant and meaningless tasks "like puzzle pieces" and "to achieve a broader purpose." (We call this intervention *superordinate framing*.) We found that applying this framing to menial tasks imbued these tasks with a greater purpose. For example, one participant wrote that their dreaded "weekly meeting," when combined with "open chat rooms" and "reporting issues to the management," enabled a larger goal: to "forge communication between individuals who would not otherwise be able to solve a problem by themselves." Another participant recognized "answering client calls" as an important step in "making sure they are happy with the product," when combined with "solving client issues" and "documenting the call." Afterward, they reported greater enjoyment and meaning.

These findings suggest that superordinate framing can be a useful tool for employees to motivate themselves. They just have to think about how their unimportant tasks fit in with other tasks to achieve a common purpose.

Superordinate framing can also be an effective tool for managers. In another study, we hired nearly 900 online workers in the U.S. to complete the same widget-building task. Some were told that they were creating widgets [virtual blocks] for an art project (purpose framing). Others were told that their widgets would be "woven together" with widgets made by either themselves or other workers to create this artwork (superordinate framing). Workers reported feeling more joy, meaning, and motivation when they were under the impression that their task belonged to a larger set.

Table 1

Participants' Average Rating of Task Meaning by Type of Framing and Perceived Importance of Task

	Participants' average rating of how meaningful they found the task (1 = not at all, 9 = extremely)		
Participants' perception of importance of tasks prior to framing	Superordinate framing	Purpose framing	Control (no framing)
Unimportant tasks	5.81	5.05	3.82
Important tasks*	7.24	7.40	7.39

*For important tasks, the differences in average ratings between superordinate, purpose, and control were not statistically significant.

Table 2

Participants' Average Rating of Task Enjoyment by Type of Framing and Perceived Importance of Task

	Participants' average rating of how enjoyable they found the task (1 = not at all, 9 = extremely)		
Participants' perception of importance of tasks prior to framing	Superordinate framing	Purpose framing	Control (no framing)
Unimportant tasks	4.93	4.05	3.30
Important tasks*	6.08	6.15	6.16

*For important tasks, the differences in average ratings between superordinate, purpose, and control were not statistically significant.

Tables adapted from Jaewon Yoon, Ashley V. Whillans, and Ed O'Brien, "Connecting the Dots: Superordinate Framing Enhances the Value of Unimportant Tasks." ©2019 by Jaewon Yoon, Ashley V. Whillans, and Ed O'Brien.

11) Over the course of the passage, the main focus shifts from a

A. hypothesis about the causes underlying a behavior observed among employees in large companies to an outline of a study designed to test that hypothesis.
B. summary of previous research findings about improving manager-employee relationships to an account of a more recent study that challenges those earlier findings.
C. narrative of how large corporations inspire their employees to work more effectively to a comparison of how employees and managers view the importance of their respective roles.
D. discussion of the unintended consequences of an approach to motivating employees to an explanation of research that suggests an alternative approach that may be more successful.

12) Which choice best supports the idea that the authors believe superordinate framing can help employees become less reliant on management to define the importance of their work?

A. line 5-7 (“Managers . . . demotivation”)
B. line 18-20 (“If reflecting . . . work”)
C. line 31-32 (“We found . . . purpose”)
D. line 40-41 (“These . . . themselves”)

13) As used in line 19, “derive” most nearly means

A. obtain.
B. infer.
C. emit.
D. determine.

14) Based on the passage, with which statement about modern workplaces would the authors most likely agree?

A. Most employees in modern workplaces can readily quote the mission statements of their companies.
B. Managers’ failure to prioritize their employees’ well-being may account for the trend of declining morale in modern workplaces.
C. Despite appearances to the contrary, it is unlikely that people perform unnecessary tasks in modern workplaces.
D. The efficiency of modern workplaces could be improved if employees are invited to participate in identifying tasks that can be eliminated.

15) Which choice provides the best evidence for the answer to the previous question?

A. line 1-3 (“People . . . have”)
B. line 9-11 (“Workplaces . . . goals”)
C. line 15-18 (“When . . . of purpose”)
D. line 26-28 (“Thus . . . value”)

16) In the context of the passage, the examples of participant responses in line 32-38 (“For . . . call”) mainly serve to

A. indicate the wide variety of tasks that employees in modern workplaces are expected to perform.
B. illustrate the connections that participants make between menial work tasks they do and the overall purpose those tasks collectively serve.
C. provide details about the kinds of tasks that employees find most enjoyable and the kinds of tasks they dislike.
D. show that participants who list their work tasks report greater workplace efficiency than do participants who do not list their tasks.

17) As used in line 34, “enabled” most nearly means

A. facilitated.
B. prepared.
C. granted.
D. authorized.

18) According to table 1, the participants’ average rating of task meaning for unimportant tasks in the control condition was

A. 3.82.
B. 5.05.
C. 7.24.
D. 7.39.

19) Based on table 1, how would the authors most likely explain their observation in line 14-15 (“Constantly . . . impact”) in light of the data for important tasks across all condition groups?

A. If employees already perceive tasks as being meaningful, they are less likely to experience a disconnect between the tasks and their company’s mission.
B. If employees view their important tasks as part of a set, they are less likely to be satisfied with them than when they view the tasks in isolation.
C. Employees find important tasks to be more meaningful when their company articulates a memorable mission statement.
D. Employees who are assigned a balance of important and unimportant tasks tend to be most affected by mission statements.

20) Taken together, the two tables best support which statement?

A. On average, participants in the no-framing control group rated task enjoyment more highly than task meaning for both unimportant and important tasks.
B. Altering the type of framing has less of an impact on participants’ average ratings of task meaning and task enjoyment for important tasks than it does for unimportant tasks.
C. Superordinate framing is the most effective means of enhancing participants’ average ratings of task meaning and task enjoyment when the tasks are deemed to be important.
D. On average, participants in the superordinate-framing group gave higher ratings to both task meaning and task enjoyment for important tasks than did participants in the purpose-framing group.

Questions 21-31 are based on the following passage.

This passage is adapted from Leslie Nemo, "Growing Virtual Plants Could Help Farmers Boost Their Crops." ©2017 by Scientific American, a division of Nature America, Inc.

Line

What if farmers could grow sugarcane in a matter of seconds, not days or weeks? Scientists are doing just that. Of course, these crops are not sprouting from soil. Instead they flourish on a computer screen.

Digital plants like these are part of a new movement in agricultural science called "in silico," where researchers design highly accurate, computer-simulated crops to help speed up selective breeding, in which plants are chosen and replanted to amplify their desirable traits. Scientists believe the future of farming is not just in fields, but in graphics, too.

The millennia-old strategy of just handpicking and replanting the varieties that thrive is too slow, says Eberhard Voit, a biologist at Georgia Institute of Technology. "We need a more targeted approach," he says. This is where crops in silico may help. By studying plant growth using computer simulations, researchers could discover which attributes make the best pickings and why, in far less time than a traditional growing season.

The term in silico, or "in silicon," refers to silicon computer chips. The technique begins with scientists collecting data about plant behavior under microscopes and in the field. Next they build statistical models that identify mathematical relationships in the data. Researchers then create simulations based on those equations, which allows them to see the traits they measured play out on a screen. Once they visualize the crops, scientists can manipulate the data to see which factors result in the fastest-growing, most drought-resistant or least pest-susceptible plants possible.

The digital sugarcane, described earlier this year by researchers at the University of Illinois at Urbana-Champaign, illustrates how crops in silico might aid farmers. In the computer graphic, a leafy canopy mirrors the range of heights, leaf sizes and angles measured in real Brazilian sugarcane fields.

Sunlight filters through the foliage with varying intensity, missing patches shaded by other leaves. In response to these varied shapes and light exposures the digital crop mimics how real-world sugarcane plants would grow.

In their study the researchers used the simulation to test four different planting patterns—a perfectly symmetrical grid of seed lines versus a staggered one, and a north-to-south versus east-to-west orientation of planting rows. Their model revealed asymmetrical and north-to-south alignment produced the highest yield, which was 10 percent greater than that which typical Brazilian sugarcane fields currently supply. Supercomputers took an entire day to process the team's data and provide results, says study co-leader Stephen Long at Illinois, who is also a professor of plant biology and crop science at Lancaster University in England. Still, a day of processing is hardly any time compared with an entire growing season. But Long thinks it will not be long before technological advances speed up these calculations. "Within 12 months, what took a day could be done in a minute," he says.

The researchers' model helps reveal how conditions such as sunlight and shading affect crop growth—but many other factors such as water availability and microbial interactions determine the length of a corncob or width of a soybean. Before these other elements get translated into code scientists first need to understand how they work in real life.

Plant physiologists and biologists around the world are now investigating these crucial questions in both the field and lab. For example, Long and Illinois colleague Xinguang Zhu, who also holds a position at the Chinese Academy of Sciences, study a type of photosynthesis unique to crops like soybeans and rice. Voit researches what controls the production of a plant wall–toughening compound called lignin. Jonathan Lynch, a plant physiologist at The Pennsylvania State University and another founder of the crops in silico movement, looks at root behavior under a range of soil nutrient conditions. As they learn more, scientists will factor these key details of crops' survival and growth into their labs' in silico simulations.

21) In context, the author's statement about "the future of farming" (line 7) is mainly meant to convey the idea that

A. farmers will soon have to develop additional software skills.
B. fields will someday no longer be necessary for growing sugarcane.
C. techniques developed with computer assistance will someday help farmers grow crops more efficiently.
D. simulations of sugarcane crops will come to model the growth patterns of real sugarcane crops more accurately over time.

22) According to the passage, Voit believes that selective breeding

A. takes too long to be a productive process for improving crop yields.
B. would be more easily accomplished if sugarcane plants weren't harvested by hand.
C. is difficult unless one has been trained in the identification of desirable plants.
D. is a method whose effectiveness has been proved over many centuries.

23) As used in line 11, "approach" most nearly means

A. offer.
B. method.
C. entrance.
D. advance.

24) What main function does the fourth paragraph (line 15-22) serve in the passage as a whole?

A. It portrays the process by which in silico crops are created.
B. It proposes an optimal course of action for farmers planting sugarcane.
C. It describes equipment that is used to conduct an experiment.
D. It shows why in silico sugarcane crops are more predictable in their behavior than real sugarcane crops are.

25) Which choice best supports the idea that simulated crops have shown farmers a way to increase their sugarcane production?

A. line 18-19 ("Researchers . . . screen")
B. line 24-26 ("In the . . . fields")
C. line 30-32 ("In their . . . rows")
D. line 32-35 ("Their . . . supply")

26) It can reasonably be inferred from the passage that the researchers of in silico crops anticipate which improvement to their methods in the near future?

A. A means of simulating hypothetical sugarcane plants that use the photosynthesis methods of other species
B. A means of maximizing growth in fields that have previously been planted with other crops
C. A way to get symmetrical seed lines to yield as much sugarcane as asymmetrical seed lines
D. A way of simulating many more growing seasons in the same time period than is presently possible

27) Which choice provides the best evidence for the answer to the previous question?

A. line 27-29 ("In response . . . grow")
B. line 40-41 ("Within . . . says")
C. line 42-44 ("The researchers' . . . soybean")
D. line 48-50 ("For example . . . rice")

28) Based on the passage, the researchers' models of sugarcane growth are most effective at determining how crop growth is affected by

A. the presence of the compound lignin.
B. certain soil nutrient conditions.
C. a variety of light conditions.
D. faster cycles of selective breeding.

29) What main purpose do the last two paragraphs serve in the passage as a whole?

A. They recommend a course of action for farmers planting sugarcane, corn, and soybeans.
B. They mention factors influencing plant behavior that aren't present in current in silico models.
C. They compare the best growth conditions of sugarcane to those of other crops.
D. They point out previously unacknowledged flaws in the researchers' experiment.

30) The author mentions the "length of a corncob or width of a soybean" (line 44) most likely to

A. demonstrate that in silico corn and soybean crops model their real-world counterparts more accurately than in silico sugarcane crops do.
B. suggest that sugarcane farmers usually plant other crops as well as sugarcane.
C. indicate that research into in silico crops is applicable to other crops besides sugarcane.
D. argue that many plant physiologists are more interested in corn and soybeans than in sugarcane.

31) As used in line 47-48, "crucial" most nearly means

A. historic.
B. mandatory.
C. essential.
D. desperate.

Questions 32-42 are based on the following passages.

Passage 1 is adapted from Mary Ward et al., "An Appeal Against Female Suffrage." Originally published in 1889. Passage 2 is adapted from M. M. Dilke, "The Appeal Against Female Suffrage: A Reply. II." Originally published in 1889. Women in the United Kingdom in 1889 did not have the right to vote in elections for Parliament, the national legislature.

Line

Passage 1

As voters for or members of School Boards, Boards of Guardians, and other important public bodies, women have now opportunities for public usefulness which must promote the growth of character, and at the same time strengthen among them the social sense and habit. All these changes of recent years, together with the great improvements in women's education which have accompanied them, we cordially welcome. But we believe that the emancipating process has now reached the limits fixed by the physical constitution of women, and by the fundamental difference which must always exist between their main occupations and those of men. The care of the sick . . . ; the treatment of the poor; the education of children: in all these matters, and others besides, they have made good their claim to larger and more extended powers. We rejoice in it. But when it comes to questions of foreign or colonial policy, or of grave constitutional change, then we maintain that the necessary and normal experience of women—speaking generally and in the mass—does not and can never provide them with such materials for sound judgment as are open to men. . . .

. . . If we turn from the *right* of women to the suffrage—a right which on the grounds just given we deny—to the effect which the possession of the suffrage may be expected to have on their character and position and on family life, we find ourselves no less in doubt. It is urged that the influence of women in politics would tell upon the side of morality. We believe that it does so tell already, and will do so with greater force as women by improved education fit themselves to exert it more widely and efficiently. But it may be asked, On what does this moral influence depend? We believe that it depends largely on qualities which the natural position and functions of women as they are at present tend to

develop, and which might seriously be impaired by their admission to the turmoil of active political life. These qualities are, above all, sympathy and disinterestedness. Any disposition of things which threatens to lessen the national reserve of such forces as these we hold to be a misfortune. It is notoriously difficult to maintain them in the presence of party necessities and in the heat of party struggle.

Passage 2

The fact is, we have made up our minds in England that to insure every class obtaining justice every class must be directly represented; and that . . . we cannot have too wide an opinion from the people as a whole on the main principles that are to guide our life as a nation. Woman may never be intellectually fitted for the position of minister of the Crown or ambassador, though with her present rate of progress he would be a rash man who would attempt to predict exactly how far she will go; but that does not affect one way or the other her right to vote, or the right of the nation to have her recorded opinion on every question with which she is familiar. Why should she sit on a School Board, and in that capacity make recommendations to the Government on the Education Code, and yet when that same Code is before Parliament have no power to support its provisions or secure its rejection? Why should she sit on boards of guardians, and after visiting pauper schools, and planning perhaps some new scheme that will turn our most hopeless and wretched population into valuable bread-winners, yet have no influence with Parliament to get that scheme carried into effect?

We cannot afford as a nation to allow such a potent moral influence as that of women to lie fallow. It is very well to call it a reserve force, but a reserve force that is never to be put into action is of small practical value. We think the time has come when that moral influence must be both organized and put in action. In old times, when population was scattered and manners were patriarchal, individual charity and personal influence could work wonders. With our vast cities and ever-increasing complication of interests and industries, combination of influence and co-operation in good works have become absolutely necessary, unless the feminine element is to be entirely eliminated. Men are going forward so fast, that the rift between the sexes will become wider if women are to continue working on the old lines and never take a step in advance. The choice is not between going on and standing still, it is between advancing and retreating.

32) Based on Passage 1, Ward and her coauthors would likely concede that there is a small proportion of women in England who may be

A. qualified to assess complex political matters affecting the nation at large.
B. reluctant to volunteer to serve on local boards and committees.
C. conscious of the negative consequences that suffrage may have on their lives.
D. eager to take advantage of new opportunities to become educated.

33) Which choice provides the best evidence for the answer to the previous question?

A. line 5-7 (“All . . . welcome”)
B. line 12-16 (“But . . . men”)
C. line 17-20 (“If we . . . doubt”)
D. line 26-27 (“These . . . disinterestedness”)

34) According to Ward and her coauthors in Passage 1, expanded educational opportunities will enable women to become more

A. firm in their conviction that women deserve the right to vote.
B. capable of fulfilling domestic responsibilities.
C. knowledgeable about political issues and candidates.
D. effective in imparting moral values to the public.

35) In Passage 1, the use of the phrase “national reserve” (line 28) mainly serves to

A. lament the government’s inability to resolve disputes with civility.
B. emphasize the country’s resilience in the face of adversity.
C. characterize certain traits as essential to the country’s overall well-being.
D. provide an example of a topic that is hotly debated in Parliament.

36) As used in line 42, “secure” most nearly means

A. maintain.
B. obtain.
C. safeguard.
D. fasten.

37) According to Dilke in Passage 2, as England has become increasingly industrialized, which development has also taken place?

A. The government has become more resistant to the woman suffrage movement.
B. The methods traditionally used to effect social change have become insufficient.
C. The influence of charitable organizations in the nation has grown rapidly.
D. The demand for political representation among those living in cities has intensified.

38) In Passage 2, Dilke most strongly implies that one consequence of continuing to deny political representation to women in England is that

A. women will become distrustful of the nation’s political institutions.
B. women’s participation in local organizations will begin to decline.
C. feelings of animosity between men and women will increase.
D. women will soon have even less political power than they currently do.

39) Based on Passage 1, Ward and her coauthors would most likely object to the course of action advocated by Dilke in Passage 2 on the grounds that it would

A. fail to lessen the animosity between political parties in Parliament.
B. conflict with the aims of local boards and other social organizations.
C. hinder women’s ability to perform their most important function in public life.
D. face widespread opposition among representatives serving in Parliament.

40) Which choice from Passage 1 provides the best evidence for the answer to the previous question?

A. line 10-12 (“The care . . . powers”)
B. line 20-21 (“It is . . . morality”)
C. line 24-26 (“We believe . . . life”)
D. line 29-30 (“It is . . . struggle”)

41) Based on Passage 2, Dilke would most likely regard the view expressed by Ward and her coauthors in line 7-10, Passage 1 (“But . . . men”) as

A. legitimate, since Dilke asserts that a wide disparity continues to exist between men and women in public life.
B. shortsighted, since Dilke implies that women may prove themselves capable of assuming social roles they do not currently occupy.
C. lamentable, since Dilke believes that Ward and her coauthors overlook recent advances women have made in public life.
D. inaccurate, since Dilke maintains that women are equally capable of serving in government positions as men.

42) Dilke (Passage 2) would respond to the claim of Ward and her coauthors (Passage 1) regarding women’s moral influence in politics most likely by pointing out that

A. in the current era, women are even more necessary as a moral influence in England than they once were.
B. in the realm of politics, women are not necessarily a greater source of moral influence than men are.
C. as women progress socially, their focus in politics will move beyond issues having to do with morality alone.
D. until women have the right to vote, their moral influence in the political world will not be fully realized.

Questions 43-52 are based on the following passage and supplementary material.

This passage is adapted from Lisa Grossman, "This Star Cheated Death, Exploding Again and Again." ©2017 by Society for Science & the Public.

Line

A shocking supernova refuses to die.

This exploding star, named iPTF14hls, has erupted continuously for the last three years, and it may have had two other outbursts in the past, astronomers report in *Nature*. Such a tireless supernova could be the first example of a proposed explosion that involves burning antimatter in a stellar core—or it could be something new altogether.

"A supernova is supposed to be a one-time thing—the star explodes, it's dead, it's done, it can't explode again," says astrophysicist Iair Arcavi of the University of California, Santa Barbara. "It's the weirdest supernova we've ever seen. . . . It's like the star that keeps on dying."

When iPTF14hls was discovered in September 2014 by the Intermediate Palomar Transient Factory, which scans the sky regularly with a telescope at the Palomar Observatory near San Diego, it looked like an ordinary type II supernova in a galaxy about 500 million light-years away. These explosions mark the death throes of a star between eight and about 50 times the mass of the sun, and typically glow for about 100 days before starting to dim.

The first sign that iPTF14hls was unusual came a few weeks after its discovery, when it started growing brighter. That turned out to be one of five irregular cycles of brightening and dimming.

Even stranger, data collected from September 2014 to June 2016 show that the supernova remained bright for more than 600 days, Arcavi and colleagues report. The eruption, which is just showing signs of winding down now, may have already been in progress when it was discovered, so it could have persisted even longer.

"That's just unheard of," says theoretical physicist Stanford Woosley of the University of California, Santa Cruz, who was not involved in the discovery. "Ordinary supernovae don't do that."

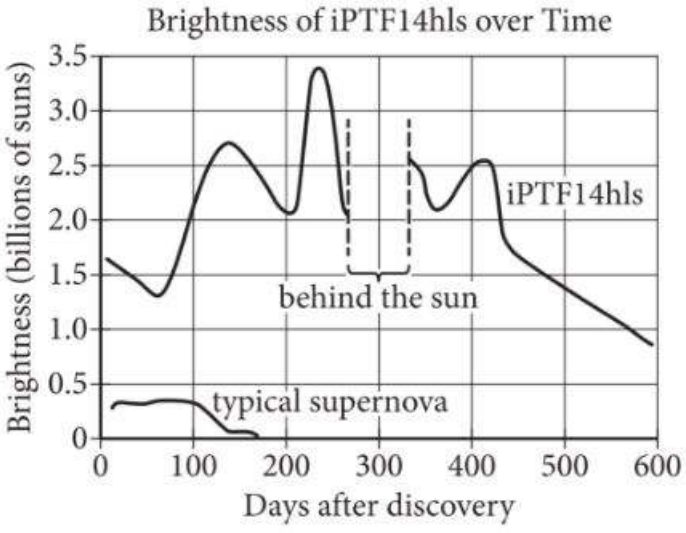
Normally, layers of gas kicked out of an exploding star slow and cool as they expand. But iPTF14hls maintained a toasty temperature—about 5,700° Celsius—for the entire time it was observed, and its outer gas layers did not slow down as they should have. That means that this gas may have already cooled and slowed, suggesting it had been expelled in an earlier, superpowerful eruption that occurred unseen between 2010 and 2014, the team suggests.

Historical data on photographic plates from the Palomar Observatory showed yet another bright burst in the same part of the sky in 1954. One theory suggests that stars between 95 and 130 times the mass of the sun can explode several times, although these cyclic deaths have never been seen before. Such stars get so hot that they convert gamma rays, whose high energy helped keep the star from collapsing under its own gravity, into electrons and their antimatter counterparts, positrons. Without that internal energy, the star's core collapses and gets even hotter. That collapse can trigger a partial explosion, in which the star blows off a large amount of mass. But after the explosion, the electrons and positrons can recombine into gamma rays and hold up the remaining stellar core.

The star can blow off steam several times, the idea goes, before finally dying in a supernova. Eventually, the remains of such a supernova would collapse into a black hole with about 40 times the mass of the sun.

But this theory also predicts that the star would blow off all its hydrogen in the first explosion. That doesn't fit here: iPTF14hls expelled 50 times the mass of the sun in hydrogen in 2014. The amount of energy in the most recent explosion is also greater than it should be.

Woosley thinks that a magnetar, a highly magnetized rapidly rotating stellar corpse, could glow continuously for around two years, although that wouldn't explain the 1954 eruption. He hopes the most recent data will help determine which theory is right, or if physicists need to come up with something new.



Adapted from Iair Arcavi et al., "Energetic Eruptions Leading to a Peculiar Hydrogen-Rich Explosion of a Massive Star." ©2017 by Macmillan Publishers Limited, part of Springer Nature.

43) It can reasonably be inferred from the passage that scientists would have felt confident estimating which information about iPTF14hls upon its detection in September 2014?

A. The years of the star's previous explosions
B. The rate at which the star's outer gas layers would gain heat
C. The range of the star's mass compared to the mass of the sun
D. The increase in speed per day of the star's outer gas layers

44) Which choice provides the best evidence for the answer to the previous question?

A. line 4-6 ("Such . . . altogether")
B. line 14-16 ("These . . . dim")
C. line 20-22 ("Even . . . report")
D. line 22-24 ("The eruption . . . longer")

45) As used in line 17, "sign" most nearly means

A. gesture.
B. command.
C. symbol.
D. indication.

46) According to the passage, the data collected between 2014 and 2016 could indicate that the outer gas layers of iPTF14hls had

A. undergone several heating and cooling cycles since scientists discovered iPTF14hls in September 2014.
B. been too hot to maintain a rate of expansion typically seen in a supernova.
C. lost heat before scientists began to observe iPTF14hls in September 2014.
D. been inhibited from cooling down as would happen normally in a supernova.

47) The sentence in line 34-35 ("Historical . . . 1954") mainly functions to

A. associate a past event with iPTF14hls.
B. establish a timeline of known activity for iPTF14hls.
C. reintroduce an older theory that had been previously dismissed.
D. demonstrate the value of archival photographs to scientists.

48) Which aspect of Woosley's proposed magnetar theory, as presented in the passage, makes his explanation an unlikely model for iPTF14hls?

A. The limited timeline of magnetar activity
B. The mass of a magnetar's inner core
C. The speed at which a magnetar rotates
D. The gases that create a magnetar's continuous glow

49) As used in line 53, "determine" most nearly means

A. terminate.
B. dictate.
C. indicate.
D. control.

50) The data in the graph best support the statement that the brightness of iPTF14hls

A. was the same at the beginning and end of the observation period.
B. consistently exceeded that of a typical supernova during the entire observation period.
C. was undetectable when it was behind the sun between 400 and 500 days after discovery.
D. rapidly dropped to that of a typical supernova between 500 and 600 days after discovery.

51) Based on the passage and the graph, the information that best illustrates the idea that iPTF14hls "refuses to die" (line 1) is iPTF14hls's

A. brightness trend between 500 and 600 days.
B. peak brightness of 3.4 billions of suns.
C. declining brightness immediately after discovery.
D. repeated cycles of brightening and dimming.

52) Which choice provides the best evidence for the answer to the previous question?

A. line 2-4 ("This . . . Nature")
B. line 11-14 ("When . . . away")
C. line 17-19 ("The first . . . dimming")
D. line 29-31 ("But . . . have")

Section 2: WRITING AND LANGUAGE

Questions 1-11 are based on the following passage.

The Art of Process

For both artists and students of the 1 arts therefore focusing on final products can be daunting. Artists may long to see their works become icons, and students may see artworks only as unequivocal masterpieces. What often gets 2 neglected is the creative process itself. In the 1960s and '70s, a movement known as Process 3 art, drawing from Dadaism and other avant-garde art movements—sought to rectify that issue by emphasizing improvisation and transience in art making rather than static, perfected objects. The legacy of this innovative method can still be seen in approaches to arts education today.

Process artists typically chose nontraditional materials—such as felt, cheesecloth, or molten lead—that allowed time, chance, or gravity to easily factor into an artwork's creation. For his 1970 work *Untitled (Pink Felt)*, 4 for instance, Robert Morris dropped various pieces of pink felt into a pile on the floor of an art gallery. With no identifiable geometric shape and no other discernible real-world point of reference, the artwork suggested that 5 sculpture can be soft and formless. It can also be utterly arbitrary. Morris's choice of the floor, too, was key; 6 abstract expressionist Jackson Pollock famously took the canvas off the wall and placed it on the floor.

The ideas at the heart of movements such as Process art 7 are also evident in more recent 8 art's program's that focus on open-ended approaches to teaching art. For example, Princeton University's Atelier, founded by Nobel Prize–winning author Toni Morrison in 1994, is a seminar program that explores the collaborative process across artistic disciplines. Student Elizabeth Belton called the approach "frighteningly unstructured and unpredictable." During one semester, theater director Peter Sellars led a seminar on the sixteenth-century Chinese opera *The Peony Pavilion*. The main assignment was for students to work in small groups and write original scenes based on their responses to the opera. The students' scenes would then be presented in a final performance, 9 once students had spent time discussing and critiquing their work. Sellars's only 10 advice: was that one group should volunteer to begin and that other groups should follow when reminded of their own scenes. Essentially, students were encouraged to discover their own processes and outcomes through chance and improvisation.

While seemingly eccentric, focusing on process over product in art making is valuable in that it shows what the life of the creative mind actually looks like, not just what a creative mind produces. As Morrison notes, 11 "It was the idea of art as play, or therapy, or as the solution to social ills that troubled me."

1)
- A. NO CHANGE
- B. arts, focusing
- C. arts; and focusing
- D. arts. Focusing

2)
- A. NO CHANGE
- B. deserted
- C. shrugged off
- D. left in the dust

3)
- A. NO CHANGE
- B. art—
- C. art:
- D. art

4)
- A. NO CHANGE
- B. in addition,
- C. in essence,
- D. as a result,

5) Which choice most effectively combines the sentences at the underlined portion?
- A. sculpture, though it is soft and formless, can be utterly arbitrary.
- B. sculpture, being utterly arbitrary, can be soft and formless too.
- C. sculpture can be not only soft and formless but also utterly arbitrary.
- D. sculpture can be soft and formless; it can be utterly arbitrary.

6) Which choice most effectively supports the claim made earlier in the sentence?

A. NO CHANGE
B. it symbolized Process artists' interests in organic functions such as the inner workings of the human body.
C. Morris also hung felt from nails on the walls to illustrate the effect of time on the artwork.
D. it was consistent with the movement's belief that art should not be, literally or figuratively, held up high on a pedestal.

7)

A. NO CHANGE
B. is
C. has been
D. are being

8)

A. NO CHANGE
B. arts program's
C. arts' programs'
D. arts programs

9) Which choice most effectively sets up the information that follows in the paragraph?

A. NO CHANGE
B. but Sellars had no overarching plan for what that would entail.
C. which would take place in the seating area while the audience sat on the stage.
D. and Sellars hoped the experience would change the way the students listened to music.

10)

A. NO CHANGE
B. advice was
C. advice was:
D. advice, was

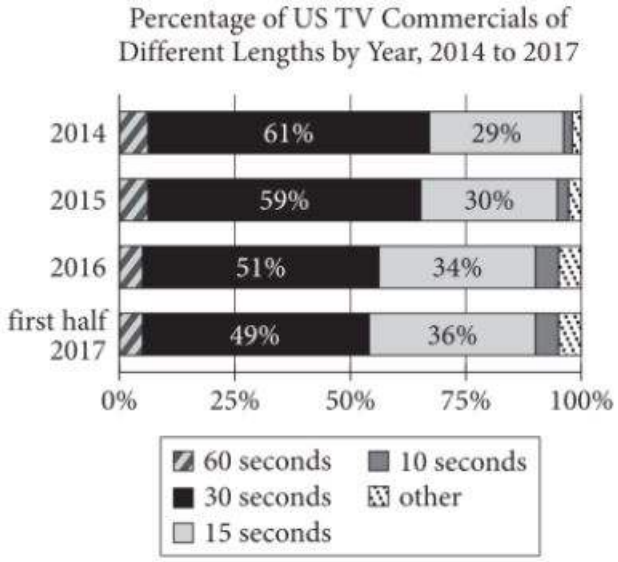
11) Which quotation from Morrison from a 2004 speech provides the most effective conclusion to the passage?

A. NO CHANGE
B. "Theater, creative writing—who needs it? Not just who likes it. Urgency and need have got to be as large a part of the practice of art as talent."
C. "We grade the book itself, the dance itself, the piece itself. . . . But it's the process where the transcendent properties of art lie."
D. "Was the university a hostile, a patronizing, or a fertile environment for an artist?"

Questions 12-22 are based on the following passage and supplementary material.

Six Seconds to Sell

TV commercials are getting shorter. In 2014, 61% of US TV ads were thirty seconds long, whereas in the first half of 2017, 12 fewer than half were. In the same time period, the percentage of fifteen-second ads rose from 13 5% to 91%, and the percentage of ten-second ads also increased. This shift was influenced by the success of streaming services like Netflix, which eliminated ads altogether.



Adapted from Sara Fischer, "TV Commercials Keep Shrinking." ©2017 by VAS Media Inc.

Today, TV networks and YouTube are increasingly running ads that 14 last only six seconds long. As with all marketing, the goal of these ads is to make an emotional connection with consumers by communicating a clear, memorable message. The challenge of this new short format is doing so in the same amount of time that the consumer takes one or two breaths.

Many advertisers initially saw this expectation as unrealistic, doubting they could create a six-second ad with a complete concept. "Likely, you'll just see a lot of nothing—logos without an idea," predicted Greg Hahn of the BBDO ad agency in 2017. Yet that has not proved to be the case. As Tara Walpert 15 Levy a vice president, at Google, says, "creativity loves constraint." The shorter time frame, she explains, has forced advertisers to rethink the way they develop ads, thus forming a new marketing style that can be highly effective.

Successful six-second ads often rely on one powerful visual to express one simple message, whereas longer ads typically weave multiple ideas and images together to make a point. For example, a thirty-second Buick ad highlights the car's size, navigation system, and power on unpaved roads, all 16 among the context of a humorous, dialogue-heavy family road trip. It uses a layered story to show that the car's spaciousness, convenience, and safety 17 has added to a family's happiness. 18 In contrast, a six-second Audi ad shows only the car's ability to accelerate. The camera's point of view is that of the driver racing down a track. In the first 3.5 seconds, the car reaches a speed of 100 kilometers per hour, illustrated by a speedometer and timer in the middle of the screen; in the final seconds, the car's name and logo appear. There is no dialogue or voice-over, just the crescendo of the engine's roar. Emphasizing the car's acceleration delivers a clear 19 message, it's fast. While some advertisers have 20 abbreviated longer ads to fit a six-second window, the best six-second ads, like this one, are specifically designed to be succinct.

A 2018 Advertising Research Foundation study found that whether 21 it features cars or candy, six-second ads get more viewer concentration per second than longer commercials do. This suggests that in a sea of ads vying for consumer attention, 22 more studies should research the best ways to grab it.

12) Which choice most effectively represents the data in the graph?

A. NO CHANGE
B. just over half
C. 59%
D. 75%

13) Which choice provides accurate information from the graph?

A. NO CHANGE
B. 5% to 36%,
C. 29% to 36%,
D. 36% to 49%,

14)

A. NO CHANGE
B. last only six seconds.
C. last for six seconds before ending.
D. only last for a length of six seconds.

15)

A. NO CHANGE
B. Levy a vice president at Google,
C. Levy, a vice president at Google,
D. Levy, a vice president at Google

16)

A. NO CHANGE
B. throughout
C. around
D. within

17)

A. NO CHANGE
B. add
C. adds
D. is adding

18)

A. NO CHANGE
B. In particular,
C. Accordingly,
D. Nonetheless,

19)

A. NO CHANGE
B. message. It's:
C. message: it's
D. message, it's:

20)

A. NO CHANGE
B. curbed
C. moderated
D. restrained

21)

A. NO CHANGE
B. they feature
C. it's featuring
D. one features

22) Which choice most effectively concludes the paragraph and passage by expressing one of the passage's main ideas?

A. NO CHANGE
B. commercial-free streaming services may be the best way
C. a few seconds may be all that's needed
D. advertisers must get extra creative

Questions 23-33 are based on the following passage.

If You Ask Me . . .

For many advice seekers in the age of the internet, the act of crowdsourcing information from online communities **23** have become standard. A person who posts a question on the website Reddit's advice forum, for example, is likely to receive hundreds of responses from a legion of anonymous members. The advice is often offered quickly (within minutes), briefly (in no more than a paragraph), and with practical directness ("Sauté the vegetables." "Talk to him.").

24 Though there are some downsides to the internet, it would be easy to write off an older medium for sharing advice—the formal advice column of newspapers and magazines—as obsolete. Yet, according to the *Columbia Journalism Review*, advice columns have "stood the test of time better than most classic newspaper staples," **25** arriving today in major publications such as the *New York Times* and *Slate*. Columns in the US have followed the same basic format at least since the Dear Abby column was launched in 1956: readers send in queries, and a small number of them are **26** published. The queries are alongside a columnist's published responses to them. While not as convenient as online forums, **27** advice columns' relevance has remained because they feature engaging writing that privileges empathy over quick fixes.

28 Contemporary columnists' willingness to reveal information about themselves may help account for the advice column's persistence as a form. The responses in the column Ask Roxane, written by author Roxane Gay for the *New York Times* since 2017, resemble confessional essays. In a reply to two middle-aged readers asking if it was too late for **29** it to have writing careers, Gay, the first Black woman to work as a lead writer for the Marvel franchise, traced her own longtime struggle to get published. "The writing world was passing me by," she admitted. Rather than give advice about *how* to have a writing career—information that could have been gleaned from a Google search—Gay went on to impart a lesson learned from **30** experience, keep writing, for youth is not a prerequisite for artistic success.

Audiences for self-revelatory columns are often large, as evidenced by the popularity of columns such as Cheryl Strayed's Dear Sugar. The column **31** was authored anonymously when it was published in the online magazine *The Rumpus*. Cultural critics have widely praised Strayed's approach of narrating personal stories and meticulously analyzing **32** readers' letters to answer what she calls "the questions you didn't ask that stand so brightly behind the questions you did." After her sizable following demanded a book version of the column, Strayed published excerpts as *Tiny Beautiful Things* (2012), which became a best seller. **33** While advice columns such as Strayed's may differ from the columns of fifty years ago, the questions that readers ask have remained consistent over time.

23)
A. NO CHANGE
B. has become
C. are becoming
D. become

24) Which choice provides the best transition from the previous paragraph to this one?
A. NO CHANGE
B. In an online world brimming with instant advice,
C. Because people are often unwilling to take others' advice,
D. Given the importance of face-to-face communication,

25)
A. NO CHANGE
B. happening
C. appearing
D. opening

26) Which choice most effectively combines the sentences at the underlined portion?
A. alongside a columnist's responses—that is, those that are published.
B. published; a columnist's responses are alongside them.
C. with a columnist's published responses alongside those queries.
D. published alongside a columnist's responses.

27)
A. NO CHANGE
B. it is advice columns that have remained relevant by featuring
C. advice columns have remained relevant by featuring
D. the relevance of advice columns has remained because they feature

28) Which choice most effectively sets up the discussion that follows in this paragraph?

A. NO CHANGE
B. Like advice columnists who use pseudonyms, readers often submit their letters using fake names, believing that doing so offers greater freedom of expression.
C. The twenty-first century has seen a proliferation of themed advice columns, such as ones dedicated solely to questions of manners and etiquette.
D. Advice columns must often adhere to strict word limits as a result of publishing constraints, leading some columnists to reply with entertaining one-liners.

29)

A. NO CHANGE
B. them
C. him
D. us

30)

A. NO CHANGE
B. experience;
C. experience
D. experience:

31) Which choice provides a detail that is most relevant to the previous sentence?

A. NO CHANGE
B. had much in common with Strayed's other nonfiction
C. was largely read by aspiring writers
D. received thousands of questions from readers

32)

A. NO CHANGE
B. readers' letter's
C. readers letter's
D. reader's letters

33) The writer wants an effective conclusion that reinforces a main idea of the passage. Which choice best accomplishes this goal?

A. NO CHANGE
B. By posing questions to her Dear Sugar readers and having them provide answers, Strayed showed that advice columns need not follow one formula.
C. Dear Sugar's success suggests that there is indeed a robust readership for well-written advice infused with a sense of intimacy.
D. The book was later adapted into a popular stage play, proving that translating a work into a different medium can result in success.

Questions 34-44 are based on the following passage.

Wild Horses

Until recently, scientists thought that the Przewalski's horse, an endangered species living in central Asia, was the only remaining truly wild horse **34** species. A wild species being one whose ancestors were never domesticated by humans. However, a genetic study of equine lineages led by Charleen Gaunitz of the University of Copenhagen **35** was published in a recent issue of the journal *Science*.

[1] Gaunitz's team began by sequencing the genomes of prehistoric horses. [2] These horses' bones and teeth had been collected during excavations of central Asian prehistoric sites belonging to the Botai culture, which bred some of the first domesticated horses more than five thousand years ago. [3] The researchers also sequenced the genomes of Eurasian horses from more recent periods. [4] They then compared this new genetic information to previously sequenced genomes of ancient and modern horses. [5] Based on these comparisons, the scientists built a family tree to **36** ascertain and determine how different horse populations were related. **37**

When Gaunitz and her colleagues analyzed the family tree data, they **38** found a big surprise. Previously, researchers considered ancient Przewalski's horses to be the ancestors of Botai **39** horses. Ancient Przewalski's horses were considered, by extension, to be the ancestors of all modern domesticated horses as well. The family tree, however, suggested that Przewalski's horses did not emerge until after domestication. **40** Modern Przewalski's horses thus appear to be a feral **41** population; one descended from escaped domesticated animals. Just as startling, the data also showed that Botai **42** horses which eventually gave rise to Przewalski's horses, are not the primary ancestors of modern domesticated horses. Instead, modern horses derive from another, as-yet-unknown population.

These conclusions amount to a major **43** shifting to scientists' understandings of the genetic relationships among different equine groups. Importantly, the discovery that modern Przewalski's horses are feral means that true wild horses are extinct. "We scientists are a bit sad because we feel that a bit of biodiversity has been lost, in that there are no more wild horses," archaeologist Sandra Olsen, who supervised the Botai excavations in 1993, told National Public Radio. "But the reality is, they disappeared some time ago." Wild or feral, Przewalski's horses **44** remains a crucial part of the story of the relationship between humans and equine populations stretching across millennia and around the globe.

34)
- A. NO CHANGE
- B. species—that is,
- C. species, a wild species is
- D. species; which is

35) Which choice most effectively establishes the main topic of the passage?
- A. NO CHANGE
- B. was conducted by an international team of geneticists and archaeologists.
- C. may provide insights into the ancient cultures of central Asia.
- D. has called the ancestry of this rare creature into question.

36)
- A. NO CHANGE
- B. determine how
- C. ascertain how and in what manner
- D. figure out, by using the comparisons they had made, how it was that

37) To make this paragraph most logical, sentence 4 should be placed
- A. where it is now.
- B. after sentence 1.
- C. after sentence 2.
- D. after sentence 5.

38) Which choice most effectively introduces the discussion in the paragraph?

A. NO CHANGE
B. speculated about the various ways ancient peoples managed horse populations.
C. employed various techniques.
D. worked with samples from across Europe and Asia.

39) Which choice most effectively combines the sentences at the underlined portion?

A. horses—not only of those horses, but also, by extension, of all modern domesticated horses.
B. horses; by extension, they were considered to be all modern domesticated horses' ancestors too.
C. horses and, by extension, all modern domesticated horses.
D. horses and all modern domesticated horses as well, because the consideration was extended.

40) Should the writer make this addition here?

A. Yes, because it provides information that clarifies a point in the preceding sentence.
B. Yes, because it corroborates the claim in the first paragraph that the Przewalski's horse is an endangered species.
C. No, because it is not consistent with the information about Przewalski's horses provided later in the passage.
D. No, because it does not explain the significance of the name Borly4.

41)

A. NO CHANGE
B. population one descended from
C. population—one descended from:
D. population: one descended from

42)

A. NO CHANGE
B. horses—which eventually gave rise to Przewalski's horses
C. horses, which eventually gave rise to Przewalski's horses,
D. horses, (which eventually gave rise to Przewalski's horses)

43)

A. NO CHANGE
B. shifting for
C. shift in
D. shift to

44)

A. NO CHANGE
B. is remaining
C. has remained
D. remain

Section 3: MATH WITHOUT CALCULATOR

1)

What value of x is the solution to the equation $x+10=3$?

A. –13
B. –7
C. 7
D. 13

2)

Jaqueline spent $150 for supplies and gas to start a lawn-mowing service. She charges $25 for each lawn she mows. In the first week Jaqueline made $50 after the cost of supplies and gas was deducted. Which equation represents this situation, where x is the number of lawns Jaqueline mowed during the first week?

A. $25x-150=50$
B. $50-25x=150$
C. $150-25x=50$
D. $25x+50=150$

3)

$$y=18x+25$$
$$y=-14x-7$$

What is the solution (x,y) to the given system of equations?

A. $(-7,25)$
B. $(-1,7)$
C. $(7,-1)$
D. $(25,-7)$

4) $ax-y=bxy$

The given equation relates the positive numbers a, b, x, and y. Which equation correctly expresses a in terms of b, x, and y?

A. $a=\frac{bxy+y}{x}$

B. $a=\frac{bxy-y}{x}$

C. $a=\frac{x}{bxy+y}$

D. $a=\frac{x}{bxy-y}$

5) $h(t)=-4.9t^2+10t$

The function h models the height $h(t)$, in meters, of a football t seconds after it is kicked. What is the interpretation of $h(2)=0.40$ in this context?

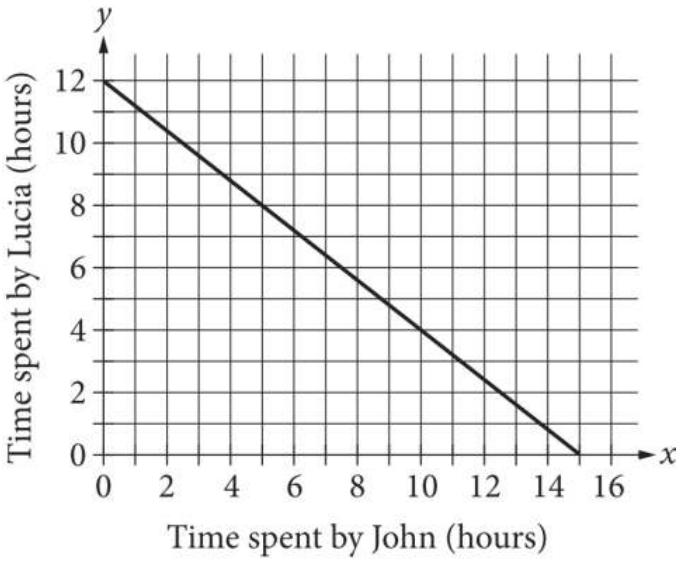
A. The football has a maximum height of 0.40 meter.
B. The football has a maximum height of 2 meters.
C. The football has a height of 0.40 meter 2 seconds after it is kicked.
D. The football has a height of 2 meters 0.40 second after it is kicked.

6) $|15-x|-9=0$

What are all the possible solutions to the given equation?

A. –6 and –24
B. –6 and 24
C. 6 and –24
D. 6 and 24

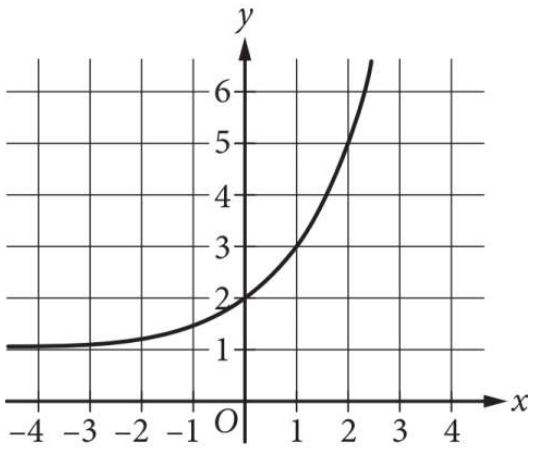
7) Lucia and John will work together to make 60 paper flowers for a school party. The line shown represents the possible combinations of time, in hours, spent by Lucia and John to fulfill this task.



According to the graph, on average, how many paper flowers will Lucia make per hour?

A. 4
B. 5
C. 12
D. 15

8)



The graph of $y=f(x)-1$ is shown. Which equation could define function f?

A. $f(x)=2^x$

B. $f(x)=2^x-1$

C. $f(x)=2^x+1$

D. $f(x)=2^x+2$

9) $x^2-10x+y^2-6y-47=0$

In the xy-plane, the graph of the given equation is a circle. If this circle is inscribed in a square, what is the perimeter of the square?

A. 18
B. 36
C. 72
D. 188

10)

Which expression is equivalent to $\sqrt[5]{32a^3b^4}$, where $a > 0$ and $b > 0$?

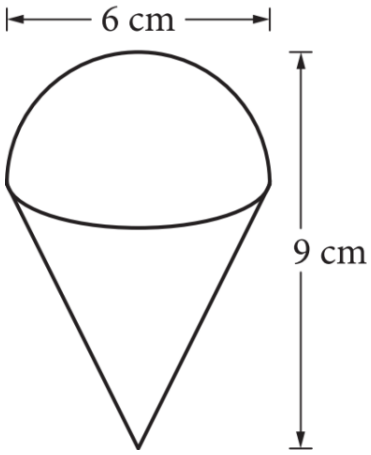
A. $2a^{\frac{3}{5}}b^{\frac{4}{5}}$

B. $2a^{\frac{5}{3}}b^{\frac{5}{4}}$

C. $32a^{\frac{3}{5}}b^{\frac{4}{5}}$

D. $32a^{\frac{5}{3}}b^{\frac{5}{4}}$

11)



A hemisphere and a cone have circular bases of equal circumference and have been connected at their bases, as shown in the figure. The diameter of the base of the hemisphere is 6 centimeters (cm) and the total height of the figure is 9 cm. What is the total volume, in cm^3, of the cone and hemisphere?

A. 18π
B. 36π
C. 45π
D. 162π

12)

Which of the following expressions is equivalent to $\left(\frac{a}{4}+\frac{b}{3}\right)^2$?

A. $\frac{a^2}{4}+\frac{b^2}{3}$

B. $\frac{a^2}{16}+\frac{b^2}{9}$

C. $\frac{a^2}{4}+\frac{ab}{12}+\frac{b^2}{3}$

D. $\frac{a^2}{16}+\frac{ab}{6}+\frac{b^2}{9}$

13)

$2x-2y=2$

One of the two linear equations in a system is given. The system has exactly one solution. Which equation could be the second equation in this system?

A. $-8x+8y=-3$

B. $3x-3y=8$

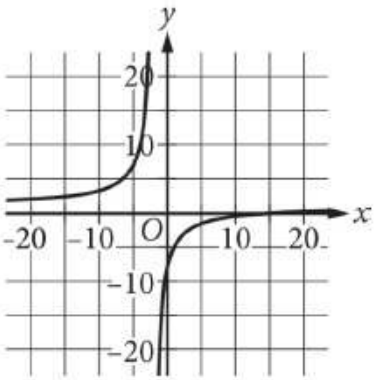
C. $-10x+8y=5$

D. $-x+y=-1$

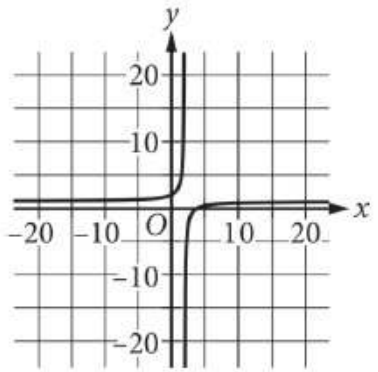
14)

Which of the following could be the graph of the equation $y = \dfrac{-4x + 16}{x + 2}$?

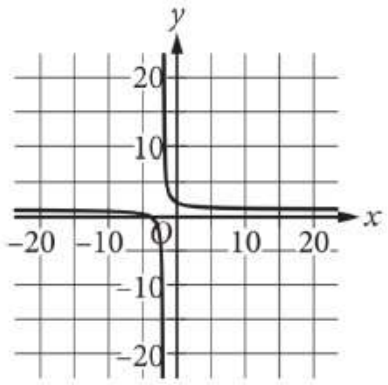
A.



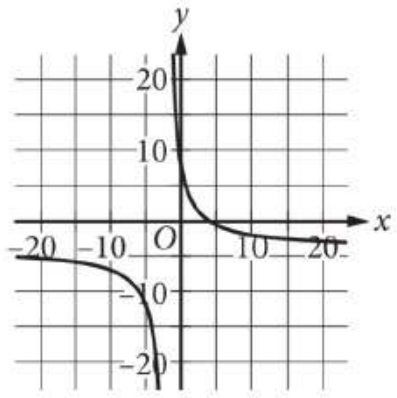
B.



C.



D.



15)

$f(x) = 5^x + 3$

If the given function f is graphed in the xy-plane, where $y = f(x)$, what is the y-intercept of the graph?

A. $(0,3)$

B. $(0,4)$

C. $(0,5)$

D. $(0,8)$

16)

The function m is defined by $m(x) = 30x + 120$. What is the slope of the graph of $y = m(x)$ in the xy-plane?

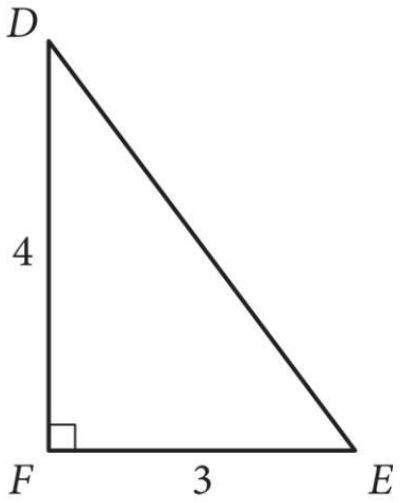
17)

The function f is defined by $f(x) = \frac{1}{5}x + \frac{9}{10}$. For what value of x does $f(x) = 1$?

18)

Line k in the xy-plane has slope $-\frac{2p}{5}$ and y-intercept $(0,p)$, where p is a positive constant. What is the x-coordinate of the x-intercept of line k ?

19)



In triangle DEF, point G (not shown) lies on $\overline{DE}$. If the measure of $\angle DFG$ is $x°$ and the measure of $\angle GFE$ is $y°$, what is the value of $\cos x° - \sin y°$?

20)

$$3x^2 - 2x - 7 = 0$$

What is the sum of the solutions to the given equation?

Section 4: MATH WITH CALCULATOR

1) A touring company purchased a new tour bus for $100,000. The graph models the value of the bus as a function of the time, in years, since it was purchased.

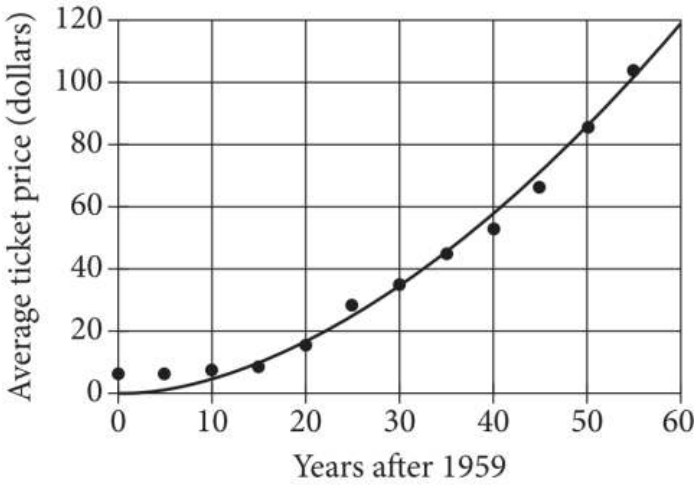
Which of the following is closest to the number of years after the company purchased the bus that the value of the bus will be half of the purchase price?

A. 1
B. 6
C. 10
D. 25

2) What is 90% of 80 ?

A. 10
B. 72
C. 88
D. 152

3)



The scatterplot shows the average price of a ticket to a certain theater for 12 select years from 1959 to 2014. An exponential model for the data is also shown. For which year is the predicted value of the average ticket price closest to $40 ?

A. 1959
B. 1974
C. 1992
D. 2014

Questions 4 and 5 refer to the following information.

Item	Price
1 pound of sugar	$0.06
12 eggs	$0.37
1 pound of potatoes	$0.02

The table shows the prices of 3 items in a certain store on January 15, 1913.

4) On January 15, 1913, Ayana purchased eggs and potatoes for a total of $0.80. She purchased 24 eggs. Based on the prices in the table, how many pounds of potatoes did she purchase?

A. 3
B. 6
C. 22
D. 40

5) On January 15, 1913, Samuel purchased s pounds of sugar and p pounds of potatoes for a total of $0.16. The total weight of the purchase was 4 pounds. Based on the prices in the table, which system of equations represents this situation?

A. $0.06s + 0.02p = 0.16$
$s + p = 4$

B. $6s + 2p = 0.16$
$s + p = 4$

C. $0.06s + 0.02p = 4$
$s + p = 0.16$

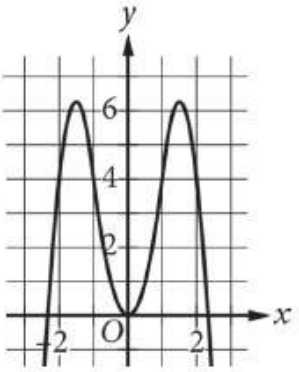
D. $6s + 2p = 4$
$s + p = 0.16$

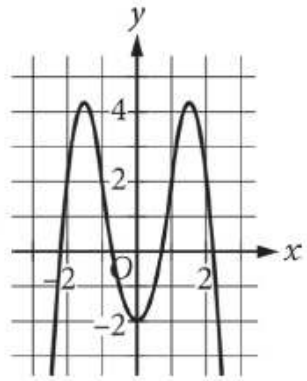
---

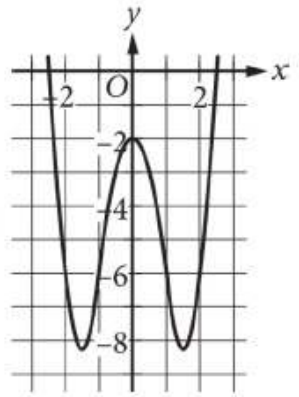
6)

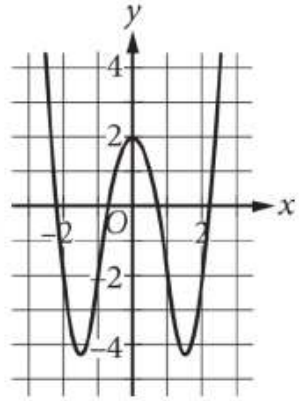
x	-2	1	2
y	-2	-2	-2

For a polynomial function, the table shows some values of x and their corresponding values of y. Which of the following could be the graph of this polynomial function?

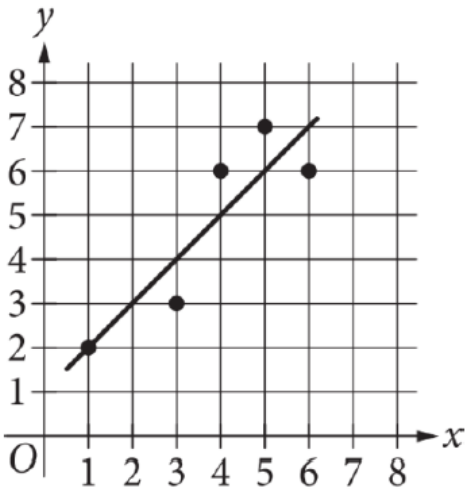
A.


B.


C.


D.


7)



In the given scatterplot, a line of best fit for the data is shown. At $x = 2$, what is the y-value predicted by the line of best fit?

A. 7
B. 3
C. 1
D. 0

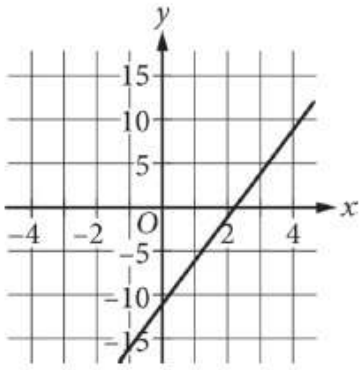
8) A right circular cylinder has a height of 6 inches. The radius of the base of the cylinder is 5 inches. What is the volume, in cubic inches, of the cylinder?

A. 10π
B. 30π
C. 50π
D. 150π

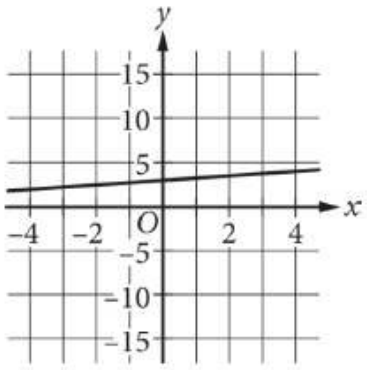
9)

The function f is defined by $f(x) = mx + b$, where m and b are constants such that $m \geq 1$ and $-7 \leq b \leq 7$. Which of the following could be the graph of $y = f(x)$?

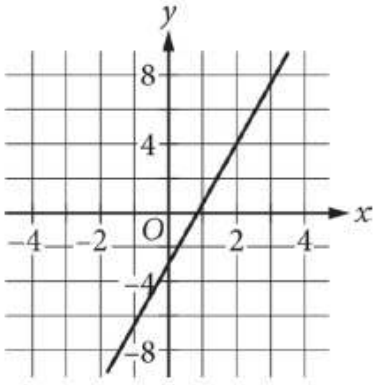
A.



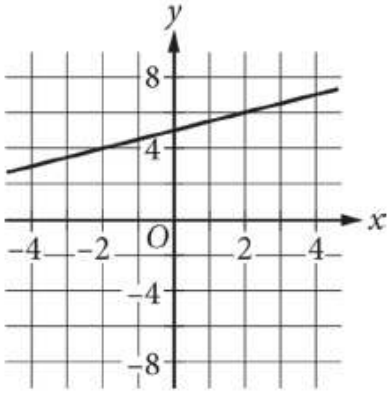
B.



C.



D.



10) The ratio of a person's weight on Earth to the person's weight on the Moon is constant. An astronaut who weighs 540 newtons on Earth weighs 90 newtons on the Moon. Another astronaut weighs w newtons on Earth. Which of the following expressions represents this astronaut's weight, in newtons, on the Moon?

A. $6w$

B. $0.6w$

C. $\frac{6}{w}$

D. $\frac{w}{6}$

Questions 11 and 12 refer to the following information.

	Nationality of author		
Century	British	French	German
Nineteenth	9	7	12
Twentieth	15	3	10

As a literature major in college, Sean has read books written by a variety of European authors. The table above shows the numbers of books written by British, French, and German authors that Sean has read, categorized by the century in which the books were written.

11)

If a book referred to by the table that was written in the twentieth century is to be selected at random, the probability that the book was written by a British author is $\frac{15}{n}$. Which of the following best describes n in this context?

A. The total number of books referred to by the table

B. The number of books referred to by the table that were written in the twentieth century

C. The number of books referred to by the table that were written by British authors

D. The number of books referred to by the table that were written by either French authors or German authors

12)

Sean also read d books that were written in the twentieth century by European authors other than those in the table. The number of books referred to by the table that were written by British authors in the twentieth century is approximately 39% of d. Of the following, which is closest to the value of d ?

A. 6
B. 15
C. 38
D. 46

---

13)

The walls of a small apartment were covered using exactly 3 gallons of paint. The paint was spread uniformly over a total area of 960 square feet. What was the rate, in gallons per square foot, at which the paint was used?

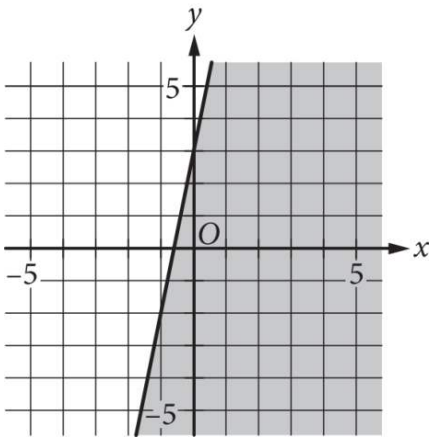
A. $\frac{1}{960}$

B. $\frac{1}{320}$

C. 320

D. 960

14)



The shaded region shown represents the solutions to which inequality?

A. $y \geq -5x + 3$

B. $y \geq -3x + 5$

C. $y \leq 3x + 5$

D. $y \leq 5x + 3$

15)

Which table could represent values of x and their corresponding values of $f(x)$ for a decreasing exponential function f?

A.

x	1	2	3	4
$f(x)$	1	2	4	8

B.

x	1	2	3	4
$f(x)$	8	4	2	1

C.

x	1	2	4	8
$f(x)$	1	9	17	25

D.

x	1	2	4	8
$f(x)$	25	17	9	1

16) The table shows the yearly snowfall, in centimeters (cm), in Toronto for 9 years.

Year	Snowfall (cm)
2002	114.9
2003	129.6
2004	134.9
2005	162.6
2006	32.4
2007	114.1
2008	216.5
2009	89.0
2010	45.6

What was the median yearly snowfall, in cm, in Toronto for these years?

A. 32.4
B. 114.9
C. 115.5
D. 184.1

17) Which equation has no solution?

A. $x = x + 1$

B. $x = 2x + 2$

C. $x + 1 = x + 1$

D. $x + 1 = 2x + 2$

18)

If $(x + 9) - 5 = 25$, what is the value of $x + 9$?

A. 30
B. 21
C. 20
D. 11

19)

$$x^2 - x - 12 = 0$$

What is the sum of the solutions to the given equation?

A. –7
B. –1
C. 1
D. 7

20)

$$\sqrt{a^2 b^6}$$

If *a* and *b* are positive numbers, which of the following is equivalent to the expression above?

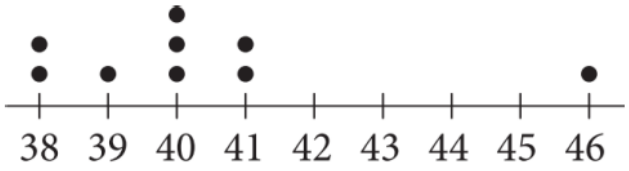
A. ab^4

B. ab^3

C. $ab\sqrt{ab^4}$

D. $ab\sqrt{b^3}$

21)



The dot plot shows the 9 values of a data set with a mean value of a and a median value of b. The value of 46 is removed to create a new data set of 8 values with a mean value of y and a median value of z. Which statement best compares the mean values and the median values for the two data sets?

A. $a = y$ and $b < z$

B. $a = y$ and $b > z$

C. $a < y$ and $b = z$

D. $a > y$ and $b = z$

22)

In the linear function g, $g(-2) = \frac{3}{4}$ and $g(3) = \frac{9}{2}$. Which equation defines g?

A. $g(x) = \frac{3}{4}x + \frac{9}{4}$

B. $g(x) = \frac{3}{4}x + \frac{9}{2}$

C. $g(x) = \frac{15}{4}x - \frac{27}{4}$

D. $g(x) = \frac{15}{4}x + \frac{33}{4}$

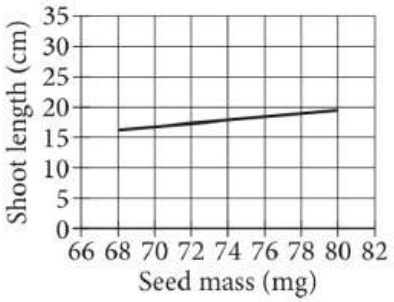
Questions 23 and 24 refer to the following information.

$f(x) = 0.28x - 2.9$

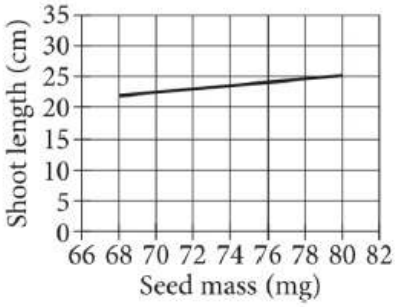
The given function f models the length, in centimeters (cm), of aboveground growth, known as shoot length, of cotton seedlings after emerging from seeds, where x represents the seed mass, in milligrams (mg), and $68 \le x \le 80$.

23) Which of the following is a graph of the model?

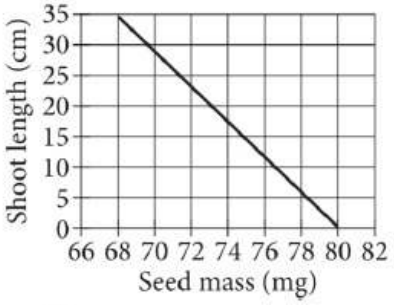
A.



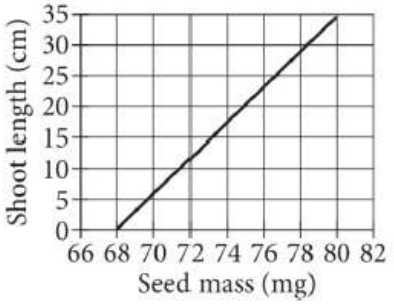
B.



C.



D.



24) What is the best interpretation of 0.28 in this context?

A. The maximum mass of the seeds was 0.28 mg.

B. The maximum shoot length of the seedlings was 0.28 cm.

C. For every two seedlings with 1 cm difference in the shoot lengths, the estimated difference in the masses of the seeds is 0.28 mg.

D. For every two seeds with 1 mg difference in the masses, the estimated difference in the shoot lengths of the seedlings is 0.28 cm.

---

25) Each of the frequency tables represents a data set.

Data Set 1	
Value	Frequency
3	1
4	0
5	2
6	4
7	2

Data Set 2	
Value	Frequency
3	2
4	3
5	2
6	1
7	1

Which statement best compares the medians of the two data sets?

A. The median of data set 2 is greater than the median of data set 1.
B. The median of data set 1 is greater than the median of data set 2.
C. The medians are the same.
D. There is not enough information to compare the medians.

26)

By examining pollen in the soil, scientists estimated that the number of *Ulmus* trees in an ancient population doubled every 664 years. There were n trees in the earliest known sample, where n is a constant. Which expression gives the estimated number of *Ulmus* trees x years after the year of the earliest known sample?

A. $n(2)^{664x}$

B. $n(2)^{\frac{664}{x}}$

C. $n(2)^{\frac{x}{664}}$

D. $n(2)^{(664+x)}$

27)

If $x > 0$ and $p\%$ of x is 13, which expression represents x in terms of p ?

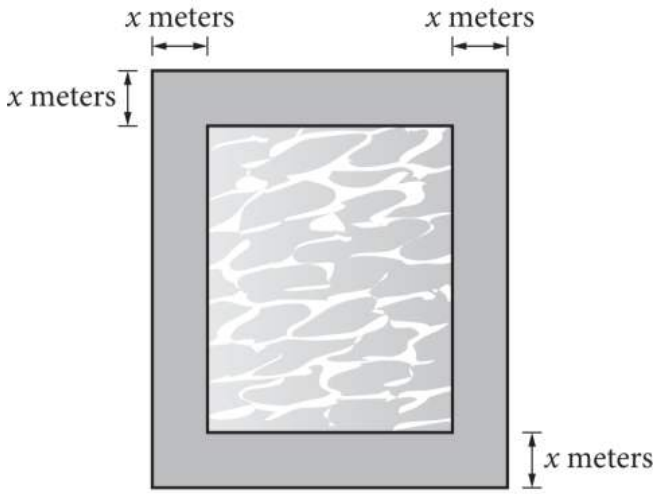
A. $13p$

B. $\frac{13p}{100}$

C. $\frac{100p}{13}$

D. $\frac{(100)(13)}{p}$

28)



Note: Figure not drawn to scale.

The figure represents a rectangular pool with a width of 20 meters and a length of 25 meters that is surrounded by a concrete border with a uniform width of x meters. If the combined area of the pool and the concrete border is 546 square meters, what is the value of x ?

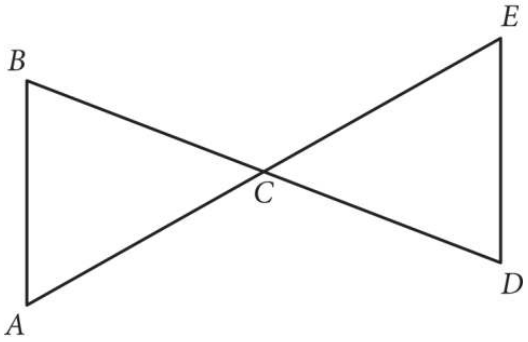
A. 0.5

B. 1

C. 5

D. 23

29)



Note: Figure not drawn to scale.

In the figure shown, $\overline{AE}$ and $\overline{BD}$ intersect at point C. Which of the following additional pieces of information is NOT sufficient to prove that $\triangle ABC$ is similar to $\triangle EDC$?

A. $\overline{AB}$ is parallel to $\overline{DE}$.

B. The measure of $\angle D$ is equal to the measure of $\angle B$.

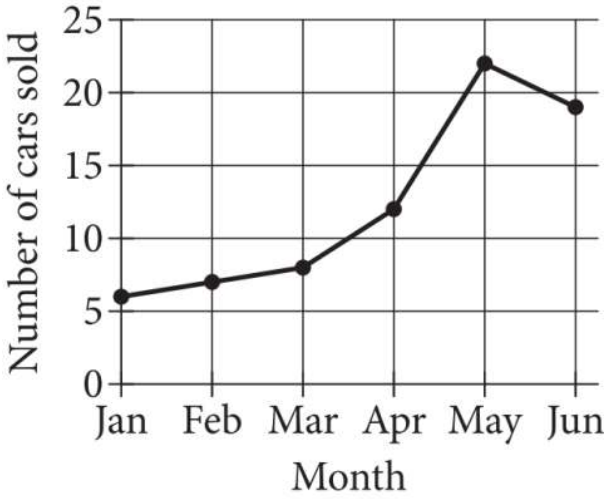
C. The length of $\overline{AB}$ is equal to the length of $\overline{DE}$.

D. The measure of $\angle A$ is equal to the measure of $\angle B$, and the measure of $\angle D$ is equal to the measure of $\angle E$.

30) The area of a rectangular region is increasing at a rate of 20 square feet per hour. Which of the following is closest to this rate in square meters per minute? (Use 1 meter = 3.28 feet.)

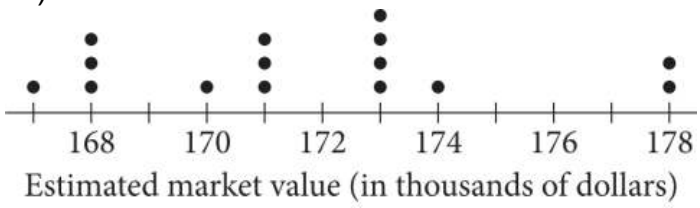
A. 0.03
B. 0.10
C. 1.09
D. 2.03

31) The line graph shows the number of cars a salesperson sold for each of the first six months of the year.



For how many of these months did the salesperson sell 10 or more cars?

32)



The dot plot shows the estimated market values for 15 houses in a neighborhood. What is the maximum estimated market value, in thousands of dollars, for the data set?

33) Line k passes through the points $(1,1)$ and $(2,6)$ in the xy-plane. If the equation for line k is written in the form $y = mx + b$, where m and b are constants, what is the value of m ?

34)

	Site A	Site B	Total
Red maple	63	27	90
Chestnut oak	62	32	94
Total	125	59	184

The table shows the distribution of two types of trees at two different sites. If a red maple represented in the table is selected at random, what is the probability of selecting a tree from site A? (Express your answer as a decimal or fraction, not as a percent.)

35)

$$5x+4y=44$$
$$3x-7y=17$$

The solution to the given system of equations is (x,y). What is the value of $8x-3y$?

36) A scientist takes two samples of Earth's crust, each with a mass of 3240 grams. Sample A has a density of 3.0 grams per cubic centimeter, and sample B has a density of 2.7 grams per cubic centimeter. How much greater is the volume, in cubic centimeters, of sample B than sample A?

37) What is the diameter of the circle in the *xy*-plane with equation $(x-5)^2+(y-4)^2=64$?

38)

$$4x^2+kx+9=0$$

In the given equation, k is a positive constant. The equation has exactly one real solution. What is the value of k ?

March 2023 SAT

Reading

1	B	**14**	C	**27**	B	**40**	C
2	C	**15**	D	**28**	C	**41**	B
3	C	**16**	B	**29**	B	**42**	D
4	C	**17**	A	**30**	C	**43**	C
5	A	**18**	A	**31**	C	**44**	B
6	D	**19**	A	**32**	A	**45**	D
7	D	**20**	B	**33**	B	**46**	C
8	B	**21**	C	**34**	D	**47**	A
9	A	**22**	A	**35**	C	**48**	A
10	D	**23**	B	**36**	B	**49**	C
11	D	**24**	A	**37**	B	**50**	B
12	D	**25**	D	**38**	D	**51**	D
13	A	**26**	D	**39**	C	**52**	C

Writing and Language

1	B	**12**	A	**23**	B	**34**	B
2	A	**13**	C	**24**	B	**35**	D
3	B	**14**	B	**25**	C	**36**	B
4	A	**15**	C	**26**	D	**37**	A
5	C	**16**	D	**27**	C	**38**	A
6	D	**17**	B	**28**	A	**39**	C
7	A	**18**	A	**29**	B	**40**	A
8	D	**19**	C	**30**	D	**41**	D
9	B	**20**	A	**31**	D	**42**	C
10	B	**21**	B	**32**	A	**43**	C
11	C	**22**	C	**33**	C	**44**	D

Math – No Calculator

1	B	**6**	D	**11**	B	**16**	30
2	A	**7**	B	**12**	D	**17**	1/2, .5
3	B	**8**	D	**13**	C	**18**	5/2, 2.5
4	A	**9**	C	**14**	D	**19**	0
5	C	**10**	A	**15**	B	**20**	.666, .667, 2/3

Math – Calculator

1	B	**11**	B	**21**	D	**31**	3
2	B	**12**	C	**22**	A	**32**	178
3	C	**13**	B	**23**	A	**33**	5
4	A	**14**	D	**24**	D	**34**	7/10, .7
5	A	**15**	B	**25**	B	**35**	61
6	D	**16**	B	**26**	C	**36**	120
7	B	**17**	A	**27**	D	**37**	16
8	D	**18**	A	**28**	A	**38**	12
9	C	**19**	C	**29**	C		
10	D	**20**	B	**30**	A		