

Questions 1-10 are based on the following passage.

This passage is adapted from *The Fortunes* by Peter Ho Davies. ©2016 by Peter Ho Davies. The passage is set in 1935. Anna, an actress, is working with Newsreel, a photographer, to create a short documentary film.

Line Anna speaks Cantonese—with an American accent, her father has always said—but no Mandarin or Shanghainese. Now she requires an interpreter to tell her hosts how delighted she is to visit her homeland. It's just as well the newsreel is silent, she thinks, the announcer's voice-over to be added later. Besides,
5 didn't she do some of her best work in silent pictures?

Newsreel films her at Yu Gardens framed by a moon gate. He films her on the Nanking Road, shopping and turning heads. In the Sincere Department Store she is delighted to learn that the onomatopoeic Chinese
10 word for the pneumatic tube system is *pung*. He films her on the Bund pointing out junks,¹ rubbing the paw of the bronze lion outside the Hong Kong and Shanghai Bank for luck. There are more cars than she expected—though she must try a rickshaw—more telephones, more streetlights. Overhead the telegraph lines make a net against the sky.

15 A pair of trams cross in front of her, parting like curtains. She marvels blithely at the modernity. "Why, it reminds me of Berlin. I was expecting old Cathay!² But it looks nothing like Grauman's Theatre."

Mostly, though, there are more Chinese than she ever imagined—compradors in tang jackets, black-and-white amahs, monks in their
20 yellow robes—crowding everywhere, more than she's ever seen. And this she keeps to herself: secretly she feels like an extra again, is glad of her chic Western wardrobe, Chanel suits, for helping her stand out.

The Mayfair Mannequin Academy of New York named her the "World's Best-Dressed Woman" in 1934. Not bad for a laundryman's daughter, she
25 wrote to her father at the time, but he didn't reply.

She finds herself waiting for Newsreel to say "Action!" Pausing at the edge of the frame, her weight tipped forward, but catching herself. They laugh when she explains it to him. Yet she still wants him to tell her what to do. "Was that good?" She asks after a take, and he says, "Sure." She feels
30 naked without stage makeup, lighting. She asks to redo a moment when she bumps into someone. "If you like." She repeats a particular gesture, a

25 wrote to her father at the time, but he didn't reply.

She finds herself waiting for Newsreel to say "Action!" Pausing at the edge of the frame, her weight tipped forward, but catching herself. They laugh when she explains it to him. Yet she still wants him to tell her what to do. "Was that good?" She asks after a take, and he says, "Sure." She feels
30 naked without stage makeup, lighting. She asks to redo a moment when she bumps into someone. "If you like." She repeats a particular gesture, a little turn of the wrist as if she's presenting the scene around her, practicing between takes and then repeating to make sure he captures it, until he looks up and over the camera and asks, "What are you doing?"

35 Newsreel's Eyemo camera runs for twenty seconds, fully wound, and she begins pacing her movements to his rhythms. From the taxi to the hotel lobby, twenty seconds. Greeting a fan, twenty seconds. Admiring a bolt of silk, twenty seconds. And then it's time to change the reel.

She feels as if he's winding her up like a tin toy.

40 Finally, she leans on a rail overlooking the river, waiting for him, and when he raises up, she lifts her own Leica to take a picture of him.

"You look like a tourist," he tells her, and she frowns. On the Whangpoo the sails of junks unfurl like fans, raised as if in modesty to hide them from gaze.

45 She outfits herself with a new wardrobe. She sheds her Western dresses and suits for sleek qipao. The milky-eyed tailor who measures her wraps a knotted string around her waist and hips. She used to work as a seamstress at her father's laundry when she was a child, she says, and he nods when someone translates. Afterward she shows off her new gowns
50 for the camera. "Going native," she tells Newsreel. He touches a finger to the knot of his bowtie as if it were a button.

She blends in better, at least until people address her in Mandarin. She can't recall the last time she felt invisible like this. But she fears getting lost in the crowd. She relies on Newsreel to pick her out, on the camera to make her stand out.

In later years she'll wear those dresses in movies and charge the studios an extra fee to rent her wardrobe.

¹ Flat-bottomed boats

² Another term for China

1

Which choice best describes what happens in the passage?

[View Answer](#) ▾

- A. A character's visit to her native country inspires her to investigate her ancestral history.
- B. A character considers how she has had to comply with expectations in her career as an actress.
- C. A character compares the customs of one country to those of another country.
- D. A character's work on a project causes her to reflect on her place in a particular culture.

Question Difficulty: Medium

2

Which choice best supports the idea that Anna's ability to speak Cantonese does not help her communicate with the people she meets in China?

[View Answer](#) ▾

- A. *[error]* ("Anna . . . homeland")
- B. *[error]* ("It's . . . pictures")
- C. [lines 8-10](#) ("In the . . . pung")
- D. [lines 37-38](#) ("Greeting . . . reel")

Question Difficulty: Easy

3

Based on the passage, which choice best describes Anna's initial reaction to China?

[View Answer](#) ▾

- A. She is baffled because she is not familiar with the local customs.
- B. She is intimidated by its expansiveness and visits only the most popular tourist destinations.
- C. She is overcome with admiration for the fashion she sees there.
- D. She is surprised because it is not as antiquated as she had imagined it to be.

Question Difficulty: Medium

4

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

[View Answer](#) ▾

- A. [lines 10-12](#) ("He . . . luck")
- B. [lines 15-17](#) ("She . . . Theatre")
- C. [lines 18-20](#) ("Mostly . . . seen")
- D. [lines 20-22](#) ("And . . . out")

Question Difficulty: Medium

5

In [line 22](#) and [line 55](#), the phrase “stand out” primarily serves to

[View Answer](#) ▾

- A. highlight Anna's active participation in the newsreel and her later disregard for it.
- B. portray Anna as materialistic and her visit to China as an attempt to garner more fame.
- C. demonstrate that Anna is unable to successfully assimilate into Chinese culture.
- D. underscore the importance Anna places on feeling distinctive.

Question Difficulty: Medium

6

In context, the fifth paragraph ([lines 23-25](#)) primarily serves to

[View Answer](#) ▾

- A. reveal that Anna and her father have not spoken in many years.
- B. introduce a contrast between Anna's current success and her modest upbringing.
- C. emphasize that Anna has received numerous accolades.
- D. provide details about the trajectory of Anna's career.

Question Difficulty: Medium

7

In context, what is the primary significance of Anna's act of taking a photograph of Newsreel?

[View Answer](#) ▾

- A. A response to this act propels Anna to reassess how she is presenting herself to others.
- B. A dismissal of this act causes her to realize that she has less autonomy than she had previously assumed.
- C. An indifference toward this act forces Anna to reconsider how she is engaging with the filming process.
- D. An acceptance of this act allows Anna to become more confident in her interactions with Newsreel.

Question Difficulty: Medium

8

As used in [line 53](#), “recall” most nearly means

[View Answer](#) ▾

- A. renew.
- B. revive.
- C. remember.
- D. reinstate.

Question Difficulty: Easy

9

According to the passage, dressing in Chinese attire causes Anna to

[View Answer](#) ✓

- A. feel that she is more anonymous.
- B. become more comfortable with her surroundings.
- C. have more appreciation for her father's work.
- D. approach her everyday activities with more enthusiasm.

Question Difficulty: Medium

10

The passage indicates that the items Anna purchases in China later serve her as

[View Answer](#) ✓

- A. a means for financial gain.
- B. a symbol of her early career.
- C. emblems of a lost culture.
- D. nostalgic reminders of her travels.

Question Difficulty: Hard

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

This passage is adapted from Christian Jarrett, "We Have an Ingrained Anti-Profit Bias that Blinds Us to the Social Benefits of Free Markets." ©2017 by the British Psychological Society.

Line According to a new paper in *Journal of Personality and Social Psychology*, most of us have an instinctual anti-profit bias. We view for-profit companies and industries—upon which capitalism is based—with inherent distrust, assuming that the more profitable they are, the more
5 harm they do to society. In fact, research shows the opposite is true: companies that make greater profits actually tend to contribute more value to society, for example in terms of their environmental responsibility and corporate philanthropy.

The authors of the new paper, led by Amit Bhattacharjee at Erasmus
10 University, believe this anti-profit bias leads many voters and politicians to endorse anti-profit policies that are likely to lead to the very opposite outcomes for society that they want to achieve. "Erroneous anti-profit beliefs may lead to systematically worse economic policies for society, even as they help people satisfy their social and expressive needs on an
15 individual level," they said.

Through seven separate studies involving hundreds of online participants, the researchers present evidence that the anti-profit bias arises because we think about for-profit motives in a somewhat superficial, ego-centric fashion. Because the desire for profit is seen as
20 based on selfish intent, we extrapolate to assume that the activities of for-profit companies and industries must be bad for society, disregarding the reality that selfish intents can have positive consequences.

We also refer to our own mundane "zero sum" experiences, such as buying a car, in which the seller's profitable gain inevitably comes at our
25 loss. We fail to consider how market forces operate on a massive scale, in which for-profit companies (competing in a free market with informed customers) need to innovate, behave fairly and develop a good reputation in order to be profitable over the long term.

For instance, in the first study, participants rated Fortune 500
30 companies in terms of how profitable they thought they were and how

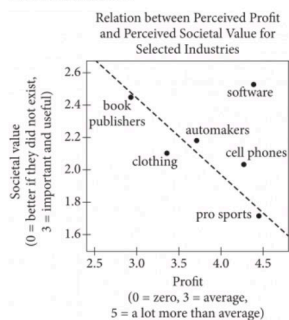
which for-profit companies (competing in a free market with informed customers) need to innovate, behave fairly and develop a good reputation in order to be profitable over the long term.

For instance, in the first study, participants rated Fortune 500
 30 companies in terms of how profitable they thought they were and how much they thought they engaged in bad business practices, such as operating at the expense of others with no concern for society. There was a clear pattern: the more profitable participants thought a company was, the more they assumed that it engaged in bad business practices. In fact,
 35 expert assessments of the firms show the opposite pattern.

In another study, participants were presented with vignettes of different companies and either told they operated for-profit or not-for-profit. Participants rated the exact same companies, engaging in the same business activities, as more likely to cause social harm, and less likely to
 40 bring social benefit, if they were described as for-profit rather than not-for-profit.

Bhattacharjee and his team found that they could attenuate their participants' anti-profit bias if they prompted them to think about how a long-term profit motive could encourage greater product innovation and
 45 quality, better treatment of staff, and more concern for reputation. However, thinking this way doesn't seem to come naturally. Participants' baseline judgments about for-profit companies were the same as when they were actively encouraged to assume that customers face few choices and have no information about firms' reputations (which isn't the case in a free market, profit-driven economy).

The findings of an ingrained anti-profit bias generally held regardless of participants' economic knowledge or political leanings. This was a US study so it remains to be seen if the same anti-profit bias will be found in other cultures.



11 The main purpose of the passage is to

[View Answer](#) ▾

- A. analyze research that claims to show that an erroneous view is less widespread than previously thought.
- B. describe findings that show why many people maintain a specific illogical position even after recognizing its faults.
- C. present data showing that a mistaken belief leads to negative outcomes for the people who hold it.
- D. discuss studies showing that an inaccurate conception is firmly established within a particular population.

Question Difficulty: Medium

12 In context, the second paragraph (lines 9-15) mainly serves to

[View Answer](#) ▾

- A. suggest a possible origin of the anti-profit bias.
- B. highlight potential consequences of the anti-profit bias.
- C. summarize the scholarly consensus about the anti-profit bias.
- D. suggest ways of overcoming the anti-profit bias.

Question Difficulty: Easy

13 As used in line 22, "positive" most nearly means

[View Answer](#) ▾

- A. certain.
- B. appreciative.
- C. beneficial.
- D. optimistic.

Question Difficulty: Easy

14 The passage most strongly suggests that one overlooked influence on the behavior of for-profit companies is the fact that

[View Answer](#) ▾

- A. increases in companies' profits typically represent increased losses by consumers.
- B. it is in companies' financial interest to act in ways that people regard favorably.
- C. the leaders of many companies are aware of people's anti-profit bias.
- D. while companies themselves act in selfish ways, people working for those companies may not.

Question Difficulty: Medium

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

[View Answer](#) ▾

- A. [error] ("We view . . . society")
- B. lines 19-22 ("Because . . . consequences")
- C. lines 23-25 ("We also . . . loss")
- D. lines 25-28 ("We fail . . . term")

Question Difficulty: Medium

16 As used in line 46, "naturally" most nearly means

[View Answer](#) ▾

- A. commonly.
- B. obviously.
- C. simply.
- D. intuitively.

Question Difficulty: Medium

17 It can reasonably be inferred from the passage that compared with US people who are critical of capitalism, US people who are supportive of capitalism are likely to be

[View Answer](#) ▾

- A. more tolerant of socially harmful business practices by for-profit companies.
- B. better at reducing their anti-profit bias when prompted to think about long-term effects.
- C. equally bad at accurately evaluating for-profit companies' effects on society.
- D. less willing to concede that the desire for profit is a selfish motive.

Question Difficulty: Medium

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

[View Answer](#) ▾

- A. line 46 ("However . . . naturally")
- B. lines 46-50 ("Participants' . . . economy")
- C. lines 51-52 ("The findings . . . leanings")
- D. lines 52-54 ("This . . . cultures")

Question Difficulty: Medium

19 According to the figure, which industry did participants perceive to be the least profitable?

[View Answer](#) ▾

- A. Book publishers
- B. Clothing
- C. Automakers
- D. Pro sports

Question Difficulty: Easy

20 Based on the figure, which choice most accurately summarizes participants' views of the societal value of the pro sports industry?

[View Answer](#) ▾

- A. While the industry has below-average societal value, it has more societal value than does the cell phones industry.
- B. Although the industry has relatively little societal value, society would not be better if the industry ceased to exist.
- C. The industry is inaccurately regarded as having little societal value.
- D. The industry would have more societal value if the industry were more profitable.

Question Difficulty: Medium

Questions 21-31 are based on the following passage and supplementary material.

This passage is adapted from Chris Brodie, “No Use Moving the Cheese.” ©2004 by Sigma Xi, The Scientific Research Society.

Line Superman has super-hearing. Spider-Man has an uncanny “spider sense.” But truth can be stranger than fiction. The newest superhero doesn’t wear a cape or mask. It’s a mouse, and it looks just like its normal brethren. Its super power is its amazing . . . nose. In a paper published in
5 Neuron, collaborators at Florida State University and Yale University describe what they call “super-smeller” mice. These exceptional creatures have noses that are 1,000 to 10,000 times more sensitive than those of ordinary mice.

The superhero origin of these rodents involves the deletion, or
10 knockout, of a gene. This technique usually generates mice that are quite sick, as nearly all mutations are harmful. Yet it doesn’t seem to be true for this gene, Kv1.3, which encodes a protein that acts as a channel to let potassium ions (K⁺) into cells. This particular ion channel is found in immunological T-cells and neurons in the hippocampus and the olfactory
15 bulb—the part of the brain that gets information from odor receptors in the nose.

In neurons, K⁺ channels such as Kv1.3 can act like governors on an engine, restricting the firing rate of the electrical spikes known as action potentials. The deletion of Kv1.3 removes this block. Using mice
20 generated in the Yale lab of Richard Flavell, a team at Florida State led by Debra Fadool discovered that the loss of the channel caused one type of olfactory neuron, the mitral cell, to fire at lower thresholds and higher frequencies. Furthermore, the mutant cells were insensitive to chemical messages that normally rein in the flow of electrical current during an
25 action potential. According to coauthor Leonard Kaczmarek, whose group at Yale studies the ion-channel biology of sensation, these changes resulted in greater excitability and better timing—effectively “phase locking” the output of the mitral cells, and thereby increasing the coherence of olfactory signals.

30 The mutation also caused structural changes in the olfactory bulb. In this part of the brain, olfactory receptor cells connect to mitral cells in

at Yale studies the ion-channel biology of sensation, these changes resulted in greater excitability and better timing—effectively “phase locking” the output of the mitral cells, and thereby increasing the coherence of olfactory signals.

30 The mutation also caused structural changes in the olfactory bulb. In this part of the brain, olfactory receptor cells connect to mitral cells in clusters called glomeruli. The knockout mice had glomeruli that were about half as large—but twice as abundant—as normal. As a result, information from the nose went to twice as many “processing units” as
35 usual. Fadool suggests this might increase the resolution of the signal—meaning that a faint odor would be more likely to be noticed above the jumble of background smells.

Mutant mice could distinguish between complex odors, such as peppermint and powdered food, with nearly 15 times the sensitivity of
40 normal mice. They were also better at detecting subtle molecular differences between odorants, such as some (but not all) closely related alcohols. The most amazing change was a huge increase in sensitivity: Mutant mice were able to perceive an odor that was 1,000 times more dilute than what wild-type mice could smell.

45 The super-smeller was definitely a surprise—none of the investigators intended to create such a creature. “We had no inkling,” states Kaczmarek. “We were looking for an effect in the auditory system.”

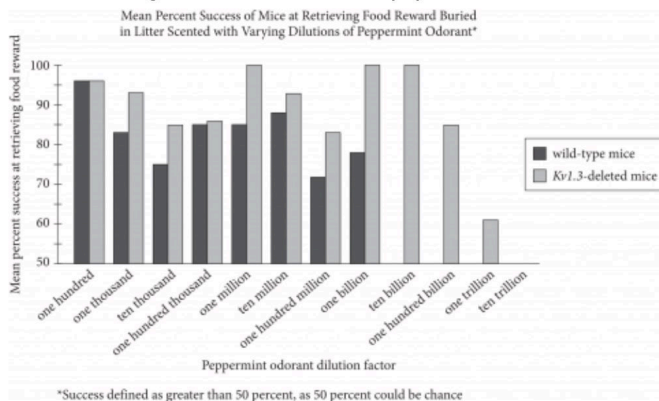


Figure adapted from D. A. Fadool et al., “Kv1.3 Channel Gene-Targeted Deletion Produces ‘Super-Smeller Mice’ with Altered Glomeruli, Interacting Scaffolding Proteins, and Biophysics.”

©2004 by Cell Press.

21 The primary purpose of the passage is to

[View Answer](#) ✓

- A. describe the discovery of a new species of mice.
- B. explore the results of a genetic mutation in mice.
- C. consider the roles of different genes in mice.
- D. discuss a misconception about the sense of smell in mice.

Question Difficulty: Easy

22 In the first paragraph, the references to Superman and Spider-Man primarily serve to

[View Answer](#) ✓

- A. emphasize the unusual nature of a research finding.
- B. explore the practical implications of a recent discovery.
- C. define the use of a scientific term by providing familiar examples.
- D. provide a contrast between realistic and imaginary situations.

Question Difficulty: Medium

23 Which choice best supports the idea that super-smeller mice can perceive distinctions in odors that are very similar to one another?

[View Answer](#) ✓

- A. lines 19-23 ("Using . . . frequencies")
- B. lines 35-37 ("Fadool suggests . . . smells")
- C. lines 38-40 ("Mutant . . . mice")
- D. lines 40-42 ("They . . . alcohols")

Question Difficulty: Medium

24 As used in line 20, "generated" most nearly means

[View Answer](#) ✓

- A. energized.
- B. provoked.
- C. produced.
- D. performed.

Question Difficulty: Easy

25 As used in line 23, "insensitive to" most nearly means

[View Answer](#) ✓

- A. merciless to.
- B. unemotional toward.
- C. unresponsive to.
- D. unconcerned with.

Question Difficulty: Easy

26 Which conclusion about the functioning of the sense of smell in mice is best supported by the passage?

View Answer

- A. The fewer the number of mutant cells, the more powerful the sense of smell is in mice.
- B. The greater the number of olfactory receptor cells connected to mitral cells, the less sensitive the sense of smell is in mice.
- C. The fewer the number of glomeruli, the less sensitive the sense of smell is in mice.
- D. The larger the size of glomeruli, the more powerful the sense of smell is in mice.

Question Difficulty: Hard

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

View Answer

- A. lines 11-13 ("Yet it . . . cells")
- B. lines 23-25 ("Furthermore . . . potential")
- C. lines 30-32 ("The mutation . . . glomeruli")
- D. lines 32-35 ("The knockout . . . usual")

Question Difficulty: Medium

28 According to the passage, the discovery of the super-smeller mice was unexpected in part because the researchers

View Answer

- A. did not know that the Kvl.3 gene existed before they pursued the experiment.
- B. were originally investigating the relationship between the Kvl.3 gene and the mice's hearing.
- C. had intended to show the Kvl.3 gene did not control the mice's sense of smell.
- D. believed that normal mice possessed a more acute sense of smell than they actually had.

Question Difficulty: Medium

29 According to the figure, the mean percent success of the wild-type mice at retrieving the food reward was no greater than 50 percent for which of the following peppermint odorant dilution factors?

View Answer

- A. One thousand
- B. Ten million
- C. One billion
- D. Ten billion

Question Difficulty: Easy

30 According to the figure, at which peppermint odorant dilution factor did the mean percent success at retrieving the food reward remain above 90 percent for both Kvl.3-deleted mice and wild-type mice?

View Answer

- A. One hundred
- B. One hundred thousand
- C. One million
- D. One hundred million

Question Difficulty: Easy

31 According to the figure, which statement best supports what the author considers the most surprising finding about the mutant mice's perception of odors compared to that of the wild-type mice, as represented in the passage?

View Answer

- A. Both wild-type mice and Kvl.3-deleted mice had an increase in success at retrieving the food reward when the peppermint odorant dilution factor changed from ten thousand to one hundred thousand.
- B. The wild-type mice had an increase in success at retrieving the food reward when the peppermint odorant dilution factor was changed from one million to ten million, whereas the Kvl.3-deleted mice suffered a decline in success when that change was made.
- C. The wild-type mice had better than 50 percent success at retrieving the food reward up to a peppermint odorant dilution factor of one billion, whereas the Kvl.3-deleted mice had better than 50 percent success at retrieving the food reward when the peppermint odorant dilution factor was greater than one billion.
- D. Wild-type mice and Kvl.3-deleted mice had the same success at retrieving the food reward when the peppermint odorant was diluted by a factor of one hundred.

Question Difficulty: Medium

Questions 32-42 are based on the following passage.

This passage is adapted from a speech delivered in 1961 by Albert Lutuli, “Africa and Freedom.” ©1960 by The Nobel Foundation. Lutuli was awarded the Nobel Peace Prize for his role in the struggle against apartheid, a system of institutionalized racial segregation and discrimination in South Africa from 1948 to 1991, the year it was abolished.

Line In years gone by, some of the greatest men of our century have stood here to receive this award, men whose names and deeds have enriched the pages of human history, men whom future generations will regard as having shaped the world of our time. No one could be left unmoved at being plucked from the village
5 of Groutville—a name many of you have never heard before and which does not even feature on many maps—to be plucked from banishment in a rural backwater, to be lifted out of the narrow confines of South Africa’s internal politics and placed here in the shadow of these great figures. . . .

10 This award could not be for me alone, nor for just South Africa, but for Africa as a whole. Africa presently is most deeply torn with strife and most bitterly stricken with racial conflict. How strange then it is that a man of Africa should be here to receive an award given for service to the cause of peace and brotherhood between men. There has been little peace
15 in Africa in our time. From the northernmost end of our continent, where war has raged for seven years, to the center and to the south there are battles being fought out, some with arms, some without. . . . Ours is a continent in revolution against oppression. And peace and revolution make uneasy bedfellows. There can be no peace until the forces of
20 oppression are overthrown.

Our continent has been carved up by the great powers; alien governments have been forced upon the African people by military conquest and by economic domination; strivings for nationhood and national dignity have been beaten down by force; traditional economics
25 and ancient customs have been disrupted, and human skills and energy have been harnessed for the advantage of our conquerors. In these times

have been harnessed for the advantage of our conquerors. In these times there has been no peace; there could be no brotherhood between men.

30 But now, the revolutionary stirrings of our continent are setting the past aside. Our people everywhere from north to south of the continent are reclaiming their land, their right to participate in government, their dignity as men, their nationhood. Thus, in the turmoil of revolution, the basis for peace and brotherhood in Africa is being restored by the resurrection of national sovereignty and independence, of equality and the dignity of man.

35 It should not be difficult for you here in Europe to appreciate this. Your continent passed through a longer series of revolutionary upheavals, in which your age of feudal backwardness gave way to the new age of industrialization, true nationhood, democracy, and rising living standards
40 —the golden age for which men have striven for generations. Your age of revolution, stretching across all the years from the eighteenth century to our own, encompassed some of the bloodiest civil wars in all history. By comparison, the African revolution has swept across three quarters of the continent in less than a decade; its final completion is within sight of our
45 own generation. Again, by comparison with Europe, our African revolution—to our credit—is proving to be orderly, quick, and comparatively bloodless. . . .

There is a paradox in the fact that Africa qualifies for such an award in its age of turmoil and revolution. How great is the paradox and how much
50 greater the honor that an award in support of peace and the brotherhood of man should come to one who is a citizen of a country where the brotherhood of man is an illegal doctrine, outlawed, banned, censured, proscribed and prohibited; where to work, talk, or campaign for the realization in fact and deed of the brotherhood of man is hazardous,
55 punished with banishment, or confinement without trial, or imprisonment; where effective democratic channels to peaceful settlement of the race problem have never existed these 300 years; and where white minority power rests on the most heavily armed and equipped military machine in Africa. This is South Africa.

Even here, where white rule seems determined not to change its mind for the better, the spirit of Africa's militant struggle for liberty, equality,

basis for peace and brotherhood in Africa is being restored by the resurrection of national sovereignty and independence, of equality and the dignity of man.

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40

45

There is a paradox in the fact that Africa qualifies for such an award in its age of turmoil and revolution. How great is the paradox and how much greater the honor that an award in support of peace and the brotherhood of man should come to one who is a citizen of a country where the brotherhood of man is an illegal doctrine, outlawed, banned, censured, proscribed and prohibited; where to work, talk, or campaign for the realization in fact and deed of the brotherhood of man is hazardous, punished with banishment, or confinement without trial, or imprisonment; where effective democratic channels to peaceful settlement of the race problem have never existed these 300 years; and where white minority power rests on the most heavily armed and equipped military machine in Africa. This is South Africa.

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Even here, where white rule seems determined not to change its mind for the better, the spirit of Africa's militant struggle for liberty, equality, and independence asserts itself. I, together with thousands of my countrymen, have in the course of the struggle for these ideals been harassed and imprisoned, but we are not deterred in our quest for a new age in which we shall live in peace and in brotherhood.

32 Over the course of the passage, the main focus shifts from

[View Answer](#) ▾

- A. an acknowledgment of the significance of an award to a discussion of the struggles to achieve the ideals that the award represents.
- B. a reflection on the merits of an award to an assessment of why that award was given to a particular individual.
- C. an expression of appreciation for an award to an examination of the obstacles that had to be surmounted to receive that award.
- D. an affirmation of the purpose of an award to a consideration of the likely impact that the award will have on the people of a continent.

Question Difficulty: Medium

33 Lutuli's point of view in the passage as a whole can best be described as that of a

[View Answer](#) ▾

- A. cautious peacemaker.
- B. conventional politician.
- C. resolute reformer.
- D. harsh critic.

Question Difficulty: Medium

34 In the first paragraph, Lutuli's description of the village of Grouville primarily serves to

[View Answer](#) ▾

- A. show why he is uniquely qualified to receive the Nobel Peace Prize on behalf of the African people.
- B. emphasize the honor he feels in winning the Nobel Peace Prize as he considers his modest background.
- C. account for his particular view of the upheaval Africa has experienced in his lifetime.
- D. explain that he comes from a village that is typical of many villages in South Africa.

Question Difficulty: Easy

35 Based on the passage, Lutuli most likely believes the revolutions taking place in Africa are a

[View Answer](#) ▾

- A. phenomenon without precedent in Africa's history.
- B. necessary step in Africa's path to liberation.
- C. development with unpredictable results.
- D. sign of growing interest in democracy worldwide.

Question Difficulty: Easy

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

[View Answer](#) ▾

- A. lines 15-17 ("From . . . without")
- B. lines 17-20 ("Ours . . . overthrown")
- C. lines 21-26 ("Our continent . . . conquerors")
- D. lines 26-27 ("In these . . . between men")

Question Difficulty: Medium

37 As used in line 32, "basis" most nearly means

View Answer ▾

- A. evidence.
- B. origin.
- C. theory.
- D. foundation.

Question Difficulty: Easy

38 It can reasonably be inferred from the passage that Lutuli views Europe's fight for democracy in part as a

View Answer ▾

- A. campaign with an inspiring outcome.
- B. military rather than a political struggle.
- C. struggle that indirectly caused the failure of Africa's economy.
- D. quest with more radical objectives than those of Africa.

Question Difficulty: Medium

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

View Answer ▾

- A. line 35 ("It should . . . this")
- B. lines 35-39 ("Your . . . generations")
- C. lines 41-44 ("By comparison . . . generation")
- D. lines 44-46 ("Again . . . bloodless")

Question Difficulty: Medium

40 In comparing revolutions in Europe and Africa, Lutuli makes the assumption that

View Answer ▾

- A. Europeans faced significantly different obstacles than Africans when fighting for democracy.
- B. Europeans will share in the future prosperity of a democratic Africa.
- C. the pursuit of democracy in Africa will give rise to the same social improvements as those achieved in Europe.
- D. the leaders of Europe recognize that the revolutionary activities of the African peoples are adaptations of strategies first used in Europe.

Question Difficulty: Medium

41 Lutuli indicates that Africa's quest for democracy is, in some respects, more commendable than the quest that took place in Europe because

View Answer ▾

- A. revolutionaries in parts of Africa have had to fight for their rights without appropriate weapons.
- B. African patriots have been willing to sacrifice considerably more of their personal assets.
- C. African reformers have had to contend with a greater variety of geographical challenges.
- D. revolutionary change in Africa has occurred in less time and with less violence.

Question Difficulty: Medium

42 Which choice best describes Lutuli's rhetorical strategy in lines 48-58 ("How great . . . in Africa")?

View Answer ▾

- A. He uses descriptive detail to convey the extent of a government's failures in leadership.
- B. He uses questions to call attention to the unsolvable issues facing a government.
- C. He uses exaggeration to illustrate the contradictions between a government's words and deeds.
- D. He uses repetitive constructions to emphasize a government's unjust practices.

Question Difficulty: Medium

Questions 43-52 are based on the following passages.

Passage 1 is adapted from Joseph Castro, "How the Mars Moon Phobos Got Its Grooves." ©2014 by Purch. Passage 2 is adapted from Elizabeth Zubritsky, "Mars' Moon Phobos Is Slowly Falling Apart." Published in 2015 by National Aeronautics and Space Administration.

Line **Passage 1**

Billions of years ago, Mars suffered from numerous big impacts, and the resulting backwash ultimately scarred the surface of Phobos, one of the Red Planet's two tiny moons, researchers say.

5 In 1976, images from NASA's Viking orbiter revealed that the surface of Phobos is covered in numerous parallel, channel-like grooves. Over the years, researchers have come up with many hypotheses to explain the odd features, but the origin of the satellite's grooves is still heavily debated today.

10 In the new study, a pair of researchers reviewed the evidence for the major hypotheses and concluded that only one holds water: The grooves are chains of secondary impacts, the landing sites of material blasted to the Mars moon by impacts on the Red Planet.

15 Using new data and images from the European Space Agency's Mars Express orbiter, the scientists also mapped the grooves in much greater detail than ever before, and calculated that the amount of Mars material needed to form all of Phobos' grooves is about two orders of magnitude lower than the total ejecta from Mars' craters.

20 "Everything fits in with this hypothesis," said John Murray, a planetary scientist at Open University in the U.K., and lead author of the new study. "We can even trace the ejecta that produced the grooves back to [source areas] on Mars."

25 Some scientists have previously speculated that the grooves are fractures resulting from tidal forces, the impact that created Phobos' prominent Stickney Crater or other sources.

"It hasn't really been a generally accepted idea, or one that has gained universal approval," Murray said, adding that there are several issues with

universal approval," Murray said, adding that there are several issues with all fracture hypotheses for the origin of the grooves. For instance, the near-perfect alignment of the grooves within each family doesn't fit with
30 other fracture fields throughout the solar system.

Other hypotheses posit that the grooves on Phobos are the result of local impacts. According to one idea, the meteor that created Stickney Crater kicked up ejecta that showered Phobos, creating the grooves; a related hypothesis proposes that rolling boulders from the crater scarred
35 Phobos. Or, the grooves may have developed when Phobos was hammered by orbiting debris, according to some researchers.

But none of these ideas can explain all of the observed characteristics and patterns of the grooves, Murray said.

Passage 2

40 Phobos' grooves were long thought to be fractures caused by the impact that formed Stickney crater. That collision was so powerful, it came close to shattering Phobos. However, scientists eventually determined that the grooves don't radiate outward from the crater itself but from a focal point nearby.

45 More recently, researchers have proposed that the grooves may instead be produced by many smaller impacts of material ejected from Mars. But new modeling by NASA's Terry Hurford and colleagues supports the view that the grooves are more like "stretch marks" that occur when Phobos gets deformed by tidal forces.

50 The gravitational pull between Mars and Phobos produces these tidal forces. Earth and our moon pull on each other in the same way, producing tides in the oceans and making both planet and moon slightly egg-shaped rather than perfectly round.

The same explanation was proposed for the grooves decades ago, after
55 the Viking spacecraft sent images of Phobos to Earth. At the time, however, Phobos was thought to be more-or-less solid all the way through. When the tidal forces were calculated, the stresses were too weak to fracture a solid moon of that size.

The recent thinking, however, is that the interior of Phobos could be a
60 rubble pile, barely holding together, surrounded by a layer of powdery regolith about 330 feet (100 meters) thick.

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The recent thinking, however, is that the interior of Phobos could be a 60 rubble pile, barely holding together, surrounded by a layer of powdery regolith about 330 feet (100 meters) thick.

An interior like this can distort easily because it has very little 65 strength and forces the outer layer to readjust. The researchers think the outer layer of Phobos behaves elastically and builds stress, but it's weak enough that these stresses can cause it to fail.

All of this means the tidal forces acting on Phobos can produce more than enough stress to fracture the surface. Stress fractures predicted by this model line up very well with the grooves seen in images of Phobos. This explanation also fits with the observation that some grooves are younger than others, which would be the case if the process that creates them is ongoing.

- 43 Which choice best supports the idea that the researchers in Passage 1 have identified the points of origin for the materials they believe led to the grooves on Phobos?

[View Answer](#) ✓

- A. lines 10-11 ("In the . . . water")
- B. lines 21-22 ("We can . . . Mars")
- C. lines 23-25 ("Some . . . sources")
- D. lines 32-35 ("According . . . Phobos")

Question Difficulty: Medium

- 44 As used in line 12, "chains" most nearly means

[View Answer](#) ✓

- A. ornaments.
- B. restrictions.
- C. strings.
- D. bonds.

Question Difficulty: Medium

- 45 As used in line 43, "radiate" most nearly means

[View Answer](#) ✓

- A. scatter.
- B. light.
- C. extend.
- D. yield.

Question Difficulty: Easy

- 46 According to Hurford in Passage 2, the gravitational pull between Mars and Phobos was

[View Answer](#) ✓

- A. sufficient to produce tidal forces that cracked the surface of Phobos.
- B. underestimated initially because Phobos was thought to be smaller than it really is.
- C. altered when Phobos endured a powerful impact that damaged its surface.
- D. overlooked by scientists who believed Phobos had an interior layer of powdery regolith.

Question Difficulty: Easy

- 47 The primary function of the sentence in lines 51-53 ("Earth . . . round") is to

[View Answer](#) ✓

- A. suggest a controversy about tidal forces on Phobos.
- B. question an underlying assumption about tidal forces.
- C. note an important distinction between Earth and Phobos.
- D. describe a situation analogous to one found on Phobos.

Question Difficulty: Medium

48

Based on Passage 2, which finding most strongly suggests that the grooves on Phobos are unlikely to have formed in a single event?

[View Answer](#) ▾

- A. Images of the various types of grooves on an egg-shaped Phobos
- B. Details suggesting that the grooves on Phobos are different ages
- C. Recent information about the interior composition of Phobos
- D. Revised calculations of the tidal forces on Phobos

Question Difficulty: Medium

49

Which choice best describes the relationship between the two passages?

[View Answer](#) ▾

- A. Passage 2 suggests an application for an idea advanced in Passage 1.
- B. Passage 2 endorses a hypothesis dismissed in Passage 1.
- C. Passage 2 corroborates the conclusion put forth in Passage 1.
- D. Passage 2 challenges data that are presented in Passage 1.

Question Difficulty: Hard

50

Both passages indicate that Stickney Crater formed when

[View Answer](#) ▾

- A. secondary impacts from Mars scarred Phobos's surface.
- B. Phobos was struck by an object with substantial force.
- C. debris from Mars bonded together to form Phobos.
- D. the gravitational pull between Mars and Phobos created tidal forces.

Question Difficulty: Medium

51

Which choice best describes how Hurford (Passage 2) would likely react to Murray's view in Passage 1 of the hypothesis that tidal forces created fractures on Phobos?

[View Answer](#) ▾

- A. By pointing out that the dismissal of the fracture hypothesis is based on an understanding that is likely inaccurate
- B. By noting that images of an egg-shaped Phobos sent from the Viking spacecraft are consistent with the early model for the fracture hypothesis
- C. By suggesting that numerous big impacts on Mars billions of years ago are unlikely to have produced sufficient ejecta to support the secondary-impact theory
- D. By indicating that the grooves on Phobos do not appear to have been originally generated by Stickney Crater

Question Difficulty: Hard

52

Which choice from Passage 2 provides the best evidence for the answer to the previous question?

[View Answer](#) ▾

- A. lines 41-44 ("That . . . nearby")
- B. lines 50-51 ("The gravitational . . . forces")
- C. lines 54-55 ("The same . . . Earth")
- D. lines 55-58 ("At the . . . size")

Question Difficulty: Hard

Questions 1-11 are based on the following passage.

OLIVE for All

1 Computer programs rely on many different pieces of software in order to function properly. Examples of computer programs include games and word processors. However, rapid technological advancements render hardware (physical computing devices) and operating 2 systems, software needed to run programs) out-of-date, which makes it difficult for individuals to access old computer programs and associated data files. According to Mahadev Satyanarayanan of Carnegie Mellon University and Vasanth Bala of the IBM Corporation, 3 data from computer programs remain available only as long as the “software applications that process those [data] formats are also preserved.”

Satyanarayanan and Bala recognized that many individuals may not have access to older computer programs and 4 they’re required software, so they developed OLIVE (Open Library of Images for Virtualized Execution), an executable content archive. OLIVE has two main purposes: First, it contains software that enables a modern computer to simulate all of the software of an older computer. Users stream this software over the Internet to their newer electronic devices, 5 and which allows them to access obsolete computer programs in order to retrieve associated data files. Second, OLIVE functions as a free digital archive of outdated computer programs that individuals can use for education and research 6 purposes.

OLIVE’s collection 7 includes sophisticated search tools that allow users to navigate the archive with ease. One example is the Great American History Machine, an interactive map containing US census and election data from 1840 to 1990. This program was created by history professor David Miller in the late 8 1980s, to help college students engage critically with US history. Owing to a lack of funding, Miller’s program was never updated for modern computer systems, but it may still be a useful teaching resource. Another program that can be found in OLIVE is NCSA Mosaic, one of the earliest web browsers. NCSA Mosaic provides a means of viewing some of the oldest websites in their original format, which may prove invaluable to historians of the Internet.

9 OLIVE’s collection extends beyond the domain of educators and researchers, however. When programmers remake a classic video game or NASA scientists need their computers on Earth to be compatible with those used on a spacecraft on a decade-long mission, 10 he or she may rely on OLIVE to fulfill their needs. As digital technologies continue to improve, 11 preserving digital information is likely to become an urgent public policy matter.

1 Which choice most effectively combines the underlined sentences?

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1 Which choice most effectively combines the underlined sentences?

View Answer M

< Previous

Next: Question 2 >

1 Which choice most effectively combines the underlined sentences?

[View Answer](#) ▾

- A. In order to function properly, computer programs rely on many different pieces of software; they include games and word processors.
- B. Computer programs, such as games and word processors, rely on many different pieces of software in order to function properly.
- C. Computer programs, including games and word processors, function properly and rely on many different pieces of software for that.
- D. For functioning properly, games, word processors, and other computer programs rely on many different pieces of software.

Question Difficulty: Easy

2

[View Answer](#) ▾

- A. NO CHANGE
- B. systems, (software
- C. systems (software
- D. systems—software

Question Difficulty: Easy

3

Which choice most effectively uses a quotation from a 2011 Library of Congress interview to further explain the idea presented in the previous sentence?

[View Answer](#) ▾

- A. NO CHANGE
- B. scholars in a variety of scientific fields “rely on complex simulation and visualization software” to perform experiments.
- C. “much attention has been paid to the preservation of digital content like text, audio and video,” while software applications become obsolete.
- D. digital libraries should include “safeguards to make sure [people] don’t publish something that [they] don’t have rights to.”

Question Difficulty: Medium

4

[View Answer](#) ▾

- A. NO CHANGE
- B. their
- C. its
- D. it’s

Question Difficulty: Medium

5

[View Answer](#) ▾

- A. NO CHANGE
- B. it
- C. which
- D. this

Question Difficulty: Easy

6

[View Answer](#) ▾

- A. NO CHANGE
- B. uses and purposes.
- C. purposes at no cost.
- D. purposes when they need them.

Question Difficulty: Easy

7

Which choice most effectively establishes the main idea of the paragraph?

[View Answer](#) ▾

- A. NO CHANGE
- B. has been praised by teachers, historians, and librarians.
- C. includes programs that were preserved because of their unique content or their function.
- D. is funded jointly by IBM and Carnegie Mellon University.

Question Difficulty: Medium

8

[View Answer](#) ▾

- A. NO CHANGE
- B. 1980s
- C. 1980s:
- D. 1980s;

Question Difficulty: Easy

9

Which choice provides the most effective transition from the previous paragraph to this paragraph?

[View Answer](#) ▾

- A. NO CHANGE
- B. OLIVE's collection has a variety of potential applications for industry, nevertheless.
- C. Furthermore, many digital libraries stand to benefit by using OLIVE.
- D. In addition, Satyanarayanan and Bala are working to enhance OLIVE's capabilities.

Question Difficulty: Medium

10

[View Answer](#) ▾

- A. NO CHANGE
- B. they
- C. one
- D. we

Question Difficulty: Medium

11

The writer wants to conclude by emphasizing the main idea of the passage. Which choice best concludes the passage?

[View Answer](#) ▾

- A. NO CHANGE
- B. Satyanarayanan and Bala will likely face a variety of hurdles: chief among them, copyright protections on software programs.
- C. OLIVE's role will become increasingly important: to function as an archive of digital products that were once commonplace.
- D. OLIVE's software archive will complement efforts to preserve other types of digital content, such as audio and video.

Question Difficulty: Medium

Writing and Language: Question 14

Questions 12-22 are based on the following passage.

The Tale of Otsi:!

In 2008 Owisokon 12 Lahache—an art teacher at a school for Mohawk students in Kahnawake, Quebec, started looking for a way to teach her pupils about both digital media art and their Mohawk heritage. 13 Lahache partnered with a company founded by Mohawk multimedia artist Skawennati Fragnito to develop a workshop to use in the 2008–2009 school year. By the end of the year, Lahache’s students had designed their very own Mohawk-themed video game.

The workshop guided the students through several phases of game development. The first 14 step was the storytelling phase. During this first phase, students learned different storytelling techniques, listened to stories presented by elders, 15 also sharing stories they knew. From this phase emerged the narrative the students would soon bring to 16 life, an Iroquois hunter journeys back to his village and defends it against characters from traditional Mohawk legends. 17 For this phase, the students had plenty of legends to draw from. Students outlined the game using sketches and clay maps; then, after a series of lessons on video game production 18 (in which they studied topics such as programming and 3-D animation), the students began to implement their plan. The end result was the game Otsi: Rise of the Kanien’kehá:ka Legends.

When the game starts, a foreboding voice introduces the player’s 19 quest: “Brave hunter, you have fought many creatures . . . so you can save your village and all the people you love from the horrible monster that destroyed mine.” During the game, the player takes the vantage point of the hunter, seeing only arms holding a bow and arrow. The hunter travels through countryside landscapes, and sometimes swims underwater, to fend off an attack on his village by the Flying Head, an ominous-looking monster with white eyes and ragged teeth. Along the way, the hunter encounters other legendary characters, such as the Hoof Lady and the Tree People, and 20 hear their stories. The hunter must then use the information he has learned to defeat the Flying Head.

The game was a success. Otsi: Rise of the Kanien’kehá:ka Legends won the 2010 imagineNATIVE Best New Media Award. While video games featuring indigenous people have largely been designed without the input of the people 21 themselves. Lahache’s workshop is part of a developing trend: indigenous people are using the medium to tell their own stories. As Fragnito explains, “We wanted to see more native people being not just the consumers of, but the producers of the [cyber] space.” 22 Fragnito and Lahache hope to continue to empower indigenous youths to take a more active role in producing new technologies.

14

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

[View Answer](#)[< Previous: Question 13](#)[Next: Question 15 >](#)

12

[View Answer](#) ▾

- A. NO CHANGE
- B. Lahache, an art teacher at a school for Mohawk students in Kahnawake, Quebec,
- C. Lahache, an art teacher at a school for Mohawk students in Kahnawake, Quebec;
- D. Lahache an art teacher at a school for Mohawk students in Kahnawake, Quebec,

Question Difficulty: Easy

13 At this point, the writer is considering adding the following sentence.

The name Kahnawake is derived from a Mohawk word that means "place of the rapids."

Should the writer make this addition here?

[View Answer](#) ▾

- A. Yes, because it adds relevant information about the heritage and culture of Lahache's students.
- B. Yes, because it introduces a detail about Mohawk naming traditions that are discussed later in the passage.
- C. No, because it provides loosely related information that interrupts the paragraph's discussion of the workshop.
- D. No, because it does not provide adequate detail about the origins of the Mohawk language.

Question Difficulty: Easy

14 Which choice most effectively combines the sentences at the underlined portion?

[View Answer](#) ▾

- A. step was the one that was the storytelling phase, and
- B. step, the storytelling phase, was the phase in which
- C. step was the storytelling phase, and
- D. step was the storytelling phase, in which

Question Difficulty: Easy

15

[View Answer](#) ▾

- A. NO CHANGE
- B. they also shared
- C. and shared
- D. in addition to sharing

Question Difficulty: Medium

16

[View Answer](#) ▾

- A. NO CHANGE
- B. life
- C. life;
- D. life:

Question Difficulty: Hard

17 Which choice provides the best transition from the previous information to the rest of the paragraph?

[View Answer](#) ▾

- A. NO CHANGE
- B. Next came the planning and development phases.
- C. Lahache served as a cultural adviser during all of the phases.
- D. Introducing the game to the public was one of the final phases.

Question Difficulty: Easy

18 Which choice provides information that is most relevant to the discussion in the paragraph?

[View Answer](#) ▾

- A. NO CHANGE
- B. (a subject with a short but complex history),
- C. (which differs dramatically from the production of board games),
- D. (which continued to be taught at later workshops as well),

Question Difficulty: Easy

19

[View Answer](#) ▾

- A. NO CHANGE
- B. quest at the beginning of the game:
- C. quest before anything else happens:
- D. quest by saying the following words:

Question Difficulty: Medium

20

[View Answer](#) ▾

- A. NO CHANGE
- B. are hearing
- C. have heard
- D. hears

Question Difficulty: Medium

21

[View Answer](#) ▾

- A. NO CHANGE
- B. themselves; though
- C. themselves,
- D. themselves, and

Question Difficulty: Medium

22 Which choice provides the most effective conclusion to the paragraph and the passage?

[View Answer](#) ▾

- A. NO CHANGE
- B. Thanks in part to the innovations of Fragnito and Lahache, the video game industry continues to thrive.
- C. The success of the workshop shows that video game design can be an interesting and lucrative career.
- D. Another game to come out of the workshop is Ieniénte and the Peacemaker's Wampum, which revolves around the story of an archaeologist who returns to her hometown.

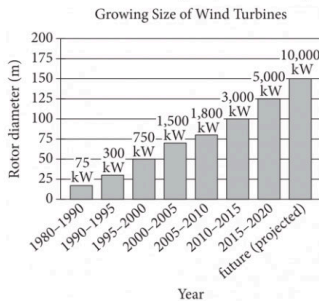
Question Difficulty: Easy

Questions 23-33 are based on the following passage and supplementary material.

Engineering the Future of Wind Energy

From 2010 to 2016 the amount of electrical power produced by wind in the United States more than doubled. As the market for wind power has **23** inflated, so has the need for experts who can design and build safe and efficient wind farms. **24** Nevertheless, engineers are needed to work on the next generation of wind turbines—the large windmill-type devices that generate electrical power from wind. Improvements in these devices have resulted in enormous increases in the amount of power a wind turbine can generate, but further advances are needed.

One way to increase the output of wind farms is to create new turbines that have longer rotor blades than previous models had. Data from the European Wind Energy Association show a **25** consistent trend in this direction since the 1980s. The trend is that turbine rotor diameters increase every few years. In the period between 2010 and 2015, the rotor diameter of new turbines reached **26** 80 meters, several times **27** that of turbines in the 1980s. As rotor blades have gotten longer, power generation has gone up dramatically: a modern turbine can generate up to 5,000 kilowatts of wind power, compared with about **28** 75 kilowatts for one from the 1980s. In the future, oversized wind turbines are projected to generate even more power.



Adapted from The Pew Charitable Trusts, “Wind Energy

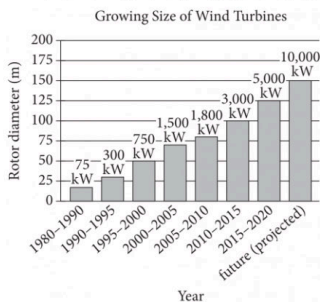
Power rating for each rotor diameter is indicated above the bar.

Investment Increases Worldwide.” ©2015 by The Pew Charitable Trusts. Original source: European Wind Energy Association.

[1] One engineer who designs the powerful wind turbines of tomorrow is Eric Loth. [2] Although many such engineers work in **29** industry, Loth, whose graduate studies in engineering focused on rotors—is employed by the University of Virginia, where he directs the Fluids Research and Innovation Laboratory. [3] Loth leads a multi-institution group that is developing an innovative type of turbine blade. [4] The group’s concept features hinged, foldable blades modeled on the flexible branches of palm trees, a design that will ensure that **30** branches will not break even when exposed to extremely strong wind gusts. [5] After they have created computerized models and simulations of the turbine and decided how and from which materials to construct the blade

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Environmentally friendly wind power **32** has become competitive with traditional energy sources such as coal and oil, but it is still comparatively more expensive to **33** generate, larger wind turbines can help close that gap. As a result, the efforts of Loth and others who design and build these turbines are crucial in ensuring the continued growth of the wind power market.

[View Answer](#) 

- A. NO CHANGE
- B. expanded,
- C. lengthened,
- D. bolstered,

Question Difficulty: Easy

[View Answer](#) 

- A. NO CHANGE
- B. Instead,
- C. Finally,
- D. Specifically,

Question Difficulty: Medium

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

[View Answer](#) 

- A. trend; the trend has been consistently in this direction since the 1980s and has increased turbine rotor diameters every few years.
- B. trend since the 1980s consisting of turbine rotors increasing in diameter in this direction every few years since then.
- C. consistent trend in this direction since the 1980s, with turbine rotor diameters increasing every few years.
- D. consistent trend in turbine rotor diameters where turbine rotor diameters, since the 1980s, increase every few years in this direction.

Question Difficulty: Easy

Which choice provides accurate information from the graph?

[View Answer](#) 

- A. NO CHANGE
- B. 100
- C. 1,800
- D. 3,000

Question Difficulty: Medium

[View Answer](#) 

- A. NO CHANGE
- B. 1980s turbines.
- C. the number of turbines in the 1980s.
- D. the number of 1980s turbines.

Question Difficulty: Medium

28

Which choice most effectively completes the comparison in the sentence using accurate information from the graph?

[View Answer](#) ▾

- A. NO CHANGE
- B. 300 kilowatts for one from the 1995–2000 time period.
- C. 750 kilowatts for one from the 2000s.
- D. 1,500 kilowatts for one from the 2005–2010 time period.

Question Difficulty: Easy

29

[View Answer](#) ▾

- A. NO CHANGE
- B. industry—Loth—
- C. industry, Loth
- D. industry, Loth—

Question Difficulty: Medium

30

[View Answer](#) ▾

- A. NO CHANGE
- B. blades
- C. it
- D. they

Question Difficulty: Medium

31 The writer wants to add the following sentence to this paragraph.

Loth thinks the prototype's blades alone might be as long as 200 meters, which means that the turbine could produce at least 10,000 kilowatts of wind power—and perhaps even up to 50,000 kilowatts.

The best placement for this sentence is

[View Answer](#) ▾

- A. after sentence 1.
- B. after sentence 2.
- C. after sentence 3.
- D. after sentence 5.

Question Difficulty: Medium

32

[View Answer](#) ▾

- A. NO CHANGE
- B. becomes
- C. had become
- D. will have become

Question Difficulty: Easy

33

[View Answer](#) ▾

- A. NO CHANGE
- B. generate; and larger
- C. generate. Larger
- D. generate larger

Question Difficulty: Medium

34

[View Answer](#) ▾

- A. NO CHANGE
- B. Therefore,
- C. Consequently,
- D. However,

Question Difficulty: Easy

Questions 34-44 are based on the following passage.

A Tale of Two Elephants

For decades, elephants were classified into two species, African and Asian, and some organizations that work to protect threatened animals still assign all elephants to one of these two groups. **34** Also, several studies conducted since 2001, including one from 2016, **35** is providing evidence that two unique African elephant populations are in fact two distinct species: the savanna elephant and the forest elephant. Conservation organizations should accept the scientific evidence and recognize the differences between the two African elephant species. Doing so will improve the **36** elephants' chances of survival.

The evidence for two distinct African elephant species is persuasive. In a 2010 study, a group of scientists led by Nadin Rohland and David Reich obtained **37** elephant DNA samples. They got these samples from an Asian elephant, an African savanna elephant, and an African forest elephant. When Rohland and Reich compared the genome of the savanna elephant to the genome of the forest **38** elephant. They found almost as many differences between these African elephants as they had between the savanna elephant and the Asian elephant. Since African and Asian elephants had long been considered different species, the researchers **39** had concluded that the savanna and forest elephants should be as well.

Those who are still unconvinced should look to a 2016 study of the long-extinct straight-tusked elephant species. Paleontologists had assumed that the straight-tusked elephant was an ancestor of the Asian elephant because the elephants' skulls are shaped similarly. But DNA extracted from straight-tusked elephant fossils **40** revealed a different evolutionary history: their DNA sequences were more similar to those of the African forest **41** elephant than to those of: the Asian elephant, or the savanna elephant. This finding supports the division of the African elephants into separate species; **42** furthermore, it suggests that the African forest elephant might even belong to a different genus from that of the African savanna elephant.

Slow to recognize these overwhelming indications, conservation groups **43** still receive billions of dollars in donations each year. If considered separate species, savanna and forest elephants would have population sizes **44** low enough in quantity to allow the animals' conservation status to be changed from "vulnerable" to "endangered." Organizations would also have the ability to address species-specific conservation issues. For example, the forest elephant is facing greater threats to its habitat than the savanna elephant is, threats that need to be tackled through specific management decisions. Conservation groups should acknowledge the findings of the scientific community and take appropriate action before many more of these animals disappear.

35

[View Answer](#) ✓

- A. NO CHANGE
- B. provides
- C. provide
- D. has provided

Question Difficulty: Hard

36

[View Answer](#) ✓

- A. NO CHANGE
- B. elephants chances
- C. elephant's chance's
- D. elephants' chance's

Question Difficulty: Easy

37

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

[View Answer](#) ✓

- A. DNA samples, which they got
- B. elephant DNA samples
- C. DNA samples
- D. samples of elephant DNA

Question Difficulty: Medium

38

[View Answer](#) ✓

- A. NO CHANGE
- B. elephant, they
- C. elephant; they
- D. elephant they

Question Difficulty: Medium

39

[View Answer](#) ✓

- A. NO CHANGE
- B. conclude
- C. concluded
- D. have concluded

Question Difficulty: Easy

40 Which choice most effectively sets up the information in the rest of the paragraph?

[View Answer](#) ▾

- A. NO CHANGE
- B. showed just how long genetic material can be preserved:
- C. demonstrated a new technique for classifying species:
- D. suggested new locations where this extinct species had roamed:

Question Difficulty: Easy

41

[View Answer](#) ▾

- A. NO CHANGE
- B. elephant; than to those of the Asian elephant
- C. elephant, than to those of the Asian elephant,
- D. elephant than to those of the Asian elephant

Question Difficulty: Medium

42

[View Answer](#) ▾

- A. NO CHANGE
- B. nevertheless,
- C. conversely,
- D. otherwise,

Question Difficulty: Easy

43 Which choice best establishes the main idea of the paragraph?

[View Answer](#) ▾

- A. NO CHANGE
- B. are limiting their own ability to protect elephants.
- C. have still affected the field of elephant research.
- D. should try to help animals other than elephants.

Question Difficulty: Medium

44

[View Answer](#) ▾

- A. NO CHANGE
- B. that are low enough in quantity
- C. with quantities low enough
- D. low enough

Question Difficulty: Medium



Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

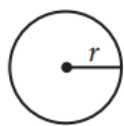
DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 16-20, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

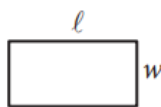
- The use of a calculator **is not permitted**.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

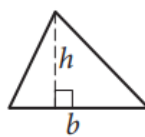


$$A = \pi r^2$$

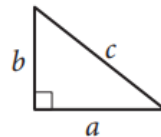
$$C = 2\pi r$$



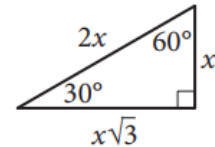
$$A = \ell w$$



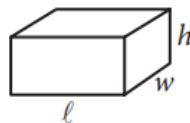
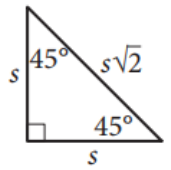
$$A = \frac{1}{2}bh$$



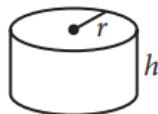
$$c^2 = a^2 + b^2$$



Special Right Triangles



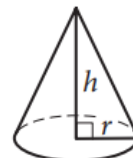
$$V = \ell wh$$



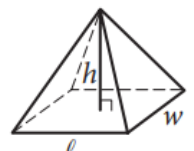
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}\ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

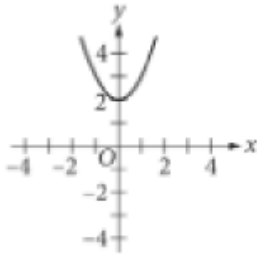
The sum of the measures in degrees of the angles of a triangle is 180.



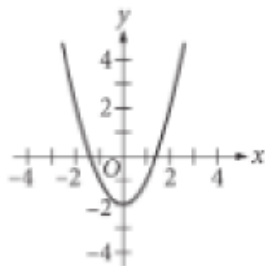
1

What is the graph of the equation $y = x^2 - 2$?

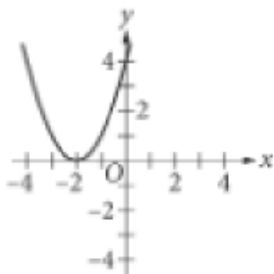
A)



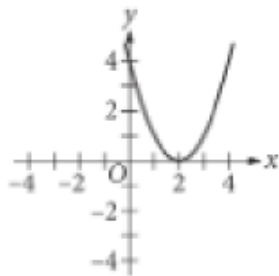
B)



C)



D)



2

$$T = NC$$

For a particular college program, the given equation relates the cost of tuition T , in dollars, to the number of credits taken, N , and the cost of each credit C , in dollars, where N and C are positive numbers. Which equation correctly expresses C in terms of N and T ?

A) $C = TN$

B) $C = T - N$

C) $C = \frac{N}{T}$

D) $C = \frac{T}{N}$

3

The linear function f is defined by

$$f(x) = 2(x - 1). \text{ What is the value of } f(4) ?$$

A) 1.5

B) 3

C) 6

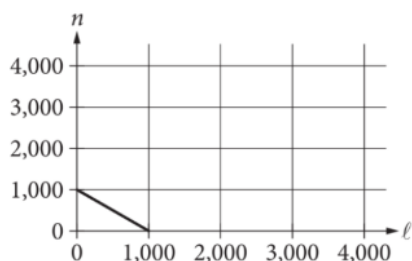
D) 7



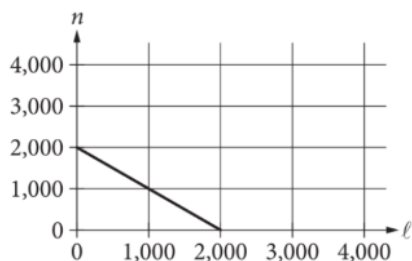
4

The equation $\ell + n = 2,000$ represents the possible combinations of the amounts of money, in dollars, that Lucia could invest in two bonds, where ℓ and n represent the amount of money, in dollars, that she could invest in Bond L and Bond N, respectively. Which of the following graphs represents the relationship between the possible combinations of the amounts of money, in dollars, that she could invest in Bond L and Bond N?

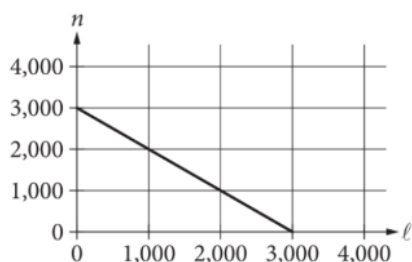
A)



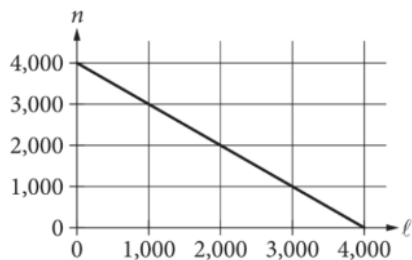
B)



C)



D)



5

In Pacific Northwest Native American cultures, people make totem poles to depict family legends and historical events. Jolon made a totem pole in x hours. He spent $\frac{1}{6}$ of the total time designing the pole, $\frac{1}{3}$ of the total time sketching the design on the pole, $\frac{1}{4}$ of the total time chiseling the design on the pole, and the remaining 24 hours of the total time sanding and painting the pole. Which of the following equations can be used to determine the total number of hours, x , he spent making the totem pole?

A) $x = \frac{1}{13}x + 24$

B) $x = \frac{3}{13}x + 24$

C) $x = \frac{2}{3}x + 24$

D) $x = \frac{3}{4}x + 24$



6

Which expression is equivalent to $\sqrt[4]{a^9}$?

- A) $a^{\frac{9}{4}}$
- B) $a^{\frac{4}{9}}$
- C) a^{13}
- D) a^{36}

7

A circle in the xy -plane has its center at $(3, 5)$ and has a radius of 6. What is an equation of the circle?

- A) $(x - 3)^2 + (y - 5)^2 = 6$
- B) $(x + 3)^2 + (y + 5)^2 = 6$
- C) $(x - 3)^2 + (y - 5)^2 = 36$
- D) $(x + 3)^2 + (y + 5)^2 = 36$

8

One of the two linear equations in a system is $3x + 4y = 8$. The system has exactly one solution.

Which of the following could be the other equation in the system?

- A) $\frac{3}{2}x + 2y = 4$
- B) $3x + 4y = 4$
- C) $4x + 3y = 8$
- D) $6x + 8y = 16$

9

$$x^2 - 3x - 1 = 0$$

What is one of the solutions of the given equation?

- A) $\frac{-3 + \sqrt{13}}{2}$
- B) $\frac{-3 + \sqrt{5}}{2}$
- C) $\frac{3 + \sqrt{5}}{2}$
- D) $\frac{3 + \sqrt{13}}{2}$

10

The function $f(x) = 2x + 2(2x + 1)$ gives the perimeter, in meters, of a rectangle that has a width of x meters. Which of the following is the best interpretation of $2x + 1$ in this context?

- A) The length, in meters, of the rectangle
- B) The width, in meters, of the rectangle
- C) Half the perimeter, in meters, of the rectangle
- D) Twice the length, in meters, of the rectangle



11

Line k has a slope of $-\frac{4}{5}$ and an x -intercept of $\left(\frac{r}{2}, 0\right)$, where r is a constant. What is the y -coordinate of the y -intercept of line k in terms of r ?

- A) $-\frac{2r}{5}$
- B) $\frac{2r}{5}$
- C) $-\frac{5r}{8}$
- D) $\frac{5r}{8}$

12

A sphere and a right circular cylinder both have radius r . The height of the cylinder is 18. For what value of r will the volume of the sphere be twice the volume of the cylinder?

- A) 6.75
- B) 13.5
- C) 27
- D) 54

13

$$-2|x - 5| = -4x$$

What are all possible solutions to the given equation?

- A) -5
- B) $\frac{5}{3}$
- C) -5 and $\frac{5}{3}$
- D) 5 and $-\frac{5}{3}$

14

$$f(x) = \left(\frac{3}{4}\right)^x + 5$$

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

- A) $\left(\frac{3}{4}, 5\right)$
- B) $\left(\frac{3}{4}, 0\right)$
- C) $(0, 5)$
- D) $(0, 6)$

15


$$f(x) = (2x + 3)(2x - 5)$$

What is the minimum value of the given function?

- A) -16
- B) $-\frac{3}{2}$
- C) $\frac{1}{2}$
- D) 2

**DIRECTIONS**

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer in boxes. →

Answer: $\frac{7}{12}$

7	/	1	2
.		.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

← Fraction line

Grid in result. {

Answer: 2.5

	2	.	5
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

← Decimal point

Acceptable ways to grid $\frac{2}{3}$ are:

	2	/	3
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

.	6	6	6
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

.	6	6	7
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8

Answer: 201 – either position is correct

	2	0	1
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3

	2	0	1
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



16

What value of x satisfies the equation $\frac{1}{8}x + \frac{1}{4} = \frac{1}{2}$?

17

The expression $\frac{4x^{11}}{12x^5}$ is equivalent to $\frac{1}{3}x^b$, where b is a constant and $x > 0$. What is the value of b ?

18

In right triangle ABC , angle C is a right angle and $\sin A = 0.70$. What is the value of $\cos B$?

19

The function f is defined by $f(r) = (r - 1)(r + 2)^2$.
If $f(h - 5) = 0$, where h is a constant, what is one possible value of h ?

20

$$-8x - 24 = 10y$$

$$15y = 6 - 18x$$

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

STOP

If you finish before time is called, you may check your work on this section only. Do not turn to any other section.



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

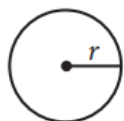
DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 31-38, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

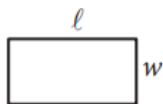
- The use of a calculator **is permitted**.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.

REFERENCE

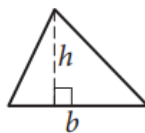


$$A = \pi r^2$$

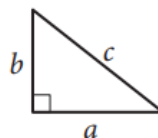
$$C = 2\pi r$$



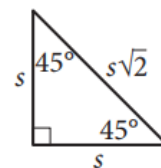
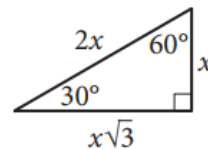
$$A = \ell w$$



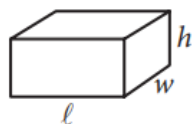
$$A = \frac{1}{2}bh$$



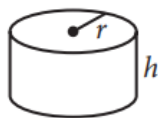
$$c^2 = a^2 + b^2$$



Special Right Triangles



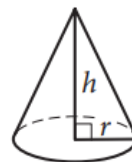
$$V = \ell wh$$



$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}\ell wh$$

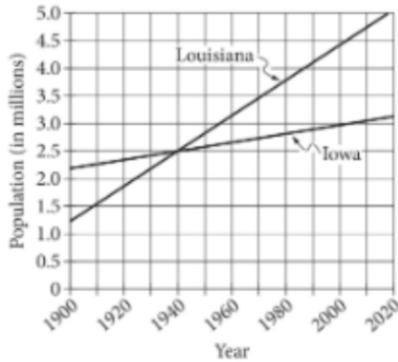
The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.



1

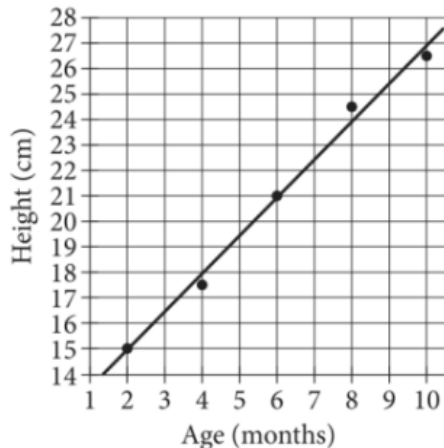


The lines shown model the populations of Iowa and Louisiana from 1900 to 2020. In what year does the graph indicate that Iowa and Louisiana had the same population?

- A) 1900
- B) 1940
- C) 1990
- D) 2000

2

A researcher measured the height of a poodle's shoulders from the ground, in centimeters (cm), as it aged over 10 months. The scatterplot shows this relationship. A line of best fit for the data is also shown.



What is the height of the poodle's shoulders, in cm, predicted by the line of best fit when the poodle is 5 months old?

- A) 18.7
- B) 19.4
- C) 20.7
- D) 21.8

3

Each face of a fair number cube is labeled with a number from 1 through 6, with a different number appearing on each face. If the number cube is rolled one time, what is the probability that the number 2 will be shown on the top face?

- A) $\frac{1}{6}$
- B) $\frac{2}{6}$
- C) $\frac{4}{6}$
- D) $\frac{5}{6}$

4

A car's fuel efficiency is 30 miles per gallon of gasoline. During a trip, the car uses 5 gallons of gasoline. Based on the car's fuel efficiency, how many miles did the car travel during the trip?

- A) 5
- B) 6
- C) 35
- D) 150



5

A line in the xy -plane passes through the point $(0, 5)$ and has a slope of 7. What is an equation of this line?

- A) $y = 5x - 7$
- B) $y = 5x + 7$
- C) $y = 7x - 5$
- D) $y = 7x + 5$

6

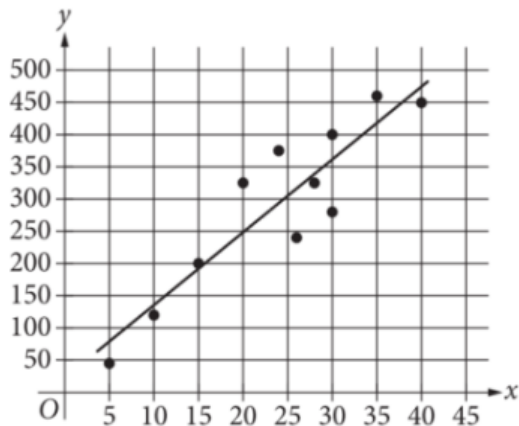
$$y < x$$

$$x > 7$$

What point (x, y) is a solution to the given system of inequalities in the xy -plane?

- A) $(0, 1)$
- B) $(3, 2)$
- C) $(6, 7)$
- D) $(9, 8)$

7



In the given scatterplot, a line of best fit for the data is shown. At $x = 20$, approximately how much greater is the actual y -value than the y -value predicted by the line of best fit?

- A) 3
- B) 20
- C) 75
- D) 250

8

The average price of regular gasoline, per gallon, in the United States in 2001 was \$1.42. Each year from 2001 to 2008, the average price increased by approximately 12% of the previous year's average price. Which equation best models this situation, where y is the average price, in dollars, of regular gasoline, per gallon, and x is the number of years since 2001?

- A) $y = 1.12^x$
- B) $y = 1.42^x$
- C) $y = 1.12(1.42)^x$
- D) $y = 1.42(1.12)^x$

9

$$5x + 3y = 7$$

$$2x + y = 2$$

The solution to the given system of equations is (x, y) . What is the value of $7x + 4y$?

- A) 2
- B) 7
- C) 9
- D) 23

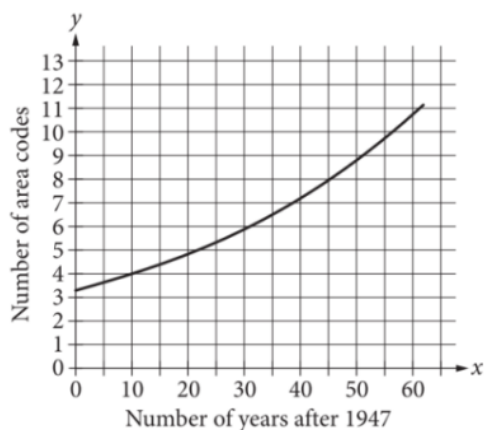
10

In a certain election, the ratio of electoral votes received in Maine by Candidate X to those received by Candidate Y was 3 to 1. The state of Maine had 4 electoral votes in this election. How many electoral votes did Candidate Y receive in Maine?

- A) 1
- B) 2
- C) 3
- D) 4



11

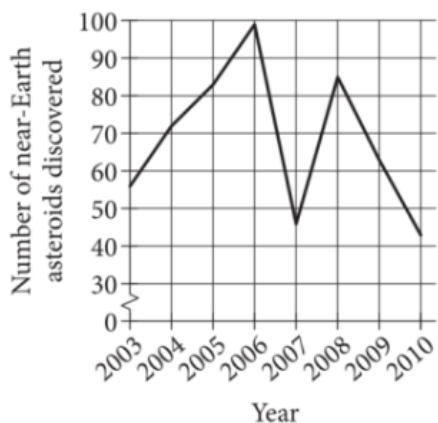


The graph shown models the number of area codes assigned to phone numbers in Illinois from 1947 through 2009, where x represents the number of years after 1947. Which equation represents this relationship?

- A) $y = 1.02(3.26)^{-x}$
- B) $y = 3.26(1.02)^{-x}$
- C) $y = 1.02(3.26)^x$
- D) $y = 3.26(1.02)^x$

12

The line graph shows the number of near-Earth asteroids discovered by the Spacewatch survey from 2003 to 2010.



During which period was the increase in the number of near-Earth asteroids discovered the greatest?

- A) From 2003 to 2004
- B) From 2004 to 2005
- C) From 2005 to 2006
- D) From 2007 to 2008

13

There are infinitely many solutions to which of the following equations?

- I. $4(x + 1) + 2 = 4x + 6$
- II. $4(x + 1) + 1 = 4x + 7$

- A) I only
- B) II only
- C) I and II
- D) Neither I nor II

14

A sample of 50 employees from the finance department at Company XYZ was selected at random. The 50 employees completed a survey about a website's ease of use, and 72% of them thought the website was easy to use. Which of the following is the largest population to which the results of this survey can be generalized?

- A) All employees in a finance department in the United States
- B) All employees in Company XYZ
- C) All employees in the finance department in Company XYZ
- D) All employees in the sample

15

$$r = \frac{10}{3}s$$

The given equation shows a proportional relationship between the variables r and s . Which expression is equivalent to $6r$?

- A) $20s$
- B) $60s$
- C) $\frac{5}{9}s$
- D) $\frac{16}{3}s$



16

Data set P: 12, 18, 19, 19, 19, 19, 19, 21, 21, 22, 22

Data set P contains the lengths, in inches, of 11 objects. The length 12 inches is removed from data set P to create data set N, which contains the lengths, in inches, of 10 objects. Which statement best compares the mean q and the median r of data set P with the mean s and the median t of data set N?

- A) $q < s; r > t$
- B) $q = s; r > t$
- C) $q < s; r = t$
- D) $q = s; r = t$

17

$$6 = \frac{2}{3}(x - 7)$$

Which equation has the same solution as the given equation?

- A) $9 = x - 14$
- B) $9 = \frac{2}{3}x - 7$
- C) $9 = x - 7$
- D) $9 = x - \frac{14}{3}$

18

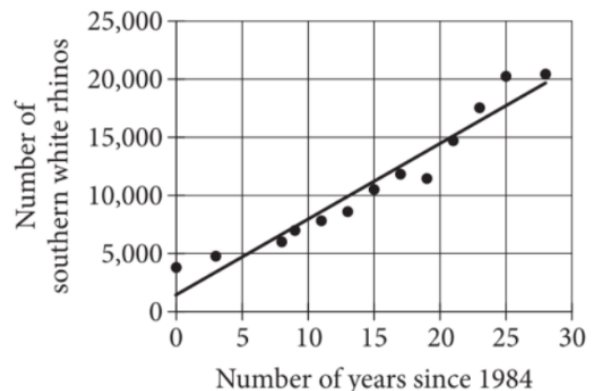
Distance (miles)	Average time (minutes)
0.16	4
0.48	12
0.72	18

The table shows the average time t , in minutes, it takes Oliver to walk a certain distance d , in miles. Which equation could represent this linear relationship?

- A) $t = 40d$
- B) $t = 25d$
- C) $t = \frac{1}{25}d$
- D) $t = \frac{1}{40}d$

Questions 19 and 20 refer to the following information.

The number of southern white rhinos was 3,800 in 1984. Due to conservation methods over time, the number of southern white rhinos increased to 20,405 by 2012. The scatterplot shows the relationship between time, in number of years since 1984, and the number of southern white rhinos. A line of best fit for the data is also shown.





19

What is the best approximation for the ratio of southern white rhinos in 1984 to southern white rhinos in 2012?

- A) 1 to 3
- B) 1 to 5
- C) 1 to 20
- D) 1 to 28

20

Which value is closest to the slope of the line of best fit shown?

- A) -2,500
- B) -650
- C) 650
- D) 2,500

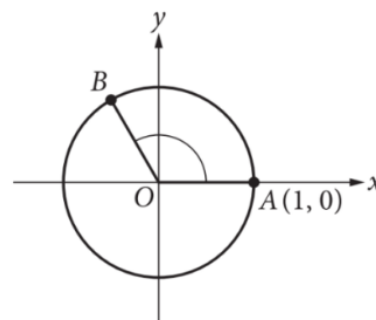
21

$$\sqrt{x^2} = 5$$

What are all possible solutions to the given equation?

- A) -25 and 25
- B) -5 and 5
- C) -25 only
- D) 5 only

22



In the figure shown, points A and B lie on the circle with radius 1 centered at the origin, O . If the cosine of $\angle AOB$ is $-\frac{1}{2}$, what is the measure, in radians, of $\angle AOB$?

- A) $\frac{5\pi}{12}$
- B) $\frac{7\pi}{12}$
- C) $\frac{2\pi}{3}$
- D) $\frac{5\pi}{6}$



Questions 23 and 24 refer to the following information.

Oocytes are a type of cell that can be modeled as a sphere. The table shows the surface area, in square micrometers (μm^2), and volume, in cubic micrometers (μm^3), based on the average radius for oocytes at the same stage of development in four types of mammals.

(The surface area of a sphere with a radius of r is $4\pi r^2$, and the volume of a sphere with a radius of r is equal to $\frac{4}{3}\pi r^3$.)

Mammal	Surface area (μm^2)	Volume (μm^3)
Mouse	498.76	1,047.4
Hamster	1,720.2	6,708.8
Pig	2,660.3	12,903
Human	4,071.5	24,429

24

Based on the information in the table, what is the average radius, in micrometers, of a hamster oocyte?

- A) 68.4
- B) 20.7
- C) 14.2
- D) 11.7

23

The volume of a mouse oocyte is approximately what percent of the volume of a human oocyte?

- A) 4.29%
- B) 8.16%
- C) 12.25%
- D) 23.32%



25

Under certain conditions, the equation $9.8T^2 = 4\pi^2L$ models the time T , in seconds, it takes for a pendulum to complete one cycle, where L is the length, in meters, of the pendulum. Solving the equation for T yields $T = 2\pi\sqrt{\frac{L}{9.8}}$. Which of the following is the best interpretation of $T = 2\pi\sqrt{\frac{12}{9.8}}$ in this context?

- A) The time, in seconds, it takes a pendulum of $2\pi\sqrt{\frac{12}{9.8}}$ length meters to complete one cycle
- B) The time, in seconds, it takes a pendulum of length 9.8 meters to complete one cycle
- C) The time, in seconds, it takes a pendulum of length 12 meters to complete one cycle
- D) The time, in seconds, it takes a pendulum of length $\frac{12}{9.8}$ meters to complete one cycle

26

$$(x - 5)^2 + 1 = 0$$

How many distinct real solutions does the given equation have?

- A) Zero
- B) Exactly one
- C) Exactly two
- D) Infinitely many

27

The Sun's mass is 1.989×10^{30} kilograms, and 0.04% of its total mass is sulfur. If the total mass of sulfur in the Sun is $s \times 10^{30}$ kilograms, what is the value of s ?

- A) 0.0007956
- B) 0.007956
- C) 0.07956
- D) 0.7956

28

x	$f(x)$
-2	-5
4	4
12	16

Some values of x and their corresponding values of $f(x)$ for the linear function f are shown in the table. What is the value of $f(6)$?

- A) 7
- B) 8
- C) 9
- D) 10



29

For the linear equation $y = mx + b$, where m and b are positive constants, which of the following tables gives three values of x and their corresponding values of y ?

A)

x	y
-2	$-2m$
1	m
$-\frac{b}{m}$	0

B)

x	y
-2	$-2m + b$
1	$m + b$
$-\frac{b}{m}$	0

C)

x	y
-2	$-2m + b$
1	$m + b$
b	0

D)

x	y
-2	$-2m$
1	m
b	0

30

A fitness membership costs \$45 per month. All new members receive a discount of \$20 off the cost of their first month of membership. Which function c gives the total cost $c(t)$, in dollars, that a new member pays after t months of membership?

A) $c(t) = 20 + 45t$

B) $c(t) = 25 + 45t$

C) $c(t) = 20 + 45(t - 1)$

D) $c(t) = 25 + 45(t - 1)$

**DIRECTIONS**

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.

5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded

as 3.5 or $7/2$. (If $\begin{array}{|c|c|c|} \hline 3 & 1 & / & 2 \\ \hline \bullet & \bullet & \bullet & \bullet \\ \hline \end{array}$ is entered into the

grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)

6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer → in boxes.

Grid in result.

Answer: $\frac{7}{12}$

7	/	1	2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

← Fraction line

Answer: 2.5

2	.	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0
①	①	①
②	②	②
③	③	③
④	④	④
⑤	⑤	⑤
⑥	⑥	⑥
⑦	⑦	⑦
⑧	⑧	⑧
⑨	⑨	⑨

← Decimal point

Acceptable ways to grid $\frac{2}{3}$ are:

2	/	3
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0
①	①	①
②	②	②
③	③	③
④	④	④
⑤	⑤	⑤
⑥	⑥	⑥
⑦	⑦	⑦
⑧	⑧	⑧

.	6	6	6
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧

.	6	6	7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧

Answer: 201 – either position is correct

2	0	1
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0
①	①	①
②	②	②
③	③	③

2	0	1
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0
①	①	①
②	②	②
③	③	③

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



31

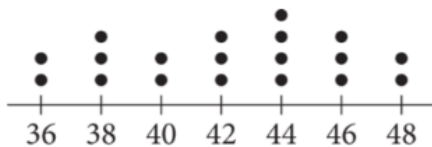
A list of 10 data values is shown below.

4, 6, 7, 2, 8, 9, 6, 3, 3, 3

What is the mean of the data?

32

The dot plot represents a data set.

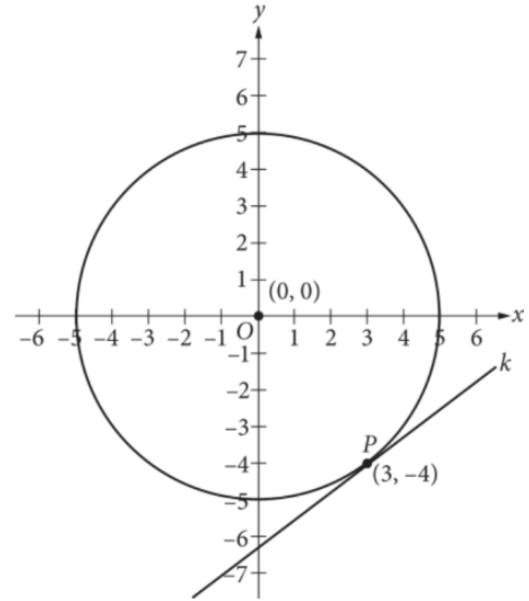


What is the median of the 19 values in the data set?

33

A bag contains only red, blue, and yellow marbles. If a marble is selected at random from this bag, the probability of selecting a yellow marble is 2 times the probability of selecting a blue marble, and the probability of selecting a yellow marble is 6 times the probability of selecting a red marble. What is the probability of selecting a blue marble? (Express your answer as a decimal or fraction, not as a percent.)

34



Line k is tangent to the circle with center O at point P as shown. What is the slope of line k ?

35

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

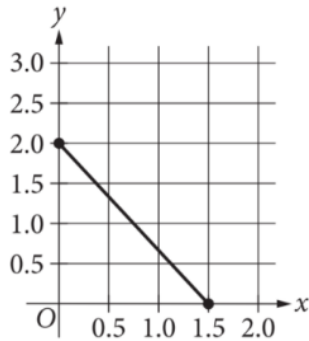
$$g(x) = 4x^2 - rx + 36$$

For the given functions f and g , r is a constant. If

$$f(x) \cdot g(x) = 4x^3 + 108, \text{ what is the value of } r?$$

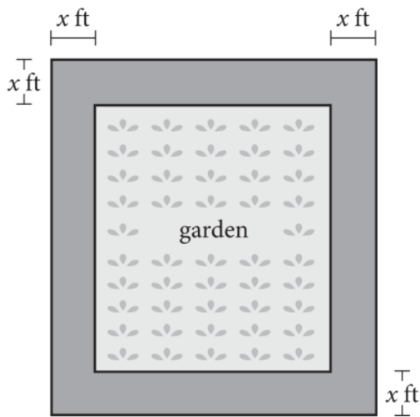


36



Line m is shown in the xy -plane, and the point with coordinates $(0.25, r)$ is on line m . What is the value of r ?

37



Note: Figure not drawn to scale.

The rectangular garden shown has a width of 50 feet and a length of 45 feet and is surrounded by a paved path with a uniform width of x feet. If the combined area of the garden and the paved path is 2646 square feet, what is the value of x ?

38

The population of a city in 2000 was 2.6 times its population in 1999. The population of this city increased by $p\%$ from 1999 to 2000. What is the value of p ?

STOP

If you finish before time is called, you may check your work on this section only. Do not turn to any other section.