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2020-12-Asia



Reading Test

65 MINUTES, 52 QUESTIONS

Turn to Section 1 of your answer sheet to answer the questions in this section.

DIRECTIONS

Each passage or pair of passages below is followed by a number of questions. After reading each passage or pair, choose the best answer to each question based on what is stated or implied in the passage or passages and in any accompanying graphics (such as a table or graph).

Questions 1-10 are based on the following passage.

This passage is from Anita Desai, *Translator Translated*. ©2011 by Anita Desai. The narrator is working on an English-language translation of a novel by Suvarna Devi, who wrote in Oriya, a language native to India. The narrator has just met with her editor, Tara.

Tara has not asked me a single question about my involvement with this language. I had been given no opportunity to explain how I came about it, what it meant to me and why, while teaching the usual, Line 5 accepted course of English literature in a women's college, I had maintained my commitment to it. I could have told her so much, so much—but was given no chance and so I had to keep the information withheld, a secret. No one knew what a weight that 10 exerted, one I longed to relieve.

But, getting off the bus and climbing the stairs to my room at the top, I found I could, in a quite miraculous way, unload myself of that weight. As soon as I took out the little paperback—its pages 15 were coming loose from the binding, I noticed—and pulled a piece of paper to me and began to translate the first line, it was as if I had been given a magic key that would open the rest.

'It started to rain. It was getting dark.'

20 But no—immediately I could see how blunt that looked, how lacking in spirit. Where was the music, the lilt of the original?

'Rain began to fall. The village was in darkness.'

Yes, and yes. How easy to see that these words 25 worked, the others did not. I hurried on, hurried while that sense lasted of what was right, what was

wrong, an instinct sometimes elusive which had to be courted and kept alert. Selecting, recognising, acknowledging. I was only the conduit, the medium 30 between that language and this—but I was the one doing the selecting, the discriminating, and I was the only one who could; the writer herself could not. I was interpreting the text for her because I had the power—too strong a word perhaps, but the ability, 35 yes. I was also the one who knew what she meant, what worlds her words evoked. They were not mine but they were my mother's. I barely remembered her or those earliest years spent in her lap; I only imagined I did. I was not sure if I had ever seen the 40 shefali tree's night-blooming flowers in the morning, or the pond where blue lotuses bloomed and intoxicated bumblebees buzzed, or heard the sound of cattle lowing as they made their way homewards at twilight, but at some subconscious level, I found I 45 knew them just as she did. Translating Suvarna Devi's words and text into English was not so different, I thought, from what she herself must have felt when writing them in her own language, which was, after all, a kind of translation too—from seeing 50 and hearing and feeling into syntax. And I, who had inherited the language, understood it and understood her in a way no one else could have done, by instinct and empathy. The act of translation brought us together as if we were sisters—or even as if we were 55 one, two compatible halves of one writer.

Of course there were instances—small stumbles—when I could not find the exact word or phrase. In Suvarna Devi's language, each word conjured a whole world; the English equivalent, I had

60 to admit, did not. Cloud, thunder, rain. Forest and pool. Rooster and calf. How limited they sounded if they could not evoke the scene, its sounds and scents—images without shadows. Perhaps an adjective was needed. Or two, or three.

65 I tried them out. In the original, adjectives were barely used, but I needed them to make up for what was lost in the translation. Of course I could see that restraint was called for, I had to hold fast. Not too fast, though. A middle way. A golden mean.

70 I laughed out loud and struck my forehead with my hand to think of all the different strains and currents of my life and how they were coming into play. I had never felt such power, never had such power, such joy in power. Or such confusion.

75 I stopped only when I became aware it was night outside, the crows silent, the street lights burning, the traffic thinning, its roar subsiding into a tired growl. The television set in my landlady's flat was turned on, the evening soap opera at full volume—and I 80 hadn't even noticed it earlier.

1

In context of the passage as a whole, the first paragraph mainly serves to

- A) convey the intensity of the narrator's relationship to Oriya.
- B) portray the narrator's frustration with the translation process.
- C) establish that the narrator is fluent in both Oriya and English.
- D) highlight the narrator's reaction to her editor's attitude toward translation.

2

Which choice best supports the idea that the narrator is aware that her translations are influenced by subjective impressions?

- A) Lines 6-10 ("I could . . . relieve")
- B) Lines 17-18 ("it was . . . rest")
- C) Lines 25-28 ("I hurried . . . alert")
- D) Lines 36-39 ("They . . . did")

3

Based on the passage, what does the narrator believe about certain experiences she associates with her mother?

- A) It is not important whether the narrator herself actually had them.
- B) They are more tangible to her than are physical objects her mother gave her.
- C) The worlds that those experiences conjure are fading from the narrator's memory.
- D) She cannot be certain that those experiences meant as much to her mother as they do to her.

4

In context, the description in lines 19-23 mainly serves to reveal

- A) unusually high standards that the narrator sets for herself as a translator.
- B) numerous liberties the narrator takes with Devi's text in the process of translation.
- C) awareness of the narrator that Oriya words can have contradictory meanings.
- D) process the narrator goes through as she works to translate Devi's text.

5

As used in line 34, "strong" most nearly means

- A) tough.
- B) extreme.
- C) fierce.
- D) durable.

6

- Which point does the narrator make about Oriya?
- A) It is easier to appreciate than to master.
 - B) It is more evocative than the English language.
 - C) It is more difficult to learn than other Indian languages.
 - D) It is easier to translate than other Indian languages.

7

- The passage suggests that the narrator most likely views the incorporation of adjectives in her translation of Suvarna Devi's novel as
- A) a technique to be employed judiciously.
 - B) a strategy that translators mostly avoid.
 - C) an action that Devi would condone.
 - D) a solution that she might regret.

8

- Which choice provides the best evidence for the answer to the previous question?
- A) Lines 61-63 ("How limited . . . shadows")
 - B) Lines 63-64 ("Perhaps . . . three")
 - C) Lines 65-67 ("In the . . . translation")
 - D) Lines 67-69 ("Of course . . . though")

9

- As used in line 67, the phrase "lost in the translation" most nearly refers to a meaning that has been
- A) disordered.
 - B) misplaced.
 - C) obscured.
 - D) squandered.

10

- The last paragraph of the passage mainly serves to
- A) suggest that the conditions under which the narrator lives impede her work.
 - B) convey the quietness the narrator needs to work most efficiently.
 - C) illustrate how absorbed the narrator is when she is engaged in her work.
 - D) confirm that the narrator devotes nearly all her time to her work.

Questions 11-21 are based on the following passage and supplementary material.

This passage is adapted from Mario Livio, *Why? What Makes Us Curious*. ©2017 by Mario Livio.

Research has suggested that curiosity in children is often related to the discovery of the causal relationships that govern the child's environment. If Line 5 this inference is correct, however, then it also makes 5 for a very clear and interesting prediction: children's curiosity should especially be piqued by and focused on exploring those situations in which their expectations are violated. This prediction can be tested by examining how exploration and learning 10 are affected when the observed evidence contradicts prior beliefs.

Elizabeth Bonawitz, Laura Schulz, and their colleagues attempted to do precisely that through a series of extensive studies. In one carefully planned 15 experiment, the researchers asked children to scrutinize nine *asymmetric* blocks of Styrofoam that could be stabilized on a balancing rod. In an initial "belief-classification" task, the researchers closely observed whether the children were attempting to 20 balance the blocks at the *geometric center* of their base, in the middle of the base of the block, or at their perceived *center of mass*, closer to the heavier end. The experimenters took hold of the block just before the children could stably set it on the post so that the 25 children did not get a chance to actually see whether or not the block was balanced. In this way, the researchers created a group of children (with a mean age of six years and ten months) with a known prior bias toward the geometric center as the balancing 30 point, and a group of somewhat older, more experienced children (mean age of seven years and five months) with a prior belief in the center of mass as a balancing spot. They also had a group of younger children (mean age of five years and two months) 35 who had no prior "theory" about the balancing point and who therefore tended to balance blocks simply by trial and error.

In the second stage, all the groups were shown blocks that appeared to be in perfect equilibrium on 40 the rod. That, however, is when things started to get interesting. Children with "geometric center" and "center of mass" theories who were shown identical, balanced configurations explored the blocks differently, depending on their prior beliefs. When 45 the children were shown a block balanced at its center of mass (consistent to the center-of-mass

"theorists" but belief-violating to the geometric-center "theorists"), those who had their belief defied spent more time exploring the block, while the others 50 preferred to examine a new toy. The behavior of the two groups that had prior theories was reversed when the block was balanced at its geometric center. The children who had no prior theory always preferred the new, untried item, irrespective of the 55 evidence presented to them.

In related experiments, the researchers showed the children that the precisely balanced blocks were actually held in their place by a magnet. The reactions of the different groups were again 60 interesting. Both the geometric-center group and the center-of-mass group used the new element—the magnet—in an attempt to explain the evidence, but only in those cases in which their prior beliefs had been at odds with the new observations. That is, 65 geometric-center theorists who saw the block balanced at its center of mass concluded that this was only because the block was held in place by the magnet. The same was true for center-of-mass believers who were presented with a block balanced 70 at its geometric center. Moreover, in experiments in which the presence of the magnet was not revealed, the children used the new evidence of the belief-violating balanced block as a motivating force to rethink and revise their predictions. They did not feel 75 compelled to change their beliefs if an auxiliary explanation (in this case, the presence of the magnet) was available.

Table 1
Block vs. New Toy Playing Time by Child's Balance Theory and Block's Balance Position

Child's balance theory	Block balance position	Block playtime (seconds)	New toy playtime (seconds)
Geometric center	Geometric center	23.8	30.1
	Center of mass	33.4	15.1
Center of mass	Geometric center	38.0	21.1
	Center of mass	25.0	29.9

A magnet held the blocks in place.

Table 2

Features of Explanations for the Block Balance Positions Offered by Children Having the Geometric Center Balance Theory and Aware of the Magnet

Block balance position	Percentage of explanations for balance position involving the feature			
	Magnet	Geometric center	Center of mass	Other
Geometric center	19	50	6	25
Center of mass	63	0	25	13

A magnet held the blocks in place.

Tables adapted from Elizabeth Baraff Bonawitz et al., "Children Balance Theories and Evidence in Exploration, Explanation, and Learning." ©2011 by Elsevier Inc.

13

It can reasonably be inferred from the passage that in designing the first task of the first experiment, Bonawitz and Schulz's team took steps to ensure that the

- A) children's initial beliefs about how to balance the block were not undermined.
- B) blocks were constructed in shapes that were unfamiliar to the children.
- C) youngest children were given additional time to investigate the blocks.
- D) children's ages correlated with the balance theory they held.

14

Which choice best supports the claim that children are less inclined to investigate phenomena that conform to their expectations?

- A) Lines 38-40 ("In the . . . rod")
- B) Lines 41-44 ("Children . . . beliefs")
- C) Lines 44-50 ("When . . . toy")
- D) Lines 53-55 ("The children . . . them")

15

The sentence in lines 40-41 ("That . . . interesting") mainly serves to

- A) imply that the first stage of the first experiment was unnecessary.
- B) introduce a difference in procedure that affected results.
- C) suggest that the tasks increased in complexity.
- D) signal a transition toward discussing significant findings.

11

- As used in line 3, "govern" most nearly means
- A) supervise.
 - B) shape.
 - C) restrain.
 - D) command.

12

- Based on the passage, one important difference between the first task of the first experiment (lines 17-37) and the related experiments (lines 56-77) is that in the related experiments
- A) the researchers made their observations over an extended period of time.
 - B) children were isolated from peers and did not interact with the researchers.
 - C) children were asked to explain what they had observed.
 - D) the results did not support the researchers' original hypotheses.

16

As used in line 59, “reactions” most nearly means

- A) responses.
- B) receptions.
- C) acknowledgments.
- D) backlashes.

17

It can reasonably be inferred from the passage that withholding information that explains an unexpected outcome can

- A) lead to inconclusive results in experiments involving children.
- B) drive children to develop new and different ideas.
- C) be difficult to achieve with older, more inquisitive children.
- D) encourage children to collaborate with others.

18

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

- A) Lines 56-58 (“In related . . . magnet”)
- B) Lines 60-64 (“Both . . . observations”)
- C) Lines 68-70 (“The same . . . center”)
- D) Lines 70-74 (“Moreover . . . predictions”)

19

According to table 1, which combination of a child’s balance theory and block balance position resulted in the most block playtime?

- A) Geometric-center theory and geometric-center position
- B) Geometric-center theory and center-of-mass position
- C) Center-of-mass theory and geometric-center position
- D) Center-of-mass theory and center-of-mass position

20

The data in table 1 best support the statement that children whose balance theory

- A) matched the block’s balance position played with the block for longer than they played with the new toy.
- B) matched the block’s balance position played with the new toy for longer than they played with the block.
- C) did not match the block’s balance position played with the new toy for longer than they played with the block.
- D) did not match the block’s balance position played with the block and the new toy for equal lengths of time.

21

According to table 2, when the block was balanced at the geometric center, what percentage of children’s explanations for the balance position involved the center of mass?

- A) 0
- B) 6
- C) 25
- D) 50

Questions 22-32 are based on the following passage and supplementary material.

This passage is adapted from Elizabeth Preston, "Bacteria Help Pitcher Plants Trap Prey." ©2016 by Kalmbach Publishing Co.

Pity the insect that tumbles into a pitcher plant's trap. The slippery walls and waiting pool of water ensure it won't clamber back out. There's nothing left to do but wait to be digested.

Line 5 The California pitcher plant (*Darlingtonia californica*) is also called the cobra lily for its curled-over shape that hides its exit from its victims. Unlike other pitcher plants, it doesn't fill its trap from above with rainwater but from below, drawing 10 water up with its roots. But like others, it seems to use bacteria living in that well to help digest its prey.

The bacteria perform another role too: making the liquid even harder for an insect to escape than ordinary water.

15 Nearly a century ago, scientists first noticed that the water in the traps of some pitcher plant species had unusually low surface tension. This means an insect that's used to safely tiptoeing across puddles suddenly finds itself drowning inside a pitcher plant.

20 But the reason for this extra-deadly water wasn't clear. In 2007, Laurence Gaume and Yoel Forterre of France's CNRS (French National Centre for Scientific Research) studied the liquid of the pitcher plant *Nepenthes rafflesiana* and found that it has 25 so-called viscoelastic properties. This means "the power of gluing insects," Gaume explains, and of forming watery filaments that cling to a struggling bug.

Inspired by that research, David Armitage, a 30 graduate student at the University of California, Berkeley, wondered whether some of the unusual properties of a pitcher plant's liquid might come from the bacteria residing there.

He gathered water from six *D. californica* wells 35 and measured the liquid's surface tension. It was significantly lower than the surface tension of plain water.

Then Armitage filtered the bacteria out of these 40 fluids and used them to create artificial pitcher plant traps in the lab. He started with glass tubes and added sterile water and small amounts of pitcher

bacteria, along with ground-up crickets to feed the bacteria. The resulting fluids had similar surface tension to the natural pitcher plant fluids. After 45 leaving the tubes alone for a month, Armitage dropped ants into them.

No ants in plain water fell below the surface. Ants in pitcher fluids, or artificial pitcher fluids, mostly sank. But as Armitage made the artificial 50 pitcher fluids using smaller and smaller concentrations of bacteria, the ants became more likely to escape.

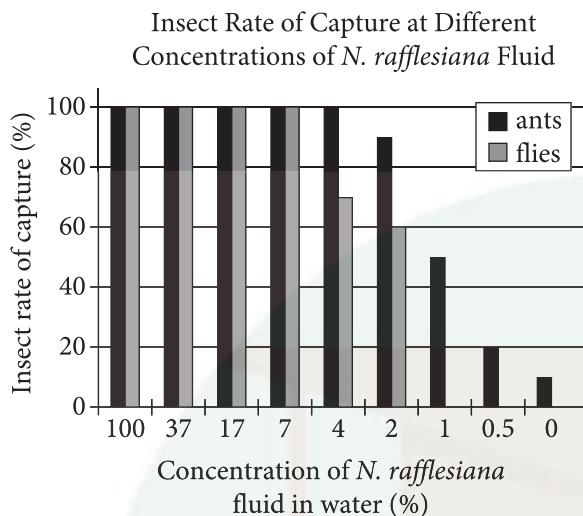
Gaume, who didn't work on Armitage's study, says this convincingly shows that pitcher plant 55 bacteria help to keep prey from escaping. She notes that the fluid of *D. californica* doesn't have all the sticky properties of the *N. rafflesiana* fluid she studied, though; different pitcher plant species may use different sets of tricks to hold onto their victims. 60 And, Gaume adds, it's still possible that the plant itself makes a liquid with low surface tension.

There are about 200 to 500 species of bacteria present in pitcher plant fluid, says Armitage, who's now at the University of Notre Dame. "A few 65 common species seem to be members of groups known to produce compounds that affect the surface tension of their medium," he says, but it will take more research to figure out exactly which bacteria make the water so dangerous.

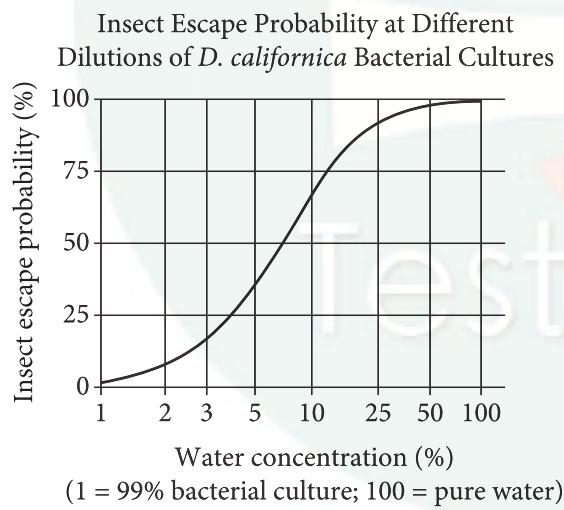
70 "Alternatively," Armitage adds, the low surface tension could be simply a side effect of the bacteria digesting bugs in the traps, "as fatty oils from the insect corpses are released into the water column."

Either way, the partnership between pitcher plants 75 and their resident bacteria seems to run deep.

Carnivorous plants don't necessarily work alone, and the cobra lily relies on microscopic partners for its deadly bite.

Figure 1

Adapted from Laurence Gaume and Yoel Forterre, "A Viscoelastic Deadly Fluid in Carnivorous Pitcher Plants." ©2007 by Laurence Gaume and Yoel Forterre.

Figure 2

Adapted from David W. Armitage, "Bacteria Facilitate Prey Retention by the Pitcher Plant *Darlingtonia californica*." ©2016 by David W. Armitage.

22

In the first paragraph, the word “pity” (line 1) and the phrase “nothing left to do” (lines 3-4) serve mainly to

- A) underscore the idea that insects that fall into pitcher plants’ traps have almost no chance of survival.
- B) emphasize the point that pitcher plants’ dependence on insects as a food source makes them vulnerable.
- C) create an image of the pitcher plant as a relatively ineffective predator of insects.
- D) suggest that pitcher plants are sometimes harmed by the insects in their traps.

23

According to the passage, what feature of the California pitcher plant’s trap is unique among pitcher plants?

- A) It emits a scent that attracts insects.
- B) It fills with water collected by the plant’s roots.
- C) It holds a pool of water.
- D) It is where the plant collects its prey.

24

Which choice provides the best evidence that some insects are able to walk across liquids that have a certain surface tension?

- A) Lines 12-14 ("The bacteria . . . water")
- B) Lines 15-17 ("Nearly . . . tension")
- C) Lines 17-19 ("This . . . plant")
- D) Lines 34-37 ("He gathered . . . water")

25

In context, the sentence in lines 25–28 (“This . . . bug”) mainly serves to

- A) clarify what the viscoelastic properties of pitcher plants are.
- B) suggest that viscoelastic properties can vary depending on the type of plant.
- C) challenge the previous understanding of how viscoelastic properties function.
- D) introduce previously unknown findings about viscoelastic properties in pitcher plants.

26

In the fifth paragraph (lines 29–33), the main focus of the passage shifts from

- A) an overview of a scientific subject to a discussion of a single study on that subject.
- B) a chronological report of previous research in a scientific field to a recommendation for future research in that field.
- C) a description of a species to a scientific explanation of how that species developed particular characteristics.
- D) a summary of an influential scientific study to a critique of that study’s findings.

27

As used in line 39, “artificial” most nearly means

- A) exaggerated.
- B) misleading.
- C) forced.
- D) fabricated.

28

It can most reasonably be inferred from the passage that increasing the concentration of bacteria in California pitcher plant fluid would

- A) cause the fluid to become less toxic to an insect in the plant’s trap.
- B) decrease the total amount of fluid that the plant’s trap could hold.
- C) make it more difficult for an insect to free itself from the plant’s trap.
- D) lower the viscoelastic properties of the fluid in the plant’s trap.

29

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

- A) Lines 43–46 (“The resulting . . . them”)
- B) Lines 49–52 (“But . . . escape”)
- C) Lines 58–59 (“different pitcher . . . victims”)
- D) Lines 76–78 (“Carnivorous . . . bite”)

30

Which conclusion is supported by the data in figure 1?

- A) Ants were captured at a lower rate than flies for all concentrations of *N. rafflesiana* fluid.
- A) Ants were captured at approximately twice the rate of flies when *N. rafflesiana* fluid concentrations were below 7 percent.
- A) Flies were captured at the same rate as ants when *N. rafflesiana* fluid concentrations were at 2 percent or higher.
- A) Flies were captured at a lower rate than ants when *N. rafflesiana* fluid concentrations were at 4 percent or less.

31

According to figure 2, in which water concentration is the insect escape probability closest to 75 percent?

- A) 3 percent
- B) 5 percent
- C) 10 percent
- D) 25 percent

32

Which statement about the fluid of *N. rafflesiana* pitcher plants is supported by information in both the passage and figure 1?

- A) Its surface tension is similar to that of the fluid of California pitcher plants.
- B) It has been shown to capture insects even when it is mixed with relatively large amounts of water.
- C) It contains the same bacteria as the fluid of California pitcher plants.
- D) It has been found to have properties that make escape difficult for insects.

Questions 33-42 are based on the following passage.

This passage is adapted from the acceptance speech of Rigoberta Menchú Tum for the 1992 Nobel Peace Prize. ©1992 by the Nobel Foundation. Menchú is a political activist and member of the K'iche', an indigenous people of Guatemala.

The Earth is the root and the source of our culture. She keeps our memories, she receives our ancestors and she, therefore, demands that we honor her and return to her, with tenderness and respect,
 Line 5 those goods that she gives us. We have to take care of her so that our children and grandchildren may continue to benefit from her. If the world does not learn now to show respect to nature, what kind of future will the new generations have?

10 From these basic features [are derived] rights and obligations in the American Continent, for the indigenous people as well as for the non-indigenous, whether they be racially mixed, blacks, whites or Asian. The whole society has an obligation to show
 15 mutual respect, to learn from each other and to share material and scientific achievements. The indigenous peoples never had, and still do not have, the place that they should have occupied in the progress and benefits of science and technology, although they
 20 represented an important basis for this development.

If the indigenous civilization and the European civilizations could have made exchanges in a peaceful and harmonious manner, without destruction, exploitation, discrimination and poverty, they could,
 25 no doubt, have achieved greater and more valuable conquests for Humanity.

Let us not forget that when the Europeans came to America, there were flourishing and strong civilizations there. One cannot talk about a
 30 "discovery of America", because one discovers that which one does not know about, or that which is hidden. But America and its native civilizations had discovered themselves long before the fall of the Roman Empire and Medieval Europe. The
 35 significance of its cultures forms part of the heritage of humanity and continues to astonish the learned.

I think it is necessary that the indigenous peoples, of which I am a member, should contribute their science and knowledge to human development,
 40 because we have enormous potential and we could combine our very ancient heritage with the achievements of European civilization as well as with civilizations in other parts of the world.

But this contribution, that to our understanding is
 45 a recovery of the natural and cultural heritage, must take place based on a rational and consensual basis in respect of the right to make use of knowledge and natural resources, with guarantees for equality between Government and society.

50 We the indigenous are willing to combine tradition with modernism, but not at any cost. . . .

At a time when the commemoration of the Fifth Centenary of the arrival of Columbus in America has repercussions all over the world, the revival of hope
 55 for the oppressed indigenous peoples demands that we reassert our existence to the world and the value of our cultural identity. It demands that we endeavor to actively participate in the decisions that concern our destiny, in the building-up of our
 60 countries/nations. Should we, in spite of all, not be taken into consideration, there are factors that guarantee our future: struggle and endurance; courage; the decision to maintain our traditions that have been exposed to so many perils and sufferings;
 65 solidarity towards our struggle on the part of numerous countries, governments, organizations and citizens of the world.

That is why I dream of the day when the relationship between the indigenous peoples and
 70 other peoples is strengthened; when they can combine their potentialities and their capabilities and contribute to make life on this planet less unequal, a better distribution of the scientific and cultural treasures accumulated by Humanity, flourishing in
 75 peace and justice.

33

Based on the passage, Menchú's perspective is best described as being that of someone who

- A) regards the values of indigenous cultures as consistent with the values of nonindigenous cultures.
- B) considers her personal experience to be representative of life in indigenous communities.
- C) prefers indigenous customs from the past to such customs in the present.
- D) identifies with indigenous peoples and speaks on their behalf.

34

The first paragraph of the passage mainly serves to

- A) position stewardship of the natural world as a responsibility that people alive today have toward future generations.
- B) draw a parallel between how the natural world sustains humans and how people alive today provide for future generations.
- C) argue that for people alive today, ensuring the economic prosperity of future generations is more important than conserving the natural world.
- D) compare the respect that people alive today feel for the natural world to their regard for future generations.

35

In the passage, Menchú points to the discrepancy between the significance of the contributions that indigenous American societies have made to science and the

- A) lack of present-day awareness of those contributions among some indigenous Americans.
- B) lesser significance of the contributions indigenous Americans have made to fields other than science.
- C) reluctance of nonindigenous people in the Americas to accept those contributions and improve upon them.
- D) insufficient access that indigenous Americans have to the advantages resulting from those contributions.

36

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

- A) Lines 10-16 (“From . . . achievements”)
- B) Lines 16-20 (“The indigenous . . . development”)
- C) Lines 34-36 (“The significance . . . learned”)
- D) Lines 37-43 (“I think . . . world”)

37

According to Menchú, the mutually beneficial sharing of ideas and technologies between Europeans and indigenous Americans would likely have had which positive effect?

- A) Fostering a state of peace among other world cultures
- B) Lessening the inequality that characterized European and indigenous societies alike
- C) Advancing the progress of human civilization as a whole
- D) Compensating for the shortcomings of civilizations elsewhere in the world

38

In lines 30 and 33, the use of the related words “discovery,” “discovers,” and “discovered” mainly serves to

- A) stress that a common conception of Europeans’ arrival in the Americas fails to acknowledge the sophistication and knowledge attained by ancient American civilizations.
- B) suggest similarities between how Europeans conducted scientific inquiry in the Americas and how the ancient American civilizations conducted their own scientific inquiry.
- C) imply that European civilizations and indigenous American civilizations alike misunderstood the true nature of scientific discovery.
- D) characterize the development of indigenous civilizations in the Americas as a precursor of the colonization of the Americas by Europeans.

39

Based on the passage, which condition would best satisfy Menchú's reservations about future contributions of the indigenous heritage to modern civilization?

- A) Nonindigenous populations compensate indigenous communities for their losses in the past.
- B) Legislation is enacted ensuring that a national government does not exercise disproportionate authority over the indigenous communities in that nation.
- C) The costs of recovering the indigenous cultural heritage are borne primarily by the nonindigenous members of society.
- D) Greater priority is placed on recovering indigenous peoples' art and language than on recovering their potentially valuable scientific knowledge.

40

Which choice provides the best evidence that in Menchú's opinion, the current historical moment is favorable for indigenous Americans' public affirmation of their heritage?

- A) Lines 50-51 ("We the . . . cost")
- B) Lines 52-57 ("At a . . . identity")
- C) Lines 57-60 ("It demands . . . countries/nations")
- D) Lines 68-75 ("That is . . . justice")

41

Based on the passage, Menchú would most strongly agree that indigenous Americans must strike a balance between which two priorities?

- A) Honoring the beliefs of their ancestors and encouraging present-day intellectual and scientific inquiry in their communities
- B) Demanding that injustices done to their communities be rectified by national governments and improving relations with those governments
- C) Promoting the interests of their own communities and advocating on behalf of oppressed groups of nonindigenous people
- D) Preserving the distinctive cultural identity of their communities and engaging in cultural exchange with nonindigenous peoples

42

As used in line 63, "decision" most nearly means

- A) resolve.
- B) consequence.
- C) preference.
- D) settlement.

Questions 43-52 are based on the following passages.

Passage 1 is adapted from Kelly Dickerson, "Earth's Magnetic Field Flip Could Happen Sooner Than Expected." ©2014 by LiveScience, a TechMediaNetwork company. Passage 2 is adapted from Ronald T. Merrill, *Our Magnetic Earth: The Science of Geomagnetism*. ©2010 by The University of Chicago.

Passage 1

Earth's magnetic field, which protects the planet from huge blasts of solar radiation, has been weakening over the past six months, according to *Line* data collected by a European Space Agency (ESA) 5 satellite array called Swarm.

The biggest weak spots in the magnetic field—which extends 370,000 miles (600,000 kilometers) above the planet's surface—have sprung up over the Western Hemisphere, while the field has 10 strengthened over areas like the southern Indian Ocean, according to the magnetometers onboard the Swarm satellites—three separate satellites floating in tandem.

The scientists who conducted the study are still 15 unsure why the magnetic field is weakening, but one likely reason is that Earth's magnetic poles are getting ready to flip, said Rune Floberghagen, the ESA's Swarm mission manager. In fact, the data suggest magnetic north is moving toward Siberia. 20 "Such a flip is not instantaneous, but would take many hundred if not a few thousand years," Floberghagen told Live Science. "They have happened many times in the past."

Scientists already know that magnetic north shifts. 25 Once every few hundred thousand years the magnetic poles flip so that a compass would point south instead of north. While changes in magnetic field strength are part of this normal flipping cycle, data from Swarm have shown the field is starting to 30 weaken faster than in the past. Previously, researchers estimated the field was weakening about 5 percent per century, but the new data revealed the field is actually weakening at 5 percent per decade, or 10 times faster than thought. As such, rather than the 35 full flip occurring in about 2,000 years, as was predicted, the new data suggest it could happen sooner.

Passage 2

Let's consider the evidence a few twenty-first-century scientists have given that we are in the initial 40 stages of a magnetic field reversal. The dipole field¹ is

estimated to have decreased by 30 percent during the past 2,000 years. This decrease has recently accelerated, as evidenced by a 6 to 7 percent decrease in the intensity of the dipole field during the past 45 century. It has been 780,000 years since the last reversal, while the mean time between reversals for the past 25 million years is around 250,000 years. We are overdue for a reversal, or so the proponents claim. These sound like compelling arguments, don't 50 they? Why then do scientists like me urge caution?

Suppose you flipped a fair coin many times, and it just happened to come up heads several times in a row. What is the probability that the next time you flip the coin it will come up heads? If it is a fair coin. 55 as assumed, the answer is 50 percent. The coin does not know its past history. Although the statistical analysis used is different when treating reversals from that used in treating the multiple flips of a coin. Earth's magnetic field essentially also does not know 60 its past history. The present magnetic field does not know what polarity it had 50,000 years ago, let alone what it did 780,000 years ago. The conclusion that we are overdue for a reversal does not imply that the probability for a reversal has increased.

65 Earth's magnetic field has exhibited many variations in intensity. The recent intensity has been either average or above average for the past million years. Many times in the past, it has been significantly lower and no reversals followed. For 70 example, it was about 40 percent lower than today's field 6,000 years ago.

Because the field is almost always increasing or decreasing, the trick is to figure out some way to tell when any particular decrease might lead to a reversal. 75 Paleomagnetists are investigating various properties of the nondipole field and possible relationships of it to the dipole field to determine if they can reasonably predict when the next reversal will come.

Unfortunately, we only poorly know the character of 80 the nondipole field preceding or during a magnetic field reversal. Thus, no one has been able to produce a viable method of predicting reversals. For that matter, it is not clear that we can ever predict a reversal much before it happens. It may be a little like

85 trying to forecast weather months in advance when conditions of deterministic chaos apply. Nevertheless, changes in Earth's magnetic field, including reversals, will almost certainly occur in the future.

¹ The portion of the magnetic field with opposing north and south poles

43

According to Passage 1, the Swarm satellite array has detected which recent change in Earth's magnetic field?

- A) The field as a whole has been alternately weakening and strengthening in six-month intervals.
- B) The field has weakened over some areas of Earth and has strengthened over some other areas of Earth.
- C) The distance that the field extends above Earth's surface has decreased by nearly half.
- D) The amount of solar radiation that the field allows to reach Earth's surface has been steadily decreasing.

44

Information in Passage 1 best supports which statement about flips of Earth's magnetic field?

- A) They generally follow decreases in field strength, but some flips may have followed increases in field strength.
- B) They are known to be associated with variations in field strength, but that relationship is not fully understood.
- C) They sometimes occur during periods of steady field strength, but scientists have not determined why.
- D) They were once thought to be correlated with changes to field strength, but recent findings have weakened that view.

45

In conjunction with lines 27-30 ("While . . . past"), which choice provides the best evidence for the answer to the previous question?

- A) Lines 14-18 ("The scientists . . . manager")
- B) Lines 20-23 ("Such . . . past")
- C) Line 24 ("Scientists . . . shifts")
- D) Lines 25-27 ("Once . . . north")

46

As used in line 32, "revealed" most nearly means

- A) discovered.
- B) confided.
- C) demonstrated.
- D) betrayed.

47

The main purpose of the first paragraph of Passage 2 is to

- A) describe a scientific consensus that the author helped to establish but now rejects.
- B) provide an overview of data that the author has collected to test his hypothesis.
- C) present several pieces of evidence that the author will show to be inaccurate.
- D) summarize information used in support of a claim that the author will challenge.

48

- As used in line 82, “produce” most nearly means
- A) provoke.
 - B) devise.
 - C) fund.
 - D) disclose.

49

- Which choice best describes the relationship between the two passages?
- A) Passage 2 offers a method for evaluating the likelihood of an event described in Passage 1.
 - B) Passage 2 criticizes a common misunderstanding of the theory proposed in Passage 1.
 - C) Passage 2 calls into question the accuracy of the data discussed in Passage 1.
 - D) Passage 2 casts doubt on interpretations of evidence like the one presented in Passage 1.

50

- The author of Passage 2 would most likely respond to the suggestion made in lines 34–37, Passage 1 (“As such . . . sooner”) by arguing that
- A) even a large decrease in the strength of Earth’s magnetic field would not guarantee a magnetic field reversal.
 - B) the probability that the magnetic field will continue to weaken for the next few thousand years is very low.
 - C) estimates of the extent of the overall weakening in Earth’s magnetic field have been exaggerated.
 - D) a credible prediction for a magnetic field reversal would require observations made over a very long period of time.

51

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

- A) Lines 42-45 (“This . . . century”)
- B) Lines 56-60 (“Although . . . history”)
- C) Lines 66-71 (“The recent . . . years ago”)
- D) Lines 79-81 (“Unfortunately . . . reversal”)

52

It can reasonably be inferred from the passages that Floberghagen (Passage 1) and the author of Passage 2 would disagree about the answer to which question?

- A) Can the consequences of a magnetic field reversal be accurately predicted?
- B) Can scientists confidently identify the long-term frequency of magnetic field reversals?
- C) Is there good reason to expect a magnetic field reversal relatively soon?
- D) Is there sufficient evidence to say that magnetic field reversals are linked in some way to changes in field strength?



STOP

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

Writing and Language Test

35 MINUTES, 44 QUESTIONS

Turn to Section 2 of your answer sheet to answer the questions in this section.

DIRECTIONS

Each passage below is accompanied by a number of questions. For some questions, you will consider how the passage might be revised to improve the expression of ideas. For other questions, you will consider how the passage might be edited to correct errors in sentence structure, usage, or punctuation. A passage or a question may be accompanied by one or more graphics (such as a table or graph) that you will consider as you make revising and editing decisions.

Some questions will direct you to an underlined portion of a passage. Other questions will direct you to a location in a passage or ask you to think about the passage as a whole.

After reading each passage, choose the answer to each question that most effectively improves the quality of writing in the passage or that makes the passage conform to the conventions of standard written English. Many questions include a “NO CHANGE” option. Choose that option if you think the best choice is to leave the relevant portion of the passage as it is.

Questions 1-11 are based on the following passage.

Driving Innovation

In May of 2015, Jacqueline Chen could be seen at the National Science Bowl, a nationwide science and math competition, delivering a speech on how 1 research on turbulent flow can improve engine efficiency? Chen is a mechanical engineer who first became interested in turbulent flow—irregular fluctuations in the pressure and velocity of a liquid or gas—as a college student. Today, she is the founding director of an interdisciplinary team leading research in this area.

1

- A) NO CHANGE
- B) research on turbulent flow can improve engine efficiency.
- C) can research on turbulent flow improve engine efficiency.
- D) can research on turbulent flow improve engine efficiency?

Modeling turbulent flow is important for understanding a number of complicated **2** systems, these include the flow of air in the atmosphere, the circulation of blood in the body, and the behavior of fuel and air in engines. **3** Chen uses computers in her work, which draws on computer science, mathematics, and chemistry to create computer simulations of the reactions that take place in internal combustion engines. Such engines, which are found in automobiles, airplanes, and power plants, rapidly mix a liquid or gaseous fuel with air and combust it to produce mechanical energy. With more precise models of the movement and interactions of fluids in engines, Chen and her team can help improve the design of these engines to reduce the buildup of pollutants in a system and increase the amount of usable energy they produce.

2

- A) NO CHANGE
- B) systems, included are
- C) systems include
- D) systems, including

3

Which choice provides the most effective transition from the previous sentence?

- A) NO CHANGE
- B) The US Department of Energy has provided funding for Chen's research,
- C) The last of these systems is the focus of Chen's research,
- D) Manufacturers stand to benefit from Chen's work,

4 The type of work Chen does has only recently become possible. While scientists have long understood the mathematics underlying turbulent 5 flow. They needed powerful supercomputers to apply that knowledge to real-world problems. As Chen puts it, “The basic equations governing flow and chemistry have been known for over a century. However, the ability to solve them—really solve them, in practical regimes and with chemical realism—is relatively new.” Key to this new capability are petascale computers, which are capable of performing one quadrillion (one million billion) calculations per second. With turbulent flow models that utilize petascale computing, Chen and her team hope to improve the design of combustion 6 engines that they are as much as 50 percent more efficient than 7 prevailing engines.

4

Which choice most clearly leads into the discussion in the paragraph?

- A) NO CHANGE
- B) Scientists have developed several other methods—such as turbocharging and direct fuel injection—for enhancing the efficiency of combustion engines.
- C) The electrical engineer Seymour Cray designed some of the first supercomputers in the 1960s.
- D) Chen’s mastery of complex mathematics has been increasingly important for her research.

5

- A) NO CHANGE
- B) flow, they
- C) flow and they
- D) flow; they

6

- A) NO CHANGE
- B) engines and that
- C) engines so that
- D) engines, in which

7

- A) NO CHANGE
- B) ongoing
- C) existing
- D) surviving

In addition to being a science innovator, Chen **8** traces her fascination with chemical processes to her childhood. She encourages young people, young women in particular, to take math and science courses and learn a computer programming language. She believes that **9** doing so can help make science **10** apart of everyday life, expanding its ability to improve society. Throughout her work, Chen has done, and continues to do, precisely that: **11** helping her fellow citizens understand the complexities of mechanical engineering.

8

Which choice most effectively sets up the next sentence?

- A) NO CHANGE
- B) is an advocate for STEM (science, technology, engineering, and mathematics) fields.
- C) serves as a member of the board of directors of the Combustion Institute.
- D) is sensitive to the difficulty many nonscientists have understanding scientific language.

9

- A) NO CHANGE
- B) it
- C) doing so, that is, taking the aforementioned steps,
- D) undertaking the things she encourages young people to do

10

- A) NO CHANGE
- B) apart of every day
- C) a part of everyday
- D) a part of every day

11

Which choice most effectively concludes the passage?

- A) NO CHANGE
- B) illustrating the success one can achieve as a scientist by working diligently and collaborating with others.
- C) enhancing the reputation of the US automotive and airline industries by making their engines more competitive worldwide.
- D) using advances in technology and scientific research to help create the clean, efficient combustion processes of tomorrow.

Questions 12-22 are based on the following passage.

The Truth about Nonfiction

In 1972, the journalist Tom Wolfe wrote an article for *New York* magazine entitled “The Birth of ‘The New Journalism,’” describing the ways he and his contemporaries had departed from conventional news reporting. The practitioners of “New Journalism,” Wolfe explained, sought not only to relay information but also to entertain readers by incorporating literary features—such as dialogue, sensory detail, and dramatic tension—more characteristic of fiction than of traditional journalism.

12 These literary features are now used by many writers of nonfiction. Mainstream journalists and critics accused Wolfe and his peers of concocting scenes and

13 dialogue merely for the purpose of the articles being more interesting. Wolfe vehemently retorted that by grounding their descriptions in exhaustive research, the New Journalists offered rich, truthful narratives about their subjects’ emotional lives.

12

Which choice most effectively introduces the paragraph?

- A) NO CHANGE
- B) What purpose did these literary features serve?
- C) Not everyone approved of Wolfe’s approach.
- D) What reactions did New Journalism elicit from readers?

13

- A) NO CHANGE
- B) dialogue merely to make their articles more compelling.

C) dialogue merely to make their articles more compelling by using made-up material.

D) dialogue, asserting that the New Journalists were merely making up material so their articles would be more compelling and interesting.

While the pioneers of New Journalism claimed a commitment to “objective truth,” some recent practitioners of creative nonfiction—a modern term for the blend of storytelling and reporting Wolfe introduced—**14** questions whether pursuing objectivity is worthwhile. Essayist John D’Agata made headlines in 2012 for his provocative book *The Lifespan of a Fact*, in which he defended the altering or **15** collecting of details for the sake of art. Although D’Agata asserted that taking such liberties allowed him to produce a truer work of art, critics accused him of intentional deceit. The New Journalists, dedicated to factual accuracy even as they pushed stylistic **16** boundaries, would likely have distanced themselves from the nonfiction genre’s latest provocateur.

14

- A) NO CHANGE
- B) has questioned
- C) have questioned
- D) is questioning

15

Which choice best supports the point being made in the sentence and paragraph?

- A) NO CHANGE
- B) wholesale invention
- C) obsessive fact-checking
- D) publication

16

- A) NO CHANGE
- B) boundaries’, would likely have distanced themselves from the nonfiction genre’s
- C) boundaries, would likely have distanced themselves from the nonfiction genres
- D) boundaries’, would likely have distanced themselves from the nonfiction genres’

17 One might concede the notion that truth can be found in the most unexpected places. Decades before D'Agata, the New Journalists 18 will have recognized that mere fact gathering did not allow them to accurately portray the volatility of their era. They maintained that truthfulness could be better expressed by emphasizing individuals' subjective realities. New Journalist Michael Herr, 19 for instance, argued that in scrupulously compiling facts about the Vietnam War, the mainstream US media missed the truth that mattered: they failed to impart meaningful stories about individual Americans' experiences in Vietnam.

17

Which choice best sets up the information that follows in the paragraph?

- A) NO CHANGE
- B) Other writers, however, advocate including as much detail as possible when writing nonfiction.
- C) While D'Agata's position might fairly be characterized as radical, the popularity of his books suggests readers are not bothered by nonfiction that bends the truth now and again.
- D) D'Agata's position is extreme, yet his central argument—that facts do not always lead to greater truth—has merit.

18

- A) NO CHANGE
- B) will recognize
- C) had recognized
- D) are recognizing

19

- A) NO CHANGE
- B) by contrast,
- C) above all,
- D) in conclusion,

The task of creative nonfiction writers, like 20 the writers known as the New Journalists, is an inherently subjective one. These 21 writers neither capture every objective detail, nor dispense with facts entirely. It is possible to use the narrative techniques that can make fiction 22 engaging for readers and to maintain a commitment to veracity. It is unnecessary to aspire to perfect objectivity; it is equally unnecessary to fabricate the raw material.

20

- A) NO CHANGE
- B) those who were writing New Journalism,
- C) that of the New Journalists,
- D) the New Journalists' work,

21

- A) NO CHANGE
- B) writers neither capture every objective detail
- C) writers neither, capture every objective detail,
- D) writers: neither capture every objective detail

22

- A) NO CHANGE
- B) a thing people really like
- C) super fun for everybody
- D) enrapturing for bibliophiles

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

The Power of Metaphor

In 1997, oceanographer Charles J. Moore was sailing in the North Pacific Ocean when he came upon a vast area full of debris. Moore described the debris field, which included such objects as a volleyball and a truck tire, in a 2003 article for *Natural History* magazine. By 2007 Moore's discovery had attracted additional media coverage and a compelling name: the "Great Pacific Garbage Patch."

Although the name was memorable, it was a misnomer. The patch was not, as some media reports implied, an "island of trash" piled high with conventional items of garbage. Rather, it was composed mainly of tiny plastic **23** particle's floating under the water's surface. Moore **24** distanced himself from the trash metaphors in 2011, calling them "media-concocted embellishments of the truth." Nevertheless, the "garbage patch" term endured, sparking new interest in the problem of marine pollution in general and microplastics in particular.

23

- A) NO CHANGE
- B) particles floating under the waters
- C) particles floating under the water's
- D) particles' floating under the waters'

24

- A) NO CHANGE
- B) separated
- C) removed
- D) excluded

[1] The garbage patch is not the only 25 instance, in which a memorable metaphor has drawn attention to a complicated environmental problem. [2] In 1985, British researchers discovered abnormally low levels of 26 ozone, a gas that protects the planet from harmful ultraviolet rays—above the Antarctic. [3] NASA scientists 27 dreamed up the term “ozone hole” to describe the condition. [4] The members of the British team objected to the characterization of low ozone levels as a “hole,” but even they acknowledged the power of the term. [5] According to Maureen Christie, author of a book on the ozone layer, while the British researchers were concerned that “the picture it provided was not a very accurate one,” they “conceded that their paper received a lot more attention” as a result of the term than it would have otherwise. 28

25

- A) NO CHANGE
- B) instance, in which a memorable metaphor,
- C) instance in which: a memorable metaphor
- D) instance in which a memorable metaphor

26

- A) NO CHANGE
- B) ozone—
- C) ozone:
- D) ozone

27

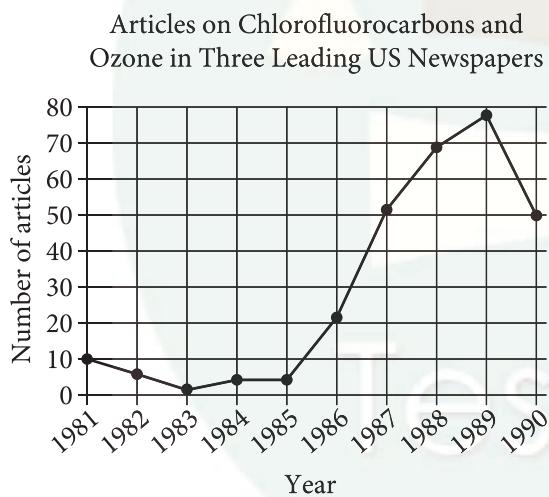
- A) NO CHANGE
- B) coined
- C) cobbled together
- D) birthed

28

To make this paragraph most logical, sentence 3 should be placed

- A) where it is now.
- B) after sentence 1.
- C) after sentence 4.
- D) after sentence 5.

In a 2001 study, sociologist Reiner Grundmann tracked newspaper coverage of the ozone issue around the time the “hole” was discovered. He saw media attention first pick up in the year **29** 1985, when more than twenty articles on the topic were published in three leading US newspapers. The number continued to rise until 1989, when it peaked at nearly **30** fifty articles. Attention to the ozone problem and public concern about **31** it's affects contributed to the development of the 1987 Montreal Protocol, an international agreement to phase out the use of certain ozone-depleting substances.



Adapted from Reiner Grundmann, “Ozone and Climate: Scientific Consensus and Leadership.” ©2005 by Sage Publications.

29

Which choice provides accurate information from the graph?

- A) NO CHANGE
- B) 1986,
- C) 1987,
- D) 1988,

30

Which choice provides accurate information from the graph?

- A) NO CHANGE
- B) sixty
- C) seventy
- D) eighty

31

- A) NO CHANGE
- B) it's effects
- C) its affects
- D) its effects

Science depends on factual precision, of course, and the distinction between microplastics and a “great garbage patch,” or low levels of a gas and a “hole,” **32** are not a trivial one. **33** However, as these examples show, misleading metaphors can be more effective than strictly accurate descriptions in drawing media attention and spurring people and governments to take action to address environmental problems.

32

- A) NO CHANGE
- B) is not
- C) have not been
- D) were not

33

- A) NO CHANGE
- B) In contrast,
- C) In conclusion,
- D) DELETE the underlined portion, adjusting the capitalization as needed.

Questions 34-44 are based on the following passage.

Henrietta Leavitt's Stellar Discovery

For millennia, people have looked up at the stars and wondered how far away they are. But determining distances to stars is difficult because **34** they are so enormous. Indeed, people were unable to measure the distance to any single star (with the exception of the Sun) before 1838. By 1900, the greatest measurable distance was still minuscule by today's standards—less than 1 percent of the diameter of the Milky Way. **35** It was like that when Henrietta Leavitt began working at the Harvard College Observatory.

[1] Leavitt searched for and cataloged Cepheid variable **36** stars: whose brightness varied from bright to dim to bright again over a regular time interval, or period. [2] Leavitt focused on Cepheids that she suspected (correctly, it turned out) to be about the same distance from Earth. [3] Within this group, stars that appeared brighter in a telescope had to be more luminous, meaning that they gave off more energy. [4] In the course of her observations, Leavitt discovered something simple yet striking: the more luminous stars had longer periods. **37**

34

- A) NO CHANGE
- B) the difficulties
- C) the stars
- D) the distances

35

- A) NO CHANGE
- B) That was just how it was
- C) It was that way
- D) Such was the situation

36

- A) NO CHANGE
- B) stars, stars
- C) stars;
- D) stars; stars

37

To make this paragraph most logical, sentence 4 should be placed

- A) where it is now.
- B) before sentence 1.
- C) after sentence 1.
- D) after sentence 2.

Leavitt's finding enabled astronomers to determine the relative distances of stars from Earth. To understand how this works, imagine that two variable stars appear **38** equally bright or dim in a telescope, but one **39** had a longer period than the other. According to Leavitt's observations, the longer-period star is always more luminous than the shorter-period star. So why do the stars **40** appear so close? The longer-period star must be farther away.

38

- A) NO CHANGE
- B) just as equally bright
- C) equally bright
- D) just as bright or dim

39

- A) NO CHANGE
- B) has
- C) would have
- D) has had

40

At this point, the writer wants to support the explanation in the paragraph by repeating a detail from a previous sentence. Which choice is most effective?

- A) NO CHANGE
- B) change so quickly?
- C) look so similar?
- D) vary so greatly?

41 The particular stars Leavitt studied were known as the Cepheids. One year later, another astronomer used measurements of a different group of Cepheids to calculate the stars' actual distances from Earth. He then incorporated these distances into the formula that Leavitt had calculated. 42 Now for the first time; astronomers could determine the distances to a large number of stars, including some that were quite far away.

41

Which choice provides the most effective transition between the previous paragraph and the information that follows in this paragraph?

- A) NO CHANGE
- B) Leavitt published her discovery in 1912.
- C) Leavitt analyzed telescopic images, which was tedious work.
- D) Cepheid periods range from one to one hundred days.

42

- A) NO CHANGE
- B) Now for the first time:
- C) Now, for the first time
- D) Now, for the first time,

This development spurred others, and a series of momentous discoveries followed. About five years later, the first estimate of the size of the Milky Way was made. About five years after that, the distance to some celestial objects was determined to be much greater than the size of the Milky **43** Way that meant that there were other galaxies beyond our own. And in 1929, a mere seventeen years after the publication of Leavitt's paper, measurements of distances to faraway galaxies were used to show that the universe was expanding. **44** While at Harvard, Leavitt was known as a "computer"—a person hired to do calculations. Leavitt didn't just discover an interesting fact about a particular type of star. She, perhaps more than any other single person, discovered the "ruler" with which to measure the universe.

43

- A) NO CHANGE
- B) Way, that
- C) Way—which
- D) Way, which

44

The writer is considering deleting the underlined sentence. Should the sentence be kept or deleted?

- A) Kept, because it provides useful additional information about Leavitt's role.
- B) Kept, because it supports a claim made earlier in the paragraph about Leavitt's accomplishments.
- C) Deleted, because it repeats information provided in an earlier paragraph.
- D) Deleted, because it detracts from the paragraph's focus on the implications of Leavitt's discovery.

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 – No Calculator

25 MINUTES, 20 QUESTIONS

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

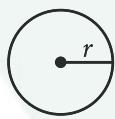
DIRECTIONS

For questions 1–15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble 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

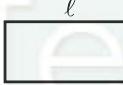
1. The use of a calculator is not permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated,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

REFERENCE

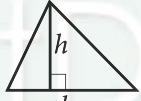


$$A = \pi r^2$$

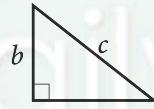
$$C = 2\pi r$$



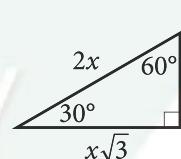
$$A = lw$$



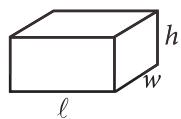
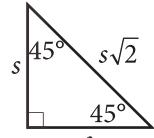
$$A = \frac{1}{2}bh$$



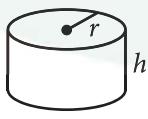
$$c^2 = a^2 + b^2$$



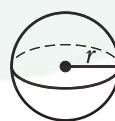
Special Right Triangles



$$V = lwh$$



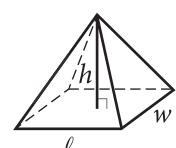
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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.

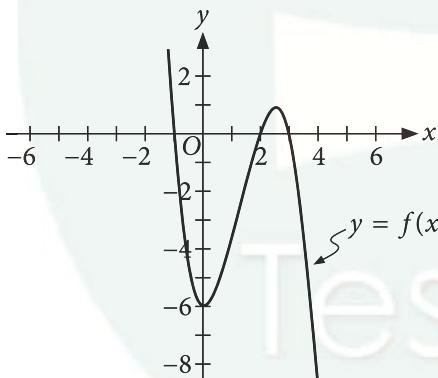
CONTINUE

1

Jamila plans to invest \$300 by buying shares of two different stocks. Stock A costs \$5.62 per share and Stock B costs \$12.97 per share. Which equation represents the number of shares of these stocks Jamila can buy, where a is the number of shares of Stock A and b is the number of shares of Stock B? (Assume that there are no fees.)

- A) $12.97a + 5.62b = 300$
- B) $12.97a - 5.62b = 300$
- C) $5.62a + 12.97b = 300$
- D) $5.62a - 12.97b = 300$

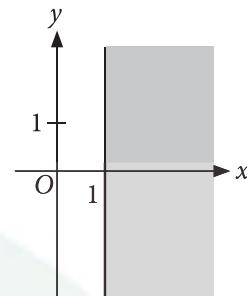
2



The graph of $y = f(x)$ is shown. What is the value of $f(0)$?

- A) 3
- B) 2
- C) -1
- D) -6

3



The shaded region shown in the graph represents all the solutions to which inequality?

- A) $x \leq 1$
- B) $x \geq 1$
- C) $y \leq 1$
- D) $y \geq 1$

4

The function f is defined by $f(x) = x^3 - 2x^2$. what is the value of $f(-2)$?

- A) -16
- B) -8
- C) 0
- D) 2



5

If $g(5) = 3$ and $g(9) = 7$, which of the following defines the linear function g ?

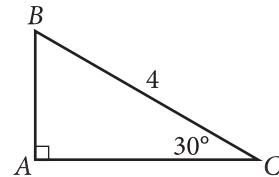
- A) $g(x) = 2x$
- B) $g(x) = -2x$
- C) $g(x) = x + 2$
- D) $g(x) = x - 2$

6

A sphere has a diameter of 4 meters. What is the volume, in cubic meters, of this sphere?

- A) $\frac{256}{3}\pi$
- B) $\frac{32}{3}\pi$
- C) 16π
- D) 4π

7



What is the length of side \overline{AC} in right triangle ABC above?

- A) 2
- B) $2\sqrt{3}$
- C) 4
- D) $4\sqrt{3}$

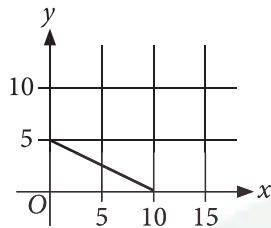
8

$$\begin{aligned}1.2x - 3y &= 0 \\ 2x + 10y &= 9\end{aligned}$$

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

- A) 0.6
- B) 1.5
- C) 2.25
- D) 9

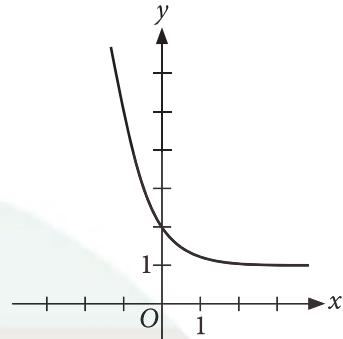
9



The line shown models the number of cubic yards of soil, x , and mulch, y , a landscaper can purchase for \$150. What is the price per cubic yard of soil?

- A) \$5
- B) \$10
- C) \$15
- D) \$30

10



What is an equation of the graph shown?

- A) $y = \left(\frac{1}{4}\right)^x$
- B) $y = \left(\frac{1}{4}\right)^x + 1$
- C) $y = \left(\frac{5}{4}\right)^x$
- D) $y = \left(\frac{5}{4}\right)^x + 1$



11

$$\frac{5g + 1}{g + 2} - 1$$

Which of the following is equivalent to the given expression if $g > 0$?

- A) $\frac{5g}{g + 1}$
- B) $\frac{5g}{g + 2}$
- C) $\frac{4g - 1}{g + 2}$
- D) $\frac{4g + 3}{g + 2}$

12

Which value is a solution to the equation $x(x + 4) = 2$?

- A) $4 + 2\sqrt{6}$
- B) $-4 - 2\sqrt{6}$
- C) $2 + \sqrt{6}$
- D) $-2 - \sqrt{6}$

13

$$y = 8$$

$$y = -2(x - 10)^2 + 6$$

If the given equations are graphed in the xy -plane, at how many points do the graphs intersect?

- A) Zero
- B) One
- C) Two
- D) Infinitely many

14

$$\text{Circle A: } x^2 + y^2 = 4$$

$$\text{Circle B: } 2x^2 + 2y^2 = 8$$

Which statement accurately compares the graphs of the given equations in the xy -plane?

- A) The graph of circle B is the same as the graph of circle A .
- B) The radius of circle B is twice the length of the radius of circle A .
- C) The graph of circle B is the result of translating the graph of circle A two units to the right.
- D) The graph of circle B is the result of translating the graph of circle A two units to the left.

15

$$(\sqrt{8})^a = 4^{\frac{b}{3}}$$

If a and b are positive numbers in the equation above, what is the value of $\frac{a}{b}$?

- A) $\frac{4}{9}$
- B) $\frac{2}{3}$
- C) $\frac{3}{2}$
- D) $\frac{9}{4}$

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 bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
- Mark no more than one bubble 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 $\frac{7}{2}$. (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: $\frac{7}{12}$ are:

7	/	1	2
.	.	.	.
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

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

← Fraction line ← 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	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	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	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

$$4(b + 21) = 16b$$

What is the solution to the given equation?

19

Joan is designing a rectangular flower garden so that the ratio of the length of the garden to its width is 3 to 2. If the area of the garden is 96 square feet, what is the perimeter, in feet, of the garden?

17

The function p is defined by $p(x) = \frac{1}{4}x + \frac{3}{4}$. What is the slope of the graph of $y = p(x)$ in the xy -plane?

18

$$cx + 2 = 3x + 6$$

In the given equation, c is a constant. The equation has no solution. What is the value of c ?

20

$$|x - 4| = 2$$

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

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.

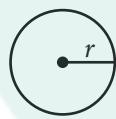
DIRECTIONS

For questions 1–30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble 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 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator is not permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. 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

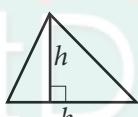


$$A = \pi r^2$$

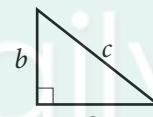
$$C = 2\pi r$$



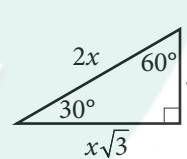
$$A = lw$$



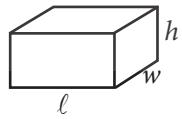
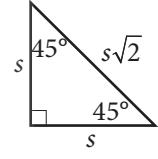
$$A = \frac{1}{2}bh$$



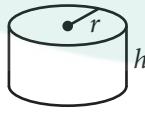
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = lwh$$



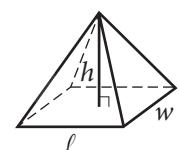
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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.

CONTINUE



1

An object travels at a rate of 8 meters per second. What is the distance, in meters, that the object travels in 2 seconds?

- A) 4
- B) 6
- C) 10
- D) 16

2

27, 8, 20, 43, 32

What is the mean of the given data set?

- A) 20
- B) 26
- C) 27
- D) 35

3

Seth asked 50 students if they planned to vote for Jada or Katie for class president. Of the students polled, 20 said they planned to vote for Jada and 30 said they planned to vote for Katie. If one of the students polled is selected at random, what is the probability that the selected student said he or she planned to vote for Jada?

- A) 20%
- B) 30%
- C) 40%
- D) 60%

4

If $6x - 3 = 15$, what is the value of $2x - 1$?

- A) 1
- B) 2
- C) 4
- D) 5

5

$$\begin{aligned}4x + y &= 10 \\-3x - y &= -7\end{aligned}$$

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

- A) 17
- B) 3
- C) -3
- D) -17

6

A café manager found that when cups of tea were sold for \$1.00, a total of 50 cups of tea were sold each day. For every \$0.10 increase in the price of a cup of tea, 1 less cup of tea was sold each day. Which equation models the total amount collected S , in dollars, from tea sales each day, where x is the number of \$0.10 price increases?

- A) $S = (1.00 + x)(50 - x)$
- B) $S = (1.00 + x)(50 + x)$
- C) $S = (1.00 + 0.10x)(50 - x)$
- D) $S = (1.00 + 0.10x)(50 + x)$



7

$$\sqrt{(x^4)} = 25$$

What are all possible solutions to the given equation?

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

8

The gravitational potential energy of an object near the surface of Earth is proportional to its height above Earth's surface. An object near Earth's surface is at height h and has gravitational potential energy P . If the object's height doubles while remaining near Earth's surface, which expression gives the gravitational potential energy of the object in terms of P ?

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

Questions 9 and 10 refer to the following information.

Sample	Sample size	Length (inches)		
		minimum	maximum	mean
A	11	15.0	20.0	18.0
B	20	12.5	22.5	17.2

The table shows the minimum, maximum, and mean lengths, in inches, of brown trout in two different samples. The sample sizes are also shown.

9

If one of the trout from the two samples is selected at random, what is the probability that the selected trout is from sample A?

- A) $\frac{11}{31}$
- B) $\frac{11}{20}$
- C) $\frac{11}{18}$
- D) $\frac{11}{15}$



10

Which of the following statements must be true?

- The length of each trout in sample A is greater than the length of each trout in sample B.
- The range of the lengths of the trout in sample A is greater than the range of the lengths of the trout in sample B.

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

12

If $a = x^3 - 2x + 7$ and $b = x + 1$, which of the following is equivalent to ab ?

- A) $x^3 - 2x^2 + 8$
B) $x^3 - 2x^2 - 2x + 8$
C) $x^4 - 2x + 7$
D) $x^4 + x^3 - 2x^2 + 5x + 7$

11

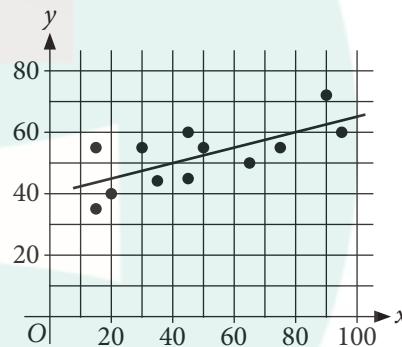
Industries in Canada, May 2012

Goods-producing industry	Percent of GDP
Agriculture	5%
Construction	25%
Manufacturing	36%
Mining, oil, and gas extraction	26%
Utilities	8%

The table shows the distribution by percent of the gross domestic product (GDP) for the five goods-producing industries in Canada. The total GDP for all five goods-producing industries in Canada for May 2012 was approximately \$474 billion. Which of the following is closest to the GDP for utilities, in billions of dollars?

- A) 8
B) 38
C) 59
D) 95

13



The scatterplot shows twelve data points and a line of best fit for the data. What is the slope of the line?

- A) $\frac{1}{2}$
B) $\frac{1}{3}$
C) $\frac{1}{4}$
D) $\frac{1}{5}$

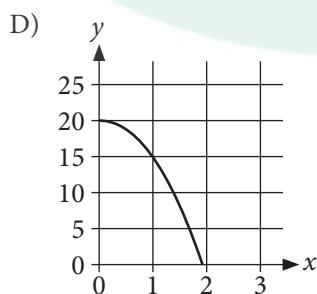
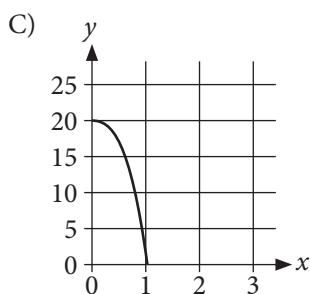
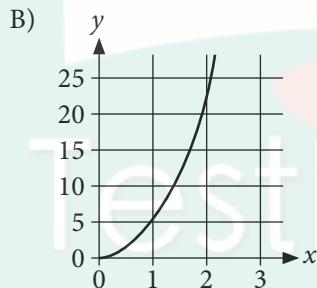
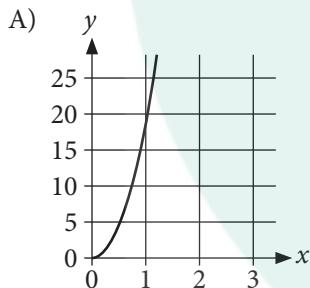
14

Which of the following is(are) true about the linear function $y = 10 + 2x$ and exponential function $y = 5(2)^x$?

- I. When $x = 0$, the value of the linear function is greater than the value of the exponential function.
 - II. When $x = 10$, the value of the linear function is greater than the value of the exponential function.
- A) I only
 B) II only
 C) I and II
 D) Neither I nor II

15

The volume of a certain cylinder with height 6 is given by $V = 6\pi r^2$, where r is the radius of the circular base of the cylinder. Which of the following is the graph of this equation in the xy -plane, where $x = r$ and $y = V$?



16

Triangles ABC and DEF each have a corresponding angle measuring 25° and a corresponding angle measuring 60° . Which additional piece of information is sufficient to determine whether triangle ABC is congruent to triangle DEF ?

- A) The perimeter of triangle ABC
- B) The area of triangle DEF
- C) The length of one pair corresponding sides from the two triangles
- D) No additional piece of information is necessary to determine whether the two triangles are congruent.

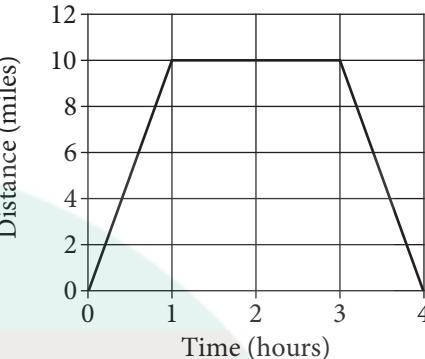
17

x	y
400	2
800	4
1,200	6

The table shows the number of cans of a type of flooring stain, y , needed to cover x square feet of flooring. Which of the following equations best models the relationship between x and y ?

- A) $y = 100x^2$
- B) $y = 200x$
- C) $y = \frac{x}{200}$
- D) $y = \frac{x^2}{200}$

18



Coraline biked on a straight bike path. The graph shows her distance from the start of the path as a function of time. Which of the following best describes Coraline's bike ride?

- A) She biked away from the start of the path at a constant speed for 1 hour, took a 2-hour break, then biked back to the start of the path at a constant speed for 1 hour.
- B) She biked away from the start of the path at a constant speed for 1 hour, took a 2-hour break, then continued to bike away from the start of the path at a constant speed for 1 hour.
- C) She biked away from the start of the path at an increasing speed for 1 hour, took a 2-hour break, then biked back to the start of the path at a decreasing speed for 1 hour.
- D) She biked away from the start of the path at an increasing speed for 1 hour, biked at a constant speed for 2 hours, then biked back to the start of the path at a decreasing speed for 1 hour.



Questions 19 and 20 refer to the following information.

Year	Percent of US households with TV
1951	23.5
1958	83.2
1978	98.0

The table shows the percent of US households with TV for three different years. From 1951 to 1958, the percent of US households with TV increased linearly over time and can be modeled by a linear function P . From 1958 to 1978, the percent of US households with TV also increased linearly, but at a different rate.

19

Which of the following functions best models the percent of US households with TV, $P(t)$, as a function of the number of years since 1951, t , where $0 \leq t \leq 7$?

- A) $P(t) = 23.5t$
- B) $P(t) = 23.5 + 7.5t$
- C) $P(t) = 23.5 + 8.5t$
- D) $P(t) = 7.5 + 23.5t$

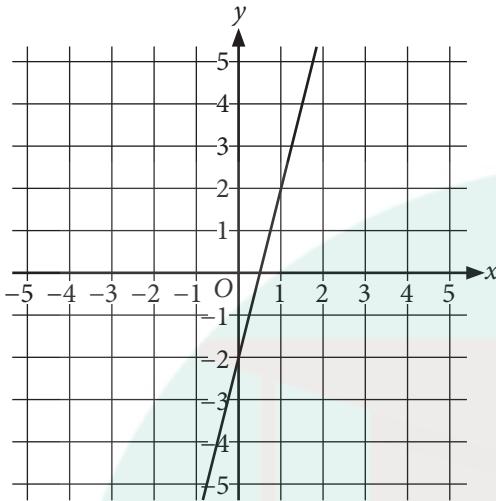
20

Based on the information given, which of the following is closest to the percent of US households with TV in 1962?

- A) 91.3%
- B) 90.6%
- C) 87.4%
- D) 86.2%



21



The line $y = mx + b$, where m and b are constants, is shown in the xy -plane. Which of the following equations could represent the equation of this line after it is translated 1 unit to the left?

- A) $y = 4x - 3$
- B) $y = 4x - 1$
- C) $y = 4x + 1$
- D) $y = 4x + 2$

22

$$\begin{aligned}x - y &= 1 \\2x - 2y &= 1\end{aligned}$$

How many solutions does the given system of equations have?

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

23

$$x^2 - 6x + c = 0$$

In the equation above, c is a constant such that $0 \leq c < 9$. Which of the following is the greater of the two solutions to the equation, in terms of c ?

- A) $\frac{6 - \sqrt{36 - 4c}}{2}$
- B) $\frac{6 + \sqrt{36 - 4c}}{2}$
- C) $\frac{-6 - \sqrt{36 - 4c}}{2}$
- D) $\frac{-6 + \sqrt{36 - 4c}}{2}$

24

There are 10 rare coins in a collection. If the value of each of the 10 coins increases by \$2, which of the following will be true?

- A) The new mean of the values will be \$2 more than the previous mean, but the standard deviation will remain the same.
- B) The mean of the values will remain the same, but the new standard deviation will be \$2 more than the previous standard deviation.
- C) Both the new mean and standard deviation of the values will be \$2 more than the previous mean and standard deviation.
- D) Neither the mean nor the standard deviation of the values will change.

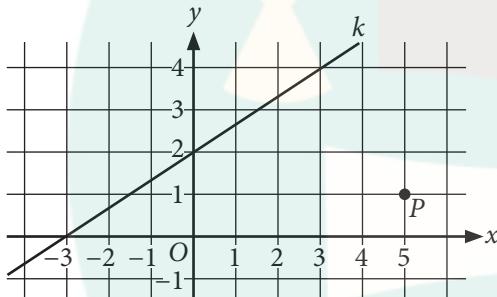
CONTINUE

25

In right triangle ABC , angle A is the right angle and the value of $\cos B$ is 0.8. Which of the following is the value of $\sin C$?

- A) 0.8
- B) 0.6
- C) 0.4
- D) 0.2

26

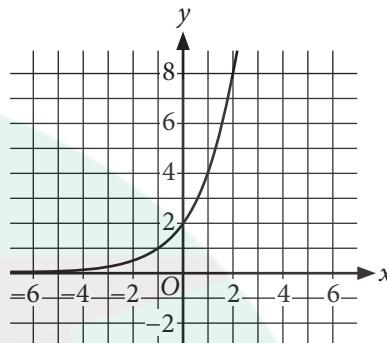


Line k and point P are shown in the xy -plane. Line ℓ (not shown) is perpendicular to line k and passes through point P . Which of the following is an equation of line ℓ ?

- A) $y = -\frac{3}{2}x + \frac{7}{2}$
- B) $y = -\frac{3}{2}x + \frac{17}{2}$
- C) $y = \frac{2}{3}x - \frac{7}{2}$
- D) $y = \frac{2}{3}x - \frac{17}{2}$

27

The graph of an exponential function is shown in the xy -plane.



Which of the following is an equation of the graph shown, where b is a positive constant?

- A) $y = 2^x + b$
- B) $y = 2^{x+b}$
- C) $y = 2^x - b$
- D) $y = 2^{x-b}$

28

A company that manufactures staplers calculates its monthly profit by subtracting its fixed monthly costs from its monthly revenue from sales. The equation $12,000 = 2.00x - 3,500$ represents this situation for a month where x staplers are manufactured and sold. What is the meaning of $2.00x$ in this context?

- A) The total cost of manufacturing x staplers
- B) The total cost of manufacturing each stapler
- C) The total monthly revenue from each stapler sold
- D) The total monthly revenue from selling x staplers



29

The quantity k is reduced by 20% of its value. Which expression is equivalent to the resulting value?

- A) $0.80k$
- B) $0.20k$
- C) $0.08k$
- D) $0.02k$

30

A truck trailer holds 16 cubic meters of soil. How many cubic centimeters of soil does the trailer hold?
(1 meter = 100 centimeters)

- A) 16,000
- B) 160,000
- C) 1,600,000
- D) 16,000,000

TestDaily

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 bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
- Mark no more than one bubble 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 $\frac{7}{2}$. (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: $\frac{7}{12}$ are:

7	/	1	2
.	.	.	.
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

Grid in result.

Answer: 2.5

	2	.	5
.	/	/	/
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

← Decimal point

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

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

Answer: 201 – either position is correct

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



31

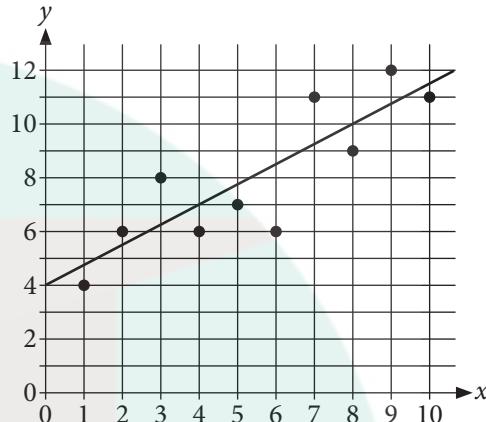
The net force, in newtons, acting on an object is proportional to the object's mass, in kilograms (kg), when the acceleration, in meters per second squared (m/s^2), is constant. Two objects, one of mass 70 kg and the other of mass 50 kg, have accelerations of 4 m/s^2 in the same direction. If the force acting on the 70 kg object is 280 newtons, what is the force, in newtons, acting on the 50 kg object?

32

A certain blue whale calf weighed 5500 pounds when it was born, and its weight increased at a rate of 250 pounds per day for the first n days, where n is an integer. If the calf's weight was greater than 8000 pounds but less than 9000 pounds n days after birth, what is one possible value of n ?

33

The scatterplot shows the relationship between two variables, x and y . A line of best fit for the data is also shown.

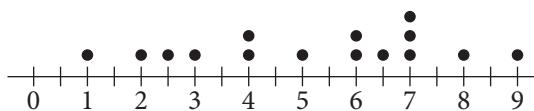


For how many of the 10 data points does the line of best fit predict a y -value that is greater than the actual y -value?

34

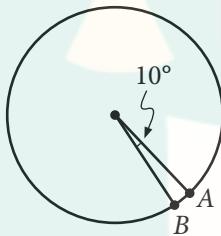
Between 1749 and 1811, the population of China increased 100%. In 1811, China's population was 360 million. In 1749, what was China's population, in millions?

35



Mohs' scale of hardness can be used to compare substances. The dot plot displays the hardness value of each of 15 substances. What is the median hardness value of the 15 substances?

36



The circle shown has a circumference of 72π . The length of minor arc \widehat{AB} is $x\pi$. What is the value of x ?

37

$$H(n) = 1000(1 - 0.05)^n$$

As a beam of X-ray photons passes through a metal block, the metal absorbs several of the photons. The function H , defined by the equation shown, models the relationship between the predicted number of photons, $H(n)$, remaining in a beam and the number of blocks of metal, n , the beam has passed through. Based on this model, the percentage of photons remaining after passing through 1 metal block is $p\%$. What is the value of p ?

38

In the xy -plane, the line that contains the points $(-3, 5)$ and $(1, 2)$ intersects the y -axis at $(0, c)$. What is the value of c ?

STOP

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

16

$$4(b + 21) = 16b$$

What is the solution to the given equation?

19

Joan is designing a rectangular flower garden so that the ratio of the length of the garden to its width is 3 to 2. If the area of the garden is 96 square feet, what is the perimeter, in feet, of the garden?

17

The function p is defined by $p(x) = \frac{1}{4}x + \frac{3}{4}$. What is the slope of the graph of $y = p(x)$ in the xy -plane?

18

$$cx + 2 = 3x + 6$$

In the given equation, c is a constant. The equation has no solution. What is the value of c ?

20

$$|x - 4| = 2$$

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

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.

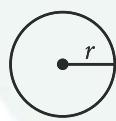
DIRECTIONS

For questions 1–30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble 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 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

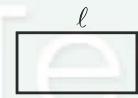
NOTES

1. The use of a calculator is not permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. 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.

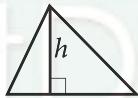
REFERENCE



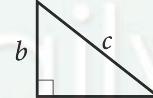
$$\begin{aligned}A &= \pi r^2 \\C &= 2\pi r\end{aligned}$$



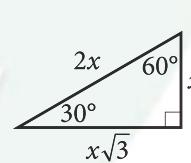
$$A = lw$$



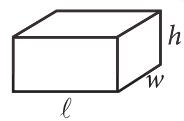
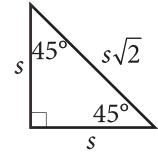
$$A = \frac{1}{2}bh$$



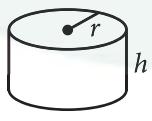
$$c^2 = a^2 + b^2$$



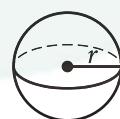
Special Right Triangles



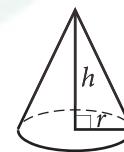
$$V = lwh$$



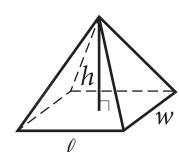
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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.

CONTINUE



1

An object travels at a rate of 8 meters per second. What is the distance, in meters, that the object travels in 2 seconds?

- A) 4
- B) 6
- C) 10
- D) 16

2

27, 8, 20, 43, 32

What is the mean of the given data set?

- A) 20
- B) 26
- C) 27
- D) 35

3

Seth asked 50 students if they planned to vote for Jada or Katie for class president. Of the students polled, 20 said they planned to vote for Jada and 30 said they planned to vote for Katie. If one of the students polled is selected at random, what is the probability that the selected student said he or she planned to vote for Jada?

- A) 20%
- B) 30%
- C) 40%
- D) 60%

4

If $6x - 3 = 15$, what is the value of $2x - 1$?

- A) 1
- B) 2
- C) 4
- D) 5

5

$$\begin{aligned}4x + y &= 10 \\-3x - y &= -7\end{aligned}$$

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

- A) 17
- B) 3
- C) -3
- D) -17

6

A café manager found that when cups of tea were sold for \$1.00, a total of 50 cups of tea were sold each day. For every \$0.10 increase in the price of a cup of tea, 1 less cup of tea was sold each day. Which equation models the total amount collected S , in dollars, from tea sales each day, where x is the number of \$0.10 price increases?

- A) $S = (1.00 + x)(50 - x)$
- B) $S = (1.00 + x)(50 + x)$
- C) $S = (1.00 + 0.10x)(50 - x)$
- D) $S = (1.00 + 0.10x)(50 + x)$



7

$$\sqrt{(x)^4} = 25$$

What are all possible solutions to the given equation?

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

8

The gravitational potential energy of an object near the surface of Earth is proportional to its height above Earth's surface. An object near Earth's surface is at height h and has gravitational potential energy P . If the object's height doubles while remaining near Earth's surface, which expression gives the gravitational potential energy of the object in terms of P ?

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

Questions 9 and 10 refer to the following information.

Sample	Sample size	Length (inches)		
		minimum	maximum	mean
A	11	15.0	20.0	18.0
B	20	12.5	22.5	17.2

The table shows the minimum, maximum, and mean lengths, in inches, of brown trout in two different samples. The sample sizes are also shown.

9

If one of the trout from the two samples is selected at random, what is the probability that the selected trout is from sample A?

- A) $\frac{11}{31}$
- B) $\frac{11}{20}$
- C) $\frac{11}{18}$
- D) $\frac{11}{15}$



10

Which of the following statements must be true?

- The length of each trout in sample A is greater than the length of each trout in sample B.
 - The range of the lengths of the trout in sample A is greater than the range of the lengths of the trout in sample B.
- A) I only
B) II only
C) I and II
D) Neither I nor II

11

Industries in Canada, May 2012

Goods-producing industry	Percent of GDP
Agriculture	5%
Construction	25%
Manufacturing	36%
Mining, oil, and gas extraction	26%
Utilities	8%

The table shows the distribution by percent of the gross domestic product (GDP) for the five goods-producing industries in Canada. The total GDP for all five goods-producing industries in Canada for May 2012 was approximately \$474 billion. Which of the following is closest to the GDP for utilities, in billions of dollars?

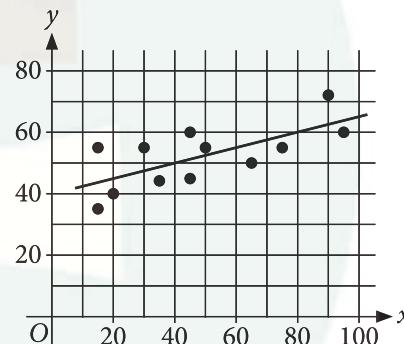
- A) 8
B) 38
C) 59
D) 95

12

If $a = x^3 - 2x + 7$ and $b = x + 1$, which of the following is equivalent to ab ?

- A) $x^3 - 2x^2 + 8$
B) $x^3 - 2x^2 - 2x + 8$
C) $x^4 - 2x + 7$
D) $x^4 + x^3 - 2x^2 + 5x + 7$

13



The scatterplot shows twelve data points and a line of best fit for the data. What is the slope of the line?

- A) $\frac{1}{2}$
B) $\frac{1}{3}$
C) $\frac{1}{4}$
D) $\frac{1}{5}$



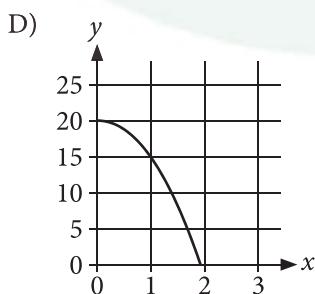
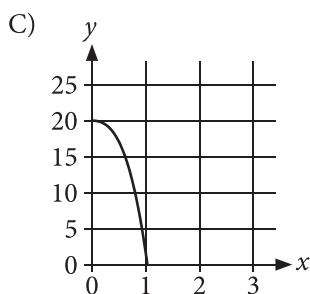
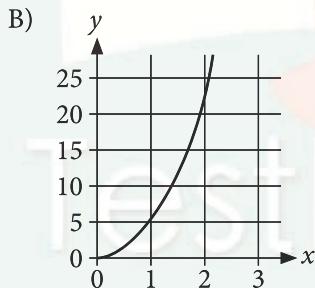
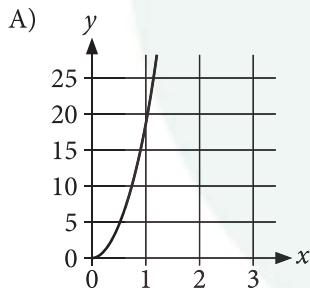
14

Which of the following is(are) true about the linear function $y = 10 + 2x$ and exponential function $y = 5(2)^x$?

- I. When $x = 0$, the value of the linear function is greater than the value of the exponential function.
 - II. When $x = 10$, the value of the linear function is greater than the value of the exponential function.
- A) I only
 B) II only
 C) I and II
 D) Neither I nor II

15

The volume of a certain cylinder with height 6 is given by $V = 6\pi r^2$, where r is the radius of the circular base of the cylinder. Which of the following is the graph of this equation in the xy -plane, where $x = r$ and $y = V$?





16

Triangles ABC and DEF each have a corresponding angle measuring 25° and a corresponding angle measuring 60° . Which additional piece of information is sufficient to determine whether triangle ABC is congruent to triangle DEF ?

- A) The perimeter of triangle ABC
- B) The area of triangle DEF
- C) The length of one pair corresponding sides from the two triangles
- D) No additional piece of information is necessary to determine whether the two triangles are congruent.

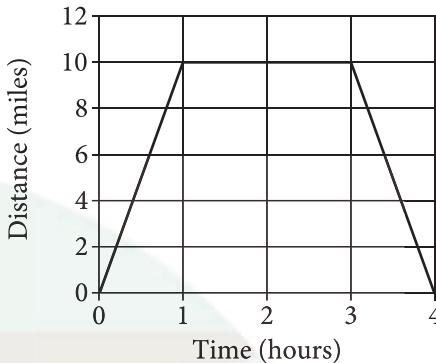
17

x	y
400	2
800	4
1,200	6

The table shows the number of cans of a type of flooring stain, y , needed to cover x square feet of flooring. Which of the following equations best models the relationship between x and y ?

- A) $y = 100x^2$
- B) $y = 200x$
- C) $y = \frac{x}{200}$
- D) $y = \frac{x^2}{200}$

18



Coraline biked on a straight bike path. The graph shows her distance from the start of the path as a function of time. Which of the following best describes Coraline's bike ride?

- A) She biked away from the start of the path at a constant speed for 1 hour, took a 2-hour break, then biked back to the start of the path at a constant speed for 1 hour.
- B) She biked away from the start of the path at a constant speed for 1 hour, took a 2-hour break, then continued to bike away from the start of the path at a constant speed for 1 hour.
- C) She biked away from the start of the path at an increasing speed for 1 hour, took a 2-hour break, then biked back to the start of the path at a decreasing speed for 1 hour.
- D) She biked away from the start of the path at an increasing speed for 1 hour, biked at a constant speed for 2 hours, then biked back to the start of the path at a decreasing speed for 1 hour.



Questions 19 and 20 refer to the following information.

Year	Percent of US households with TV
1951	23.5
1958	83.2
1978	98.0

The table shows the percent of US households with TV for three different years. From 1951 to 1958, the percent of US households with TV increased linearly over time and can be modeled by a linear function P . From 1958 to 1978, the percent of US households with TV also increased linearly, but at a different rate.

19

Which of the following functions best models the percent of US households with TV, $P(t)$, as a function of the number of years since 1951, t , where $0 \leq t \leq 7$?

- A) $P(t) = 23.5t$
- B) $P(t) = 23.5 + 7.5t$
- C) $P(t) = 23.5 + 8.5t$
- D) $P(t) = 7.5 + 23.5t$

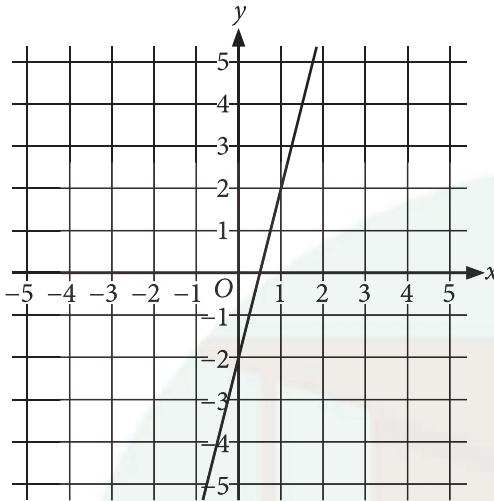
20

Based on the information given, which of the following is closest to the percent of US households with TV in 1962?

- A) 91.3%
- B) 90.6%
- C) 87.4%
- D) 86.2%



21



The line $y = mx + b$, where m and b are constants, is shown in the xy -plane. Which of the following equations could represent the equation of this line after it is translated 1 unit to the left?

- A) $y = 4x - 3$
- B) $y = 4x - 1$
- C) $y = 4x + 1$
- D) $y = 4x + 2$

22

$$\begin{aligned}x - y &= 1 \\2x - 2y &= 1\end{aligned}$$

How many solutions does the given system of equations have?

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

23

$$x^2 - 6x + c = 0$$

In the equation above, c is a constant such that $0 \leq c < 9$. Which of the following is the greater of the two solutions to the equation, in terms of c ?

- A) $\frac{6 - \sqrt{36 - 4c}}{2}$
- B) $\frac{6 + \sqrt{36 - 4c}}{2}$
- C) $\frac{-6 - \sqrt{36 - 4c}}{2}$
- D) $\frac{-6 + \sqrt{36 - 4c}}{2}$

24

There are 10 rare coins in a collection. If the value of each of the 10 coins increases by \$2, which of the following will be true?

- A) The new mean of the values will be \$2 more than the previous mean, but the standard deviation will remain the same.
- B) The mean of the values will remain the same, but the new standard deviation will be \$2 more than the previous standard deviation.
- C) Both the new mean and standard deviation of the values will be \$2 more than the previous mean and standard deviation.
- D) Neither the mean nor the standard deviation of the values will change.

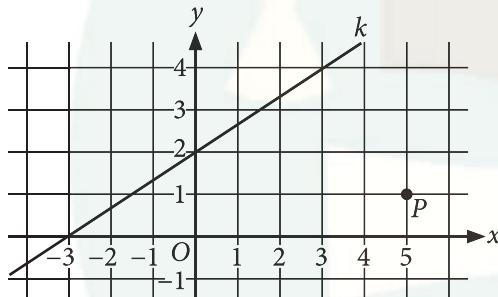
CONTINUE

25

In right triangle ABC , angle A is the right angle and the value of $\cos B$ is 0.8. Which of the following is the value of $\sin C$?

- A) 0.8
- B) 0.6
- C) 0.4
- D) 0.2

26

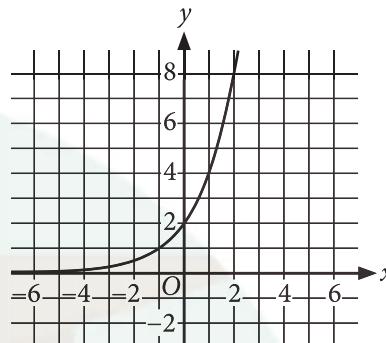


Line k and point P are shown in the xy -plane. Line ℓ (not shown) is perpendicular to line k and passes through point P . Which of the following is an equation of line ℓ ?

- A) $y = -\frac{3}{2}x + \frac{7}{2}$
- B) $y = -\frac{3}{2}x + \frac{17}{2}$
- C) $y = \frac{2}{3}x - \frac{7}{2}$
- D) $y = \frac{2}{3}x - \frac{17}{2}$

27

The graph of an exponential function is shown in the xy -plane.



Which of the following is an equation of the graph shown, where b is a positive constant?

- A) $y = 2^x + b$
- B) $y = 2^{x+b}$
- C) $y = 2^x - b$
- D) $y = 2^{x-b}$

28

A company that manufactures staplers calculates its monthly profit by subtracting its fixed monthly costs from its monthly revenue from sales. The equation $12,000 = 2.00x - 3,500$ represents this situation for a month where x staplers are manufactured and sold. What is the meaning of $2.00x$ in this context?

- A) The total cost of manufacturing x staplers
- B) The total cost of manufacturing each stapler
- C) The total monthly revenue from each stapler sold
- D) The total monthly revenue from selling x staplers

CONTINUE



29

The quantity k is reduced by 20% of its value. Which expression is equivalent to the resulting value?

- A) $0.80k$
- B) $0.20k$
- C) $0.08k$
- D) $0.02k$

30

A truck trailer holds 16 cubic meters of soil. How many cubic centimeters of soil does the trailer hold?
(1 meter = 100 centimeters)

- A) 16,000
- B) 160,000
- C) 1,600,000
- D) 16,000,000



TestDaily

**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 bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
- Mark no more than one bubble 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 $\frac{7}{2}$. (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: $\frac{7}{12}$ are:

7	/	1	2
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

Grid in result.

Answer: 2.5

	2	.	5
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

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

2	/	3
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
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
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
0	0	0
1	1	1
2	2	2
3	3	3

2	0	1	
0	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.



31

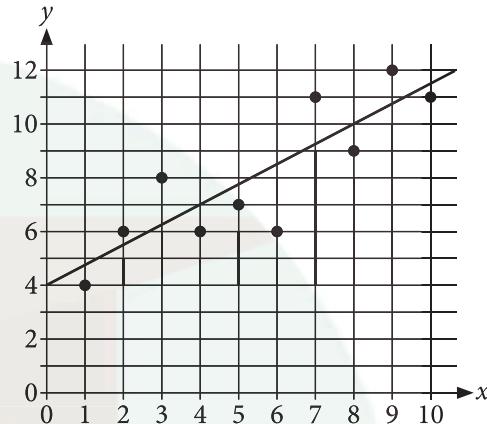
The net force, in newtons, acting on an object is proportional to the object's mass, in kilograms (kg), when the acceleration, in meters per second squared (m/s^2), is constant. Two objects, one of mass 70 kg and the other of mass 50 kg, have accelerations of 4 m/s^2 in the same direction. If the force acting on the 70 kg object is 280 newtons, what is the force, in newtons, acting on the 50 kg object?

32

A certain blue whale calf weighed 5500 pounds when it was born, and its weight increased at a rate of 250 pounds per day for the first n days, where n is an integer. If the calf's weight was greater than 8000 pounds but less than 9000 pounds n days after birth, what is one possible value of n ?

33

The scatterplot shows the relationship between two variables, x and y . A line of best fit for the data is also shown.

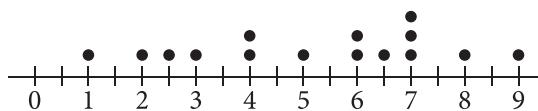


For how many of the 10 data points does the line of best fit predict a y -value that is greater than the actual y -value?

34

Between 1749 and 1811, the population of China increased 100%. In 1811, China's population was 360 million. In 1749, what was China's population, in millions?

35



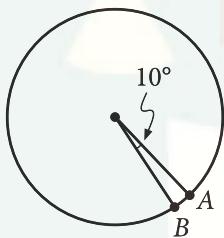
Mohs' scale of hardness can be used to compare substances. The dot plot displays the hardness value of each of 15 substances. What is the median hardness value of the 15 substances?

37

$$H(n) = 1000(1 - 0.05)^n$$

As a beam of X-ray photons passes through a metal block, the metal absorbs several of the photons. The function H , defined by the equation shown, models the relationship between the predicted number of photons, $H(n)$, remaining in a beam and the number of blocks of metal, n , the beam has passed through. Based on this model, the percentage of photons remaining after passing through 1 metal block is $p\%$. What is the value of p ?

36



The circle shown has a circumference of 72π . The length of minor arc \widehat{AB} is $x\pi$. What is the value of x ?

38

In the xy -plane, the line that contains the points $(-3, 5)$ and $(1, 2)$ intersects the y -axis at $(0, c)$. What is the value of c ?

STOP

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

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16

$$4(b + 21) = 16b$$

What is the solution to the given equation?

19

Joan is designing a rectangular flower garden so that the ratio of the length of the garden to its width is 3 to 2. If the area of the garden is 96 square feet, what is the perimeter, in feet, of the garden?

17

The function p is defined by $p(x) = \frac{1}{4}x + \frac{3}{4}$. What is the slope of the graph of $y = p(x)$ in the xy -plane?

18

$$cx + 2 = 3x + 6$$

In the given equation, c is a constant. The equation has no solution. What is the value of c ?

20

$$|x - 4| = 2$$

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

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.

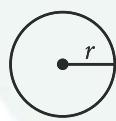
DIRECTIONS

For questions 1–30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble 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 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator is not permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. 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.

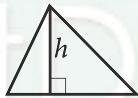
REFERENCE



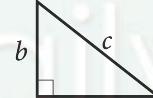
$$\begin{aligned}A &= \pi r^2 \\C &= 2\pi r\end{aligned}$$



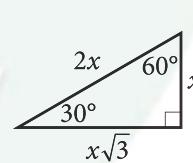
$$A = lw$$



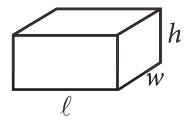
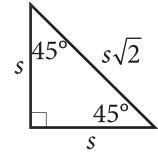
$$A = \frac{1}{2}bh$$



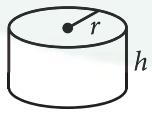
$$c^2 = a^2 + b^2$$



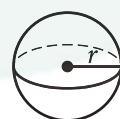
Special Right Triangles



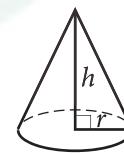
$$V = lwh$$



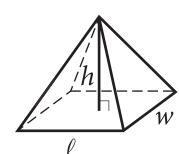
$$V = \pi r^2 h$$



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



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



$$V = \frac{1}{3}lwh$$

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.

CONTINUE



1

An object travels at a rate of 8 meters per second. What is the distance, in meters, that the object travels in 2 seconds?

- A) 4
- B) 6
- C) 10
- D) 16

2

27, 8, 20, 43, 32

What is the mean of the given data set?

- A) 20
- B) 26
- C) 27
- D) 35

3

Seth asked 50 students if they planned to vote for Jada or Katie for class president. Of the students polled, 20 said they planned to vote for Jada and 30 said they planned to vote for Katie. If one of the students polled is selected at random, what is the probability that the selected student said he or she planned to vote for Jada?

- A) 20%
- B) 30%
- C) 40%
- D) 60%

4

If $6x - 3 = 15$, what is the value of $2x - 1$?

- A) 1
- B) 2
- C) 4
- D) 5

5

$$\begin{aligned}4x + y &= 10 \\-3x - y &= -7\end{aligned}$$

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

- A) 17
- B) 3
- C) -3
- D) -17

6

A café manager found that when cups of tea were sold for \$1.00, a total of 50 cups of tea were sold each day. For every \$0.10 increase in the price of a cup of tea, 1 less cup of tea was sold each day. Which equation models the total amount collected S , in dollars, from tea sales each day, where x is the number of \$0.10 price increases?

- A) $S = (1.00 + x)(50 - x)$
- B) $S = (1.00 + x)(50 + x)$
- C) $S = (1.00 + 0.10x)(50 - x)$
- D) $S = (1.00 + 0.10x)(50 + x)$



7

$$\sqrt{(x)^4} = 25$$

What are all possible solutions to the given equation?

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

8

The gravitational potential energy of an object near the surface of Earth is proportional to its height above Earth's surface. An object near Earth's surface is at height h and has gravitational potential energy P . If the object's height doubles while remaining near Earth's surface, which expression gives the gravitational potential energy of the object in terms of P ?

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

Questions 9 and 10 refer to the following information.

Sample	Sample size	Length (inches)		
		minimum	maximum	mean
A	11	15.0	20.0	18.0
B	20	12.5	22.5	17.2

The table shows the minimum, maximum, and mean lengths, in inches, of brown trout in two different samples. The sample sizes are also shown.

9

If one of the trout from the two samples is selected at random, what is the probability that the selected trout is from sample A?

- A) $\frac{11}{31}$
- B) $\frac{11}{20}$
- C) $\frac{11}{18}$
- D) $\frac{11}{15}$



10

Which of the following statements must be true?

- The length of each trout in sample A is greater than the length of each trout in sample B.
 - The range of the lengths of the trout in sample A is greater than the range of the lengths of the trout in sample B.
- A) I only
B) II only
C) I and II
D) Neither I nor II

11

Industries in Canada, May 2012

Goods-producing industry	Percent of GDP
Agriculture	5%
Construction	25%
Manufacturing	36%
Mining, oil, and gas extraction	26%
Utilities	8%

The table shows the distribution by percent of the gross domestic product (GDP) for the five goods-producing industries in Canada. The total GDP for all five goods-producing industries in Canada for May 2012 was approximately \$474 billion. Which of the following is closest to the GDP for utilities, in billions of dollars?

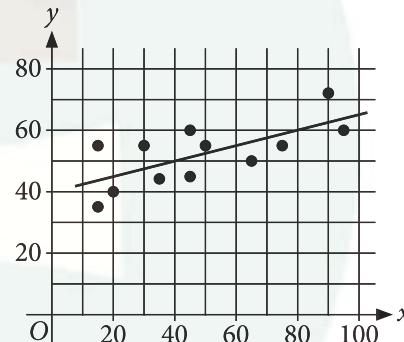
- A) 8
B) 38
C) 59
D) 95

12

If $a = x^3 - 2x + 7$ and $b = x + 1$, which of the following is equivalent to ab ?

- A) $x^3 - 2x^2 + 8$
B) $x^3 - 2x^2 - 2x + 8$
C) $x^4 - 2x + 7$
D) $x^4 + x^3 - 2x^2 + 5x + 7$

13



The scatterplot shows twelve data points and a line of best fit for the data. What is the slope of the line?

- A) $\frac{1}{2}$
B) $\frac{1}{3}$
C) $\frac{1}{4}$
D) $\frac{1}{5}$



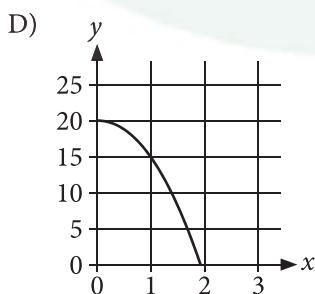
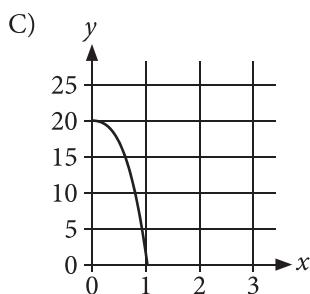
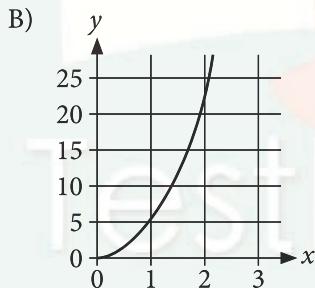
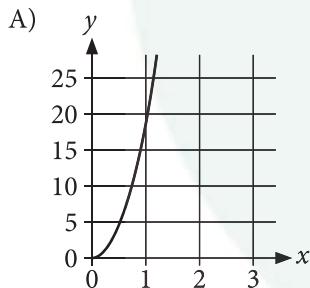
14

Which of the following is(are) true about the linear function $y = 10 + 2x$ and exponential function $y = 5(2)^x$?

- I. When $x = 0$, the value of the linear function is greater than the value of the exponential function.
 - II. When $x = 10$, the value of the linear function is greater than the value of the exponential function.
- A) I only
 B) II only
 C) I and II
 D) Neither I nor II

15

The volume of a certain cylinder with height 6 is given by $V = 6\pi r^2$, where r is the radius of the circular base of the cylinder. Which of the following is the graph of this equation in the xy -plane, where $x = r$ and $y = V$?





16

Triangles ABC and DEF each have a corresponding angle measuring 25° and a corresponding angle measuring 60° . Which additional piece of information is sufficient to determine whether triangle ABC is congruent to triangle DEF ?

- A) The perimeter of triangle ABC
- B) The area of triangle DEF
- C) The length of one pair corresponding sides from the two triangles
- D) No additional piece of information is necessary to determine whether the two triangles are congruent.

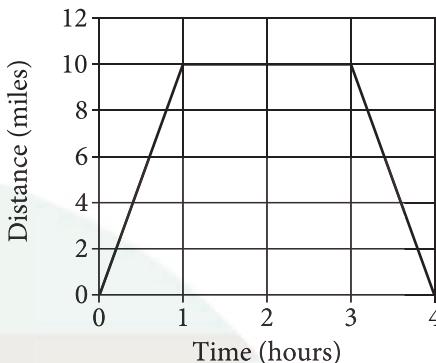
17

x	y
400	2
800	4
1,200	6

The table shows the number of cans of a type of flooring stain, y , needed to cover x square feet of flooring. Which of the following equations best models the relationship between x and y ?

- A) $y = 100x^2$
- B) $y = 200x$
- C) $y = \frac{x}{200}$
- D) $y = \frac{x^2}{200}$

18



Coraline biked on a straight bike path. The graph shows her distance from the start of the path as a function of time. Which of the following best describes Coraline's bike ride?

- A) She biked away from the start of the path at a constant speed for 1 hour, took a 2-hour break, then biked back to the start of the path at a constant speed for 1 hour.
- B) She biked away from the start of the path at a constant speed for 1 hour, took a 2-hour break, then continued to bike away from the start of the path at a constant speed for 1 hour.
- C) She biked away from the start of the path at an increasing speed for 1 hour, took a 2-hour break, then biked back to the start of the path at a decreasing speed for 1 hour.
- D) She biked away from the start of the path at an increasing speed for 1 hour, biked at a constant speed for 2 hours, then biked back to the start of the path at a decreasing speed for 1 hour.



Questions 19 and 20 refer to the following information.

Year	Percent of US households with TV
1951	23.5
1958	83.2
1978	98.0

The table shows the percent of US households with TV for three different years. From 1951 to 1958, the percent of US households with TV increased linearly over time and can be modeled by a linear function P . From 1958 to 1978, the percent of US households with TV also increased linearly, but at a different rate.

19

Which of the following functions best models the percent of US households with TV, $P(t)$, as a function of the number of years since 1951, t , where $0 \leq t \leq 7$?

- A) $P(t) = 23.5t$
- B) $P(t) = 23.5 + 7.5t$
- C) $P(t) = 23.5 + 8.5t$
- D) $P(t) = 7.5 + 23.5t$

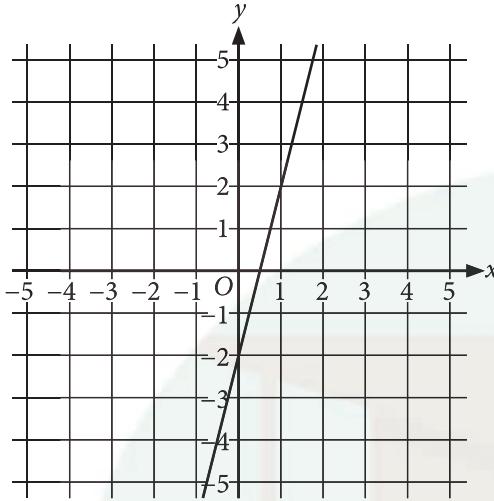
20

Based on the information given, which of the following is closest to the percent of US households with TV in 1962?

- A) 91.3%
- B) 90.6%
- C) 87.4%
- D) 86.2%



21



The line $y = mx + b$, where m and b are constants, is shown in the xy -plane. Which of the following equations could represent the equation of this line after it is translated 1 unit to the left?

- A) $y = 4x - 3$
- B) $y = 4x - 1$
- C) $y = 4x + 1$
- D) $y = 4x + 2$

22

$$\begin{aligned}x - y &= 1 \\2x - 2y &= 1\end{aligned}$$

How many solutions does the given system of equations have?

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

23

$$x^2 - 6x + c = 0$$

In the equation above, c is a constant such that $0 \leq c < 9$. Which of the following is the greater of the two solutions to the equation, in terms of c ?

- A) $\frac{6 - \sqrt{36 - 4c}}{2}$
- B) $\frac{6 + \sqrt{36 - 4c}}{2}$
- C) $\frac{-6 - \sqrt{36 - 4c}}{2}$
- D) $\frac{-6 + \sqrt{36 - 4c}}{2}$

24

There are 10 rare coins in a collection. If the value of each of the 10 coins increases by \$2, which of the following will be true?

- A) The new mean of the values will be \$2 more than the previous mean, but the standard deviation will remain the same.
- B) The mean of the values will remain the same, but the new standard deviation will be \$2 more than the previous standard deviation.
- C) Both the new mean and standard deviation of the values will be \$2 more than the previous mean and standard deviation.
- D) Neither the mean nor the standard deviation of the values will change.

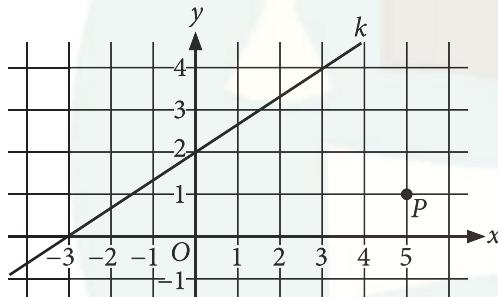
CONTINUE

25

In right triangle ABC , angle A is the right angle and the value of $\cos B$ is 0.8. Which of the following is the value of $\sin C$?

- A) 0.8
- B) 0.6
- C) 0.4
- D) 0.2

26

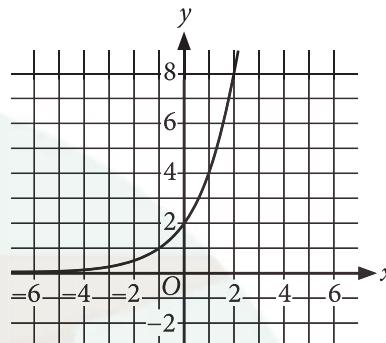


Line k and point P are shown in the xy -plane. Line ℓ (not shown) is perpendicular to line k and passes through point P . Which of the following is an equation of line ℓ ?

- A) $y = -\frac{3}{2}x + \frac{7}{2}$
- B) $y = -\frac{3}{2}x + \frac{17}{2}$
- C) $y = \frac{2}{3}x - \frac{7}{2}$
- D) $y = \frac{2}{3}x - \frac{17}{2}$

27

The graph of an exponential function is shown in the xy -plane.



Which of the following is an equation of the graph shown, where b is a positive constant?

- A) $y = 2^x + b$
- B) $y = 2^{x+b}$
- C) $y = 2^x - b$
- D) $y = 2^{x-b}$

28

A company that manufactures staplers calculates its monthly profit by subtracting its fixed monthly costs from its monthly revenue from sales. The equation $12,000 = 2.00x - 3,500$ represents this situation for a month where x staplers are manufactured and sold. What is the meaning of $2.00x$ in this context?

- A) The total cost of manufacturing x staplers
- B) The total cost of manufacturing each stapler
- C) The total monthly revenue from each stapler sold
- D) The total monthly revenue from selling x staplers

CONTINUE



29

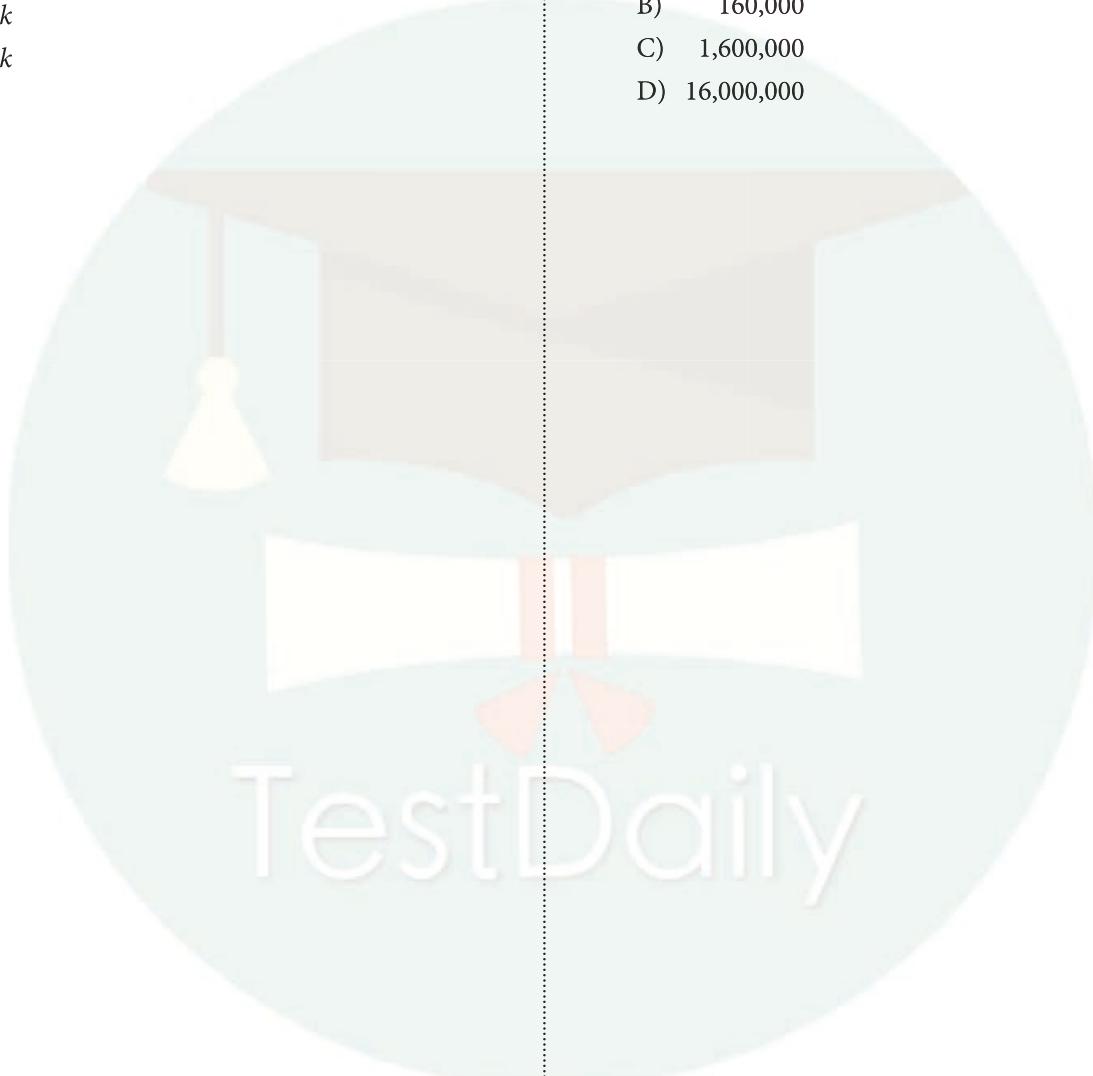
The quantity k is reduced by 20% of its value. Which expression is equivalent to the resulting value?

- A) $0.80k$
- B) $0.20k$
- C) $0.08k$
- D) $0.02k$

30

A truck trailer holds 16 cubic meters of soil. How many cubic centimeters of soil does the trailer hold?
(1 meter = 100 centimeters)

- A) 16,000
- B) 160,000
- C) 1,600,000
- D) 16,000,000



TestDaily

**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 bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
- Mark no more than one bubble 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 $\frac{7}{2}$. (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: $\frac{7}{12}$ are:

7	/	1	2
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

Grid in result.

Answer: 2.5

	2	.	5
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

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

2	/	3
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
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
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
0	0	0
1	1	1
2	2	2
3	3	3

2	0	1	
0	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.



31

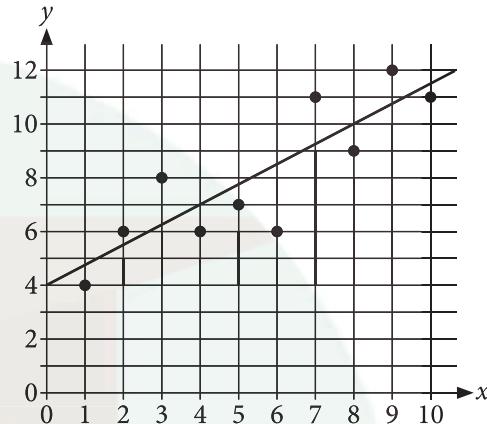
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33

The scatterplot shows the relationship between two variables, x and y . A line of best fit for the data is also shown.

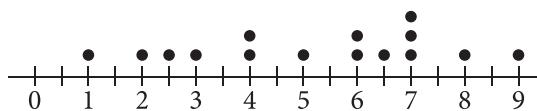


For how many of the 10 data points does the line of best fit predict a y -value that is greater than the actual y -value?

34

Between 1749 and 1811, the population of China increased 100%. In 1811, China's population was 360 million. In 1749, what was China's population, in millions?

35



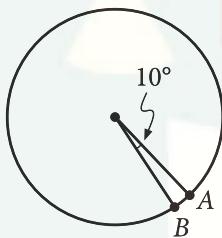
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As a beam of X-ray photons passes through a metal block, the metal absorbs several of the photons. The function H , defined by the equation shown, models the relationship between the predicted number of photons, $H(n)$, remaining in a beam and the number of blocks of metal, n , the beam has passed through. Based on this model, the percentage of photons remaining after passing through 1 metal block is $p\%$. What is the value of p ?

36



The circle shown has a circumference of 72π . The length of minor arc \widehat{AB} is $x\pi$. What is the value of x ?

38

In the xy -plane, the line that contains the points $(-3, 5)$ and $(1, 2)$ intersects the y -axis at $(0, c)$. What is the value of c ?

STOP

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