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# **IMPORTANT INFORMATION—MUST READ**

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#### **Get Situated**

Enclosed, you will find the exam booklet and bubblesheets. Before you begin, it is imperative that you:

- read all of the instructions carefully.
- find a quiet space that will remain quiet for about 3.5 hours. The closer you can simulate test conditions, the better. Make sure you have at least three sharpened pencils, an eraser, and a calculator.
- have a watch or clock in view of your testing area. It is important that you do not exceed the allotted time on any single section. If you do, your results may not be valid.
- only print the required pages from this document if you are printing from a PDF. You only need to print pages 6 to 79.

#### How To Take The Exam

There are two ways to use this test booklet. The following pages will outline each of the methods individually, in the order they are presented below.

#### Test Booklet / Physical Bubblesheet

- ► A student works through a paper copy of the exam, filling in his or her answers on the bubblesheets provided in this booklet.
- ► A student returns his or her bubblesheets to the consultant at the end of the exam for grading.

#### • Test Booklet / Online Bubblesheet

- ► A student works through the paper exam in this booklet, but transfers his or her answers to the online bubblesheet either at the end of the whole exam or after each section.
- ► Students utilizing this method will need to log in to their student account at app.satactdiagnostic.com, click on "Begin Section," and then select "I have a physical copy of the exam, take me to the online bubblesheet."

We wish you the best of luck. Please email us at diagnostic@satprepct.com if you have any questions.





## **Directions (Test Booklet / Physical Bubblesheet)**

## **Before Taking the Exam**

Make sure you do the following.

- Remove the bubblesheets at the beginning of the exam. You should write your name on each bubblesheet and fill in all of page one.
- Have at least three pencils, an eraser, and a calculator (to be used on sections 3 and 7 ONLY).
- Turn off all electronic devices like phones or tables for the duration of the exam. If you are using one for timekeeping, be sure to put it in airplane mode.
- Remove any earplugs (which may not be worn during testing), highlighters, rulers, dictionaries or other books, pens or colored pencils, and papers of any kind (including scratch paper).
- Read the student instructions (located on the next page) closely.

Below is the timing for each section, along with suggested breaks.

Section	Time (Minutes)	Questions	Calculator
ACT English	24	39	No
SAT Reading	39	30	No
ACT Math	31	31	Yes
Break	5		
SAT Writing & Language	22	27	No
ACT Reading Test	22	24	No
SAT Math (No Calculator)	14	11	No
Break	5		
SAT Math (Calculator)	29	20	Yes
ACT Science	18	20	No
Total	209	202	

## CONTINUE READING ON THE NEXT PAGE

## **Directions (Test Booklet / Physical Bubblesheet)**

#### **Read This Before You Take The Test**

This test contains tests in English, Writing, Mathematics, Reading, and Science. CALCULATORS MAY BE USED ON SECTIONS 3 AND 7 ONLY. YOU <u>MAY NOT</u> USE A CALCULATOR ON SECTION 6 (Even though it is a math section).

The questions in each section are numbered, and the suggested answers for each question are lettered ABCD/E and FGHJ/K. On the bubblesheet, the rows of circles are numbered to match the questions, and the circles in each row are lettered to correspond to the answers.

For each multiple-choice question, decide which answer is best and fill in the corresponding circle on the bubblesheet. Make sure to fill in the circle completely. For the grid-ins in Section 6 and 7, eight questions do not have answer choices. Write your answer choices in the designated areas provided on the bubblesheet. Mark only one answer for each question.

If you decide to change an answer, erase your answer thoroughly before marking a new answer. Make sure to fill in the correct answer on the bubblesheet.

Only answers marked on your bubblesheet will be scored. Your score on all sections will be based only on the number of questions you answer correctly. You will NOT be penalized for guessing on any test sections. IT IS TO YOUR ADVANTAGE TO ANSWER EVERY QUESTION EVEN IF YOU HAVE TO GUESS.

The time for each section is given at the beginning of each section at the top of the page, and you should have a way to keep time on each section. You can use a watch or an electronic device like a phone or tablet in airplane mode. You may work on a section ONLY during the alloted time for that section. If you finish a section before time is up, you may use the remaining time to return to questions that you wish to review. You may NOT go back to a previous section, and you may NOT proceed to another section during this time.

You may NOT fill in or alter circles within a section after the time for that section is up.



## **Directions (Test Booklet / Online Bubblesheet)**

## **Before Taking the Exam**

Make sure you do the following.

- Remove the bubblesheets at the beginning of the exam. You should write your name on each bubblesheet and fill in all of page one.
- Have at least three pencils, an eraser, and a calculator (to be used on sections 3 and 7 ONLY).
- Turn off all electronic devices like phones or tables for the duration of the exam, unless you are using either for the online bubblesheet.
- Remove any earplugs (which may not be worn during testing), highlighters, rulers, dictionaries or other books, pens or colored pencils, and papers of any kind (including scratch paper).
- Read the student instructions (located on the next page) closely.
- Log in to your student account at app.satactdiagnostic.com, click on "Begin Section," and then select "I have a physical copy of the exam, take me to the online bubblesheet."

Below is the timing for each section, along with suggested breaks.

Section	Time (Minutes)	Questions	Calculator
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SAT Reading	39	30	No
ACT Math	31	31	Yes
Break	5		
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ACT Reading Test	22	24	No
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ACT Science	18	20	No
Total	209	202	

## CONTINUE READING ON THE NEXT PAGE

## **Directions (Test Booklet / Online Bubblesheet)**

#### **Read This Before You Take The Test:**

This test contains tests in English, Writing, Mathematics, Reading, and Science. **CALCULATORS MAY BE USED ON SECTIONS 3 AND 7 ONLY. YOU** <u>MAY NOT</u> **USE A CALCULATOR ON SECTION 6** (Even though it is a math section). We recommend circling your answers in the booklet, then transferring those answers to the online bubblesheet.

The questions in each section are numbered, and the suggested answers for each question are lettered ABCD/E and FGHJ/K.

For each multiple-choice question, decide which answer is best and select the corresponding bubble; your selection will fill in the bubble green and put a green outline around your answer. You can change your answer at any time by selecting another answer choice. For the free response questions in Section 6 and 7, eight questions do not have answer choices. Type your answer choices in the designated areas provided in the testing environment. Free response answers accept " / " for a fraction bar and " . " for a decimal point, so an answer of "two thirds" can be entered as "2/3," ".666," or ".667."

Only answers entered on the online bubblesheet will be scored. Your score on all sections will be based only on the number of questions you answer correctly. You will NOT be penalized for guessing on any test sections. **IT IS TO YOUR ADVANTAGE TO ANSWER EVERY QUESTION EVEN IF YOU HAVE TO GUESS**.

The time for each section is given at the beginning of each section at the top of the page, and you should have a way to keep time on each section. You can use a watch or an electronic device like a phone or tablet in airplane mode. You may work on a section ONLY during the alloted time for that section. If you finish a section before time is up, you may use the remaining time to return to questions that you wish to review. You may NOT go back to a previous section, and you may NOT proceed to another section during this time.

Once a bubblesheet for a particular section is submitted, all answers are final and cannot be changed—make sure to bubble your answers carefully.

IF THE INTERNET OR POWER GOES OUT WHILE YOU ARE USING THE ONLINE BUBBLESHEET (OR YOU ACCIDENTALLY CLOSE YOUR BROWSER OR BROWSER TAB), YOUR RESPONSES ON THE SECTION YOU ARE WORKING ON WILL NOT BE SAVED. For this reason, we strongly suggest you circle all of your answers in your test booklet or enter them on the physical bubblesheet before using the online bubblesheet. Any previously submitted sections will be saved.





## SAT/ACT Diagnostic v3.2

#### **Marking Directions:**

Α

Use only a #2 pencil. Read and follow directions on exam page. Select on answer for each question. Fill in the answer circles completely. Be sure to erase marks completely to change your answer. Write only inside the specified boxes.

First Name Last Name

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#### В **Email Address(es):**

**Phone Number:** С

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**Marking Directions:** Mark only one circle for each question. Fill in response completely. Erase errors cleanly without smudging.

Correct mark: ABDE

Do NOT use these incorrect or bad marks.

Incorrect marks:Image: Constraint of the sector of the sector



D Student Name:

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Section 1   ACT English - Bubble in your responses to the multiple choice quest	ions
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1	ABCD	9	ABCD	17	ABCD	25	ABCD	33	ABCD
2	© © ® J	10	EGHJ	18	© © ® J	26	© © ® J	34	EGHJ
3	ABCD	11	ABCD	19	ABCD	27	ABCD	35	ABCD
4	© © ® J	12	EGHJ	20	© © ® J	28	© © ® J	36	© © D J
5	ABCD	13	ABCD	21	ABCD	29	ABCD	37	ABCD
6	EGBJ	14	EGBJ	22	© © ® J	30	EGBJ	38	ĒGÐJ
7	ABCD	15	ABCD	23	ABCD	31	ABCD	39	ABCD
8	$\mathbb{P} \oplus \mathbb{P} \cup$	16	$\mathbb{P} \oplus \mathbb{H} \cup$	24	$\mathbb{P} \oplus \mathbb{P} \cup$	32	$\mathbb{P} \oplus \mathbb{P} \cup$		

Section 2 | SAT Reading - Bubble in your responses to the multiple choice questions

1	A B C D	7	ABCD	13	ABCD	19	ABCD	25	ABCD
2	A B C D	8	ABCD	14	ABCD	20	ABCD	26	ABCD
3	ABCD	9	ABCD	15	ABCD	21	ABCD	27	ABCD
4	ABCD	10	ABCD	16	ABCD	22	ABCD	28	ABCD
5	A B C D	11	ABCD	17	ABCD	23	ABCD	29	ABCD
6	ABCD	12	ABCD	18	ABCD	24	ABCD	30	ABCD

Section 3 | ACT Math - Bubble in your responses to the multiple choice questions

1	ABCDE	8	E G H J K	15	ABCDE	22	EGBJK	29	ABCDE
2	$\mathbb{E} \mathbb{G} \mathbb{H} \mathbb{O} \mathbb{K}$	9	ABCDE	16	© © ® J ©	23	A B C D E	30	EGBJK
3	ABCDE	10	ĒGHJK	17	ABCDE	24	ĒGÐJK	31	ABCDE
4	$\mathbb{E} \mathbb{C} \mathbb{H} \mathbb{O} \mathbb{K}$	11	ABCDE	18	₿₿₿Ĵ®	25	ABCDE		
5	ABCDE	12	E G H J K	19	ABCDE	26	EGBJK		
6	$\mathbb{E} \mathbb{G} \mathbb{H} \mathbb{O} \mathbb{K}$	13	ABCDE	20	₿₿₿Ĵ®	27	A B C D E		
7	ABCDE	14	E G H J K	21	ABCDE	28	E G H J K		

**Marking Directions:** Mark only one circle for each question. Fill in response completely. Erase errors cleanly without smudging.

Correct mark: ABDE

Do NOT use these incorrect or bad marks.

Incorrect marks:Image: Constraint of the second second



D Student Name:

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Sect	ion 4   SAT Lang	uage	/ Writing - Bubbl	le in y	your responses to	the	multiple choice q	uesti	ons
1	ABCD	7	A B C D	13	A B C D	19	ABCD	25	A B C D
2	ABCD	8	A B C D	14	A B C D	20	ABCD	26	A B C D
3	ABCD	9	A B C D	15	A B C D	21	ABCD	27	A B C D
4	ABCD	10	A B C D	16	$A \otimes O$	22	ABCD		
5	ABCD	11	A B C D	17	A B C D	23	ABCD		
6	ABCD	12	A B C D	18	$A \otimes O$	24	ABCD		

#### Section 5 | ACT Reading - Bubble in your responses to the multiple choice questions

		-							
1	A B C D	6	© © ® J	11	ABCD	16	ĒGHJ	21	A B C D
2	€ © ₪ J	7	ABCD	12	ĒGÐJ	17	A B C D	22	© © ® J
3	A B C D	8	EGBJ	13	ABCD	18	© ® ® J	23	A B C D
4	ĒGBJ	9	ABCD	14	ĒGÐJ	19	A B C D	24	₿₿₩IJ
5	ABCD	10	© © ® J	15	ABCD	20	e e e		

#### Section 6 | SAT Math (No Calculator) - Bubble in your responses to the multiple choice questions

1	ABCD	3	ABCD	5	ABCD	7	ABCD
2	ABCD	4	ABCD	6	A B C D	8	ABCD

Q.10

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01034960 09084960 09084960

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	Q.	9		
$\odot$	0 0	0 0	$\odot$	
103456789	0103466789	000000000000000000000000000000000000000	0103466789	

	1				
			Q.	11	
$\odot$		$\odot$	0 0	0 0	$\odot$
0103496789		©®()@@()@@()	000000000000000000000000000000000000000	000000000000000000000000000000000000000	000000000000000000000000000000000000000

**Marking Directions:** Mark only one circle for each question. Fill in response completely. Erase errors cleanly without smudging.

Correct mark: ABDE

Do NOT use these incorrect or bad marks.

Incorrect marks:Image: Constraint of the sector of the sector

# **tutor**

How learning hits home.

D Student Name:

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	Section 7   SAT Math (Wi	ith Calculator) - Bubble in	your responses to the	multiple choice questions
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1	ABCD	4	ABCD	7	ABCD	10	$A \otimes C \otimes$	13	$A \otimes C \otimes$
2	A B C D	5	A B C D	8	A B C D	11	ABCD	14	$\textcircled{\ } \textcircled{\ } @$ } \textcircled{\ } \textcircled{\ } @ } \textcircled{\ } \textcircled{\ } @ } \textcircled{\ } @ } \textcircled{\ } @ } \textcircled{\ } @ } @ } @ )
3	ABCD	6	ABCD	9	ABCD	12	ABCD	15	ABCD

Q. 16				Q.	17		Q. 18			Q. 19			Q. 20						
	0 0	0 0	$\odot$	$\odot$	0 0	0 0	0	$\odot$	0 0	0 0	0	$\odot$	0 0	Ø 0	$\odot$	$\odot$	0 0	0 0	$\odot$
103466089	0 1 2 3 4 5 6 0 8 9	0103466789	0103466780	103466789	0103466780	0103466780	0103466780	103466789	0103456789	0103466789	0103466780	103456789	0103456789	0103456789	0103456789	103456789	0103466780	0103456789	0103466789

#### Section 8 | ACT Science - Bubble in your responses to the multiple choice questions

1	ABCD	5	ABCD	9	ABCD	13	ABCD	17	ABCD
2	EGBJ	6	© © D J	10	EGBJ	14	EGBJ	18	EGHJ
3	A B C D	7	A B C D	11	ABCD	15	ABCD	19	ABCD
4	© © D J	8	© © D J	12	© © ® J	16	© © B J	20	© © D J

# No Testing Material On This Page





## ACT ENGLISH TEST

39 Questions — 24 Minutes

**DIRECTIONS:** There are three passages in this section. In the column next to the text you will find questions that correspond to the underlined portions in the text. Choose the best answer choice. NO CHANGE is the correct answer choice if the underlined portion does not need improvement.

Read the entire passage once before you start to answer. Some questions pertain to a larger portion of the text, or the passage in its entirety. Make certain that you've read enough of the text beyond the question to derive the right answer. Bubble your answers on the bubblesheet.

#### **PASSAGE I**

#### The Olympic Cost

For some athletes, the Olympic Games offer a rare chance to compete against the best in their sport and display their skills on the world stage. For fans, the games provide hours of entertainment and a chance to enjoy an international sporting event that seeks to bring the world closer together. However, for many cities that host the Olympics—especially those in developing

countries-there is a lingering, detrimental effect.

To become a host for the Olympics, a city must first win a bid against other locations around the world. The International Olympic Committee (IOC) receives many bids per Olympics, so most cities are unsuccessful. In this race to <sup>2</sup> stand out, though, these bids often become more costly than the host cities anticipate.

- 1. A. NO CHANGE
  - **B.** Olympics, and especially those in developing countries: there
  - **C.** Olympics; and especially for those in developing countries, there
  - **D.** Olympics, especially those in developing countries. There
- **2.** Given that all the choices are true, which one best introduces the information that follows?
  - F. NO CHANGE
  - G. the host cities are chosen democratically and years in advance.
  - **H.** the chosen city usually submits the most elaborate and expensive bid.
  - **J.** cities tend to submit very imaginative and artistic ideas.



 $\frac{\text{For instance, the Olympics in Montreal in 1976 had}}{3}$ 

an original budget of \$124 million, but, due to unforeseen costs and dangerous construction projects that could not meet deadlines, the city was left with a debt of almost \$1.5 billion. The city only recently finished paying it off.  $\boxed{5}$ 

Most of the hosting cost comes from <u>planning</u>, <u>but expenses also come from designing and building</u> the <u>6</u> complex infrastructure that enables thousands of athletes and fans to enjoy the games. Stadiums and tracks have to be <u>7</u> <u>built</u>: transportation provided, and security systems implemented or upgraded before the Olympics can start. While planners have a framework of projected expenses, they almost always run into unanticipated issues, which is <u>8</u> <u>spiraling</u> the cost out of control.

[1] Studies have shown that most of the time, hosting the Olympics isn't worth it for the city. [2] The 2016 games in Rio, by contrast, left the city owing \$13 billion

- 3. A. NO CHANGE
  - B. However,
  - C. Therefore,
  - **D.** Likewise,
- 4. F. NO CHANGE
  - G. mismanaged
  - **H.** perilous
  - J. contingent
- 5. The writer is considering deleting the preceding sentence. Should the sentence be kept or deleted?
  - **A.** Kept, because it explains the topic of the essay for a contemporary audience.
  - **B.** Kept, because it highlights how much debt the city incurred.
  - **C.** Deleted, because it adds information that is irrelevant at this point in the paragraph.
  - **D.** Deleted, because it detracts from the paragraph's focus on the IOC.
- 6. F. NO CHANGE
  - G. planning and designing, then expensively building
  - H. first planning and designing, then building
  - J. planning, designing, and building
- 7. A. NO CHANGE
  - **B.** to be built;
  - **C.** to be built,
  - **D.** to be built –
- 8. F. NO CHANGE
  - **G.** which spiral
  - **H.** this spirals
  - **J.** which spiraled





in construction costs, which further crippled their  $\frac{1}{2}$ 

already struggling economy and exacerbated crime  $\frac{10}{10}$ 

 $\frac{\text{in poorer communities.}}{10}$  [3] To address the debt moving

forward, Rio will have to halt the progress it made on

cleaning its waterways, and will need to find a way to  $\frac{\text{derive}}{11}$ 

use from the abandoned stadiums that

have been built for the games. [4] In fact, the 1984 Olympics  $\frac{12}{12}$ 

in Los Angeles was the only games to have produced a net

gain of revenue. 13

#### 9. A. NO CHANGE

- **B.** it's
- C. there
- **D.** its
- **10.** Which choice most specifically describes a financial impact that hosting the Olympic games had on the city of Rio?
  - F. NO CHANGE
  - G. slowed commerce.
  - **H.** jeopardized pension accounts for most of Rio's public workers.
  - J. halted new construction projects.
- 11. A. NO CHANGE
  - **B.** make useful
  - C. benefit
  - **D.** use

#### 12. F. NO CHANGE

- G. were
- H. was
- J. are
- **13.** For the sake of logic and cohesion, Sentence 4 should be placed:
  - **A.** where it is now.
  - **B.** before Sentence 1.
  - C. after Sentence 1.D. after Sentence 2.





#### **PASSAGE II**

#### The Paradox of Miki Dora

In the late 1950s and 60s, surfing gained in popularity with the general public. What began as a sport for the counterculture generation became increasingly mainstream, allowing the best surfers that capitalized on 14 their talents through competitions, endorsements, and movie deals. While some surfers enjoyed having their lifestyles 15 glamorized by bands like the Beach Boys, others rebuked 15 the newfound popularity and wanted to return to how things were when the sport was largely practiced by the locals of Malibu or Hawaii.

As the big surfing names of the world began  $\frac{16}{16}$ 

competing and signing movie deals, surfers like Miklos "Miki" Dora walked a fine line between star and recluse. Born in Hungary on the banks of the Danube River, the  $\frac{17}{17}$ shores of Malibu were later surfed by Dora at a young age.  $\frac{17}{17}$ 

At the time, many considered him to be one of the greatest surfers in the world because of his grace and reflexes.

#### 14. F. NO CHANGE

- G. who capitalized
- **H.** to capitalize
- J. to have capitalized
- **15.** Given that all the choices are accurate, which one best illustrates the contrast given in the rest of the sentence?
  - A. NO CHANGE
  - **B.** Although most surfers chased off the camera crews when they arrived at the surfing holes,
  - **C.** Regardless of how some surfers viewed the multitude of surfing songs on the radio,
  - **D.** Though many surfers at the time begrudgingly began teaching lessons,
- **16.** The best placement for the underlined portion would be:
  - **F.** where it is now.
  - **G.** after the word *signing*.
  - H. after the word *between*.
  - J. before the word *world*.
- 17. A. NO CHANGE
  - **B.** Dora's surfing of the Malibu shores began at a young age.
  - C. Malibu's shores were surfed by Dora at a young age.
  - **D.** Dora began surfing at a young age on the shores of Malibu.





Onlookers were constantly amazed by the way Dora moved

back and forth on his board, maintaining, somehow,

 $\frac{\text{constantly}}{18} \text{ perfect balance.}$ 

Despite his skill, Dora denounced much of what surfing was becoming at the time. He saw the

commercialization of surfing as  $\frac{\text{an affront to}}{20}$  his lifestyle, and he made an effort to make that clear whenever given the chance. He would push nearby surfers off their boards if they got too close to him, and he would make obscene gestures to cameras or competition judges, towards

 $\frac{\text{the end of his career, he even had a warrant for his arrest}}{^{21}}$ 

following fraud charges.

While this rebellious nature conflicted with the popular image of surfing at the time, many saw it as  $\frac{a \text{ legends'}}{22}$ last chance to hold on to what made the sport
appealing in the first place. Those who originally flocked to

surfing wanted to get away from the fast-paced lifestyle of the modern world, the very idea of spending an afternoon  $\frac{23}{23}$ 

trying to catch the perfect wave runs contrary to trying to

- **18. F.** NO CHANGE
  - G. somehow constantly maintaining
  - H. constantly maintaining somehow,
  - J. maintaining somehow constantly,
- **19.** At this point, the writer is considering adding the following information:

In 1964, Dora competed in the Malibu Invitational against Dirk Masterson, his long-time rival.

Should the writer make this addition here?

- **A.** Yes, because it further elaborates on the way in which Dora was viewed by his contemporaries.
- **B.** Yes, because it showcases how Dora behaved towards the media later in his career.
- **C.** No, because it contradicts information earlier in the passage about Dora's success at competitions.
- **D.** No, because it introduces information that is only loosely related to Dora's physical expertise on a surfboard.
- **20. F**. NO CHANGE
  - **G.** a bright spot of
  - **H.** an aid to
  - J. a weakness of

#### **21. A.** NO CHANGE

- B. judges; towards the end of his career
- C. judges, towards the end of his career;
- D. judges. Towards the end of his career,

#### **22. F.** NO CHANGE

- **G.** the legends
- H. a legend's
- J. the legends'

#### **23. A.** NO CHANGE

- **B.** world: and the
- C. world—the
- D. world; and the





catch the perfect corporate job. And so, Dora was placed in the middle of a tug-of-war: he was the face of surfer culture,  $\frac{24}{24}$  while openly rejecting its commercialization. The negative 24

headlines that followed his exploits stood in stark contrast to the many "Dora Rules!" that had been graffitied near the beaches of Malibu.

Dora died in 2002, but he remains a constant reminder of what surfing meant—and still means—to some of its most enthusiastic and passionate fans.

25

- **24.** If the writer were to delete the underlined portion (and end the sentence with a period), the paragraph would primarily lose:
  - F. an indication of how Dora is remembered in surfing history.
  - **G.** an indication of how the narrator views Dora's unblemished legacy as a surfer.
  - **H.** a detail that suggests Dora has been unfairly regarded by the surfing world.
  - **J.** a detail that sheds light on why Dora acted the way he did.
- **25. A**. NO CHANGE
  - **B.** enthusiastic fans, who remember him to this day.
  - **C.** enthusiastic fans.
  - D. enthusiastic fans upon reflection.

Question 26 asks about the preceding passage as a whole.

- **26.** Suppose the writer's primary purpose had to been to detail the life of a surfing legend in order to discuss the history of surfing. Would this essay accomplish that purpose?
  - **F.** Yes, because it represents Dora as a significant turning point in the history of the surfing.
  - **G.** Yes, because it states that the 1950s and 60s were key periods in the history of surfing, and Dora was the best surfer at that time.
  - **H.** No, because it instead depicts Dora as more of a rebel than a surfer, and he therefore doesn't reflect the true characteristics of surfing.
  - **J.** No, because it instead focuses on the biography of Dora and his impact on the surfing world.





#### PASSAGE III

#### **Climbing Over It**

#### [1]

The first time my father invited me to rock climb with him, I was scared. I heard stories of climbers,

(including people that my father knew) who had made

27

one small mistake and suffered serious injuries. Some had even died. Trying to calm me down, my father showed me how to fix a rope around a cleat or rock, and how to use a spring-loaded gate called a <u>carabiner</u>: it would safely hold  $\frac{28}{28}$ 

me if I slipped and fell.

[2]

As I anxiously approached the rock surface, I could feel my heart nearly beating out of my chest. 29 I looked all the way to the top of the mountain face, which was only about 25 feet tall. [A] "Eyes on your next move, and your

limbs will follow," my dad promised. I faced the wall, took 30

 $\underline{a \text{ deep breath, and, began climbing.}}_{30}$ 

#### **27. A.** NO CHANGE

- **B.** climbers—including people that my father knew—who
- C. climbers, including people that my father knew who,
- D. climbers: including people that my father knew. Who

#### 28. F. NO CHANGE

- G. carabiner,
- H. carabiner; and so therefore
- J. carabiner and,
- **29.** The writer is considering deleting the preceding sentence. Should the sentence be kept or deleted?
  - **A.** Kept, because it establishes how rock climbing impacts the emotional state of the narrator.
  - **B.** Kept, because it provides a detail that suggests the narrator was ready to begin climbing the face.
  - **C.** Deleted, because it shifts the focus from the narrator's preparation for his climb.
  - **D.** Deleted, because it distracts the reader from the main idea of the paragraph.
- **30. F.** NO CHANGE
  - **G.** wall, took a deep breath, and
  - H. wall, and took a deep breath, then
  - J. wall, took a deep breath, and then,





#### [3]

My right hand reached upward until it felt a small

hold, and, after my left foot found another, I began hoisting

myself up off the ground. [B] As my father cheered me on, I slowly inched upward. I tried desperately to keep my weight on my legs whenever I surveyed the wall for my next move, kept my arms extended, but not tense. Before I knew it,  $\frac{32}{32}$ 

 $\frac{\text{my dad's instructions began to make sense.}}{33}$ 

#### [4]

I moved quickly up the surface, making sure to always plan where I would go next. [C] My arms and thighs

began to burn from stress, but as a result, I kept pushing  $\frac{34}{34}$ 

through it. That was, until I looked down.

#### [5]

The ground seemed far away, yet I was only three quarters up the face. I instantly hugged the wall with haste, and my father called up to me. "Just take a breath and keep going," he said. "Nothing in life is worth having without a struggle. And keep those arms extended or you'll tire yourself out."

#### 31. A. NO CHANGE

- **B.** my left found another after that, I began
- C. another was found by my foot after that, so I began
- D. I began finding another one with my foot,
- 32. F. NO CHANGE
  - G. and I was keeping
  - H. keeping
  - J. I kept
- **33.** The writer wants to end this sentence by emphasizing that the narrator thought his rock climbing skills were becoming better. Which choice best accomplishes that goal?
  - A. NO CHANGE
  - **B.** I could feel my arms regaining their strength.
  - C. the top of the mountain came into view.
  - **D.** I was scaling the face like a true professional.

#### 34. F. NO CHANGE

- G. but
- H. but at the time,
- J. but eventually,
- **35. A.** NO CHANGE
  - **B.** quickly
  - C. as fast as I could
  - **D.** DELETE the underlined portion





#### [6]

As cliché as it was, that was the push I needed. I was only a few moves away from the top, so I shook out my arms and kept climbing. [D] Within a minute, I reached the top and hoisted myself from the precipice. Catching my  $\frac{36}{36}$ 

breath and looking down, my dad's ability to glide up the  $\frac{37}{37}$ steep mountainside was marvelous. We took a second to  $\frac{37}{37}$ catch our breath and enjoy the scenery from the top of the

mountain. I didn't scale the wall as fast as I would have

liked, but I am sure I'll be faster next time.

#### **36. F.** NO CHANGE

- G. up, over
- H. toward
- J. over

#### **37. A.** NO CHANGE

- **B.** I marveled at how my dad glided up the steep mountainside.
- **C.** my dad marveled me with his ability to glide up the steep mountainside.
- **D.** gliding up the steep mountainside, my dad seem marvelous.
- **38.** Which choice best concludes the essay by focusing on an important lesson learned by the narrator?
  - F. NO CHANGE
  - **G.** My dad said my legs would be sore for the next few days, so I should be sure to ice them at home.
  - **H.** There was no doubt I had a lot to learn, but he was right: it was worth the struggle.
  - J. Climbing was my new obsession, and I was excited to head home and watch more YouTube videos.

Question 39 asks about the preceding passage as a whole.

**39.** Upon reviewing the essay and finding that some information has been left out, the writer composes the following sentence incorporating this information:

Still, at the time, it seemed as tall as the faces I had seen professionals scale on YouTube.

If the writer were to add this sentence to the essay, it would most logically be placed at:

- A. Point A in Paragraph 2
- **B.** Point B in Paragraph 3
- C. Point C in Paragraph 4
- **D.** Point D in Paragraph 6

STOP. BE CERTAIN NOT TO EXCEED THE ALLOTTED TIME. YOU MAY PROCEED TO SECTION 2 WHEN TOLD TO DO SO. No Testing Material On This Page

# **SAT Reading Test**

## **39 MINUTES, 30 QUESTIONS**

Locate Section 2 of your bubblesheet to record your answers for this section.

#### DIRECTIONS

Read the passages below and then choose the best answer for each question based on what was written or implied in the passage or passages as well as the accompanying graphics (such as a table, graph, or diagram).

## Questions 1–10 are based on the following passage.

This passage is adapted from Jane Austin's *Mansfield Park*, originally published in 1814.

About thirty years ago, Miss Maria Ward, of Huntingdon, with only seven thousand pounds, had the good luck to captivate Sir Thomas Bertram, *line* of Mansfield Park, in the county of Northampton,

5 and to be thereby raised to the rank of a baronet's lady, with all the comforts and consequences of an handsome house and large income.

She had two sisters to be benefited by her elevation; as Miss Louise Ward and Miss Frances

- 10 Ward were not quite as handsome as Maria, they were not as likely to marry with almost equal advantage. But there certainly are not so many men of large fortune in the world as there are pretty women to deserve them. Miss Louise, at the end of half a dozen
- 15 years, found herself obliged to be attached to the Rev. Mr. Norris, a friend of her brother-in-law, with scarcely any private fortune. Louise's match, indeed, when it came to the point, was not contemptible: Sir Thomas being happily able to give his friend an
  20 income in the living of Mansfield.
  - But Miss Frances married, in the common phrase, to disoblige her family, and by fixing on a lieutenant of marines, without education, fortune, or connections, did it very thoroughly. She could hardly
- 25 have made a more untoward choice. Sir Thomas had interest, which, from principle as well as pride—from a general wish of doing right, and a desire of seeing all that were connected with him in situations of respectability, he would have been glad to exert for

- 30 the advantage of Maria's sister; but her husband's profession was such as no interest could reach; and before he had time to devise any other method of assisting them, an absolute breach between the sisters had taken place. It was the natural result of the
- 35 conduct of each party, and such as a very imprudent marriage almost always produces. To save herself from useless remonstrance, Frances never wrote to her family on the subject till actually married. Maria, who was a woman of very tranquil feelings, and a
- 40 temper remarkably easy and indolent, would have contented herself with merely giving up her sister, and thinking no more of the matter; but Louise had a spirit of activity, which could not be satisfied till she had written a long and angry letter to Frances,
- 45 to point out the folly of her conduct, and threaten her with all its possible ill consequences. Frances, in her turn, was injured and angry; and an answer, which comprehended each sister in its bitterness, and bestowed such very disrespectful reflections on the
- 50 pride of Sir Thomas as Louise could not possibly keep to herself, put an end to all intercourse between them for a considerable period.

By the end of eleven years, however, Frances could no longer afford to cherish pride or resentment, or to

- 55 lose one connexion that might possibly assist her. A large and still increasing family, an husband disabled for active service, but not the less equal to company and good liquor, and a very small income to supply their wants, made her eager to regain the friends
- 50 she had so carelessly sacrificed; and she addressed Maria in a letter which spoke so much contrition and despondence, such a superfluity of children, and such a want of almost everything else, as could

not but dispose them all to a reconciliation. She was

65 preparing for her ninth lying-in; and after bewailing the circumstance, and imploring their countenance as sponsors to the expected child, she could not conceal how important she felt they might be to the future maintenance of the eight already in being.

1

Which choice best summarizes the passage?

- A) Three sisters marry well and despite sickness and hardship manage to stay close.
- B) Three sisters, who separate due to a falling out from one of their marriages, try to reunite after an 11-year separation.
- C) Three sisters each look to marry someone like Sir Thomas Bertram, and the one who does is rejected by her siblings.
- D) Marriage is not to be taken lightly and it's far better to marry for love than money.

#### 2

In line 3, "captivate" most nearly means

- A) love.
- B) mystify.
- C) capture.
- D) marry.

#### 3

The sentence in lines 36-38 ("To save ... married.") mainly serves to

- A) expose Frances's family as uncaring and selfserving.
- B) demonstrate what Frances did to avoid criticism.
- C) show that Maria was easy going.
- D) emphasize that Frances married imprudently.

#### 4

It can be inferred from the passage that Maria's sisters are not likely to marry as well as she did since

- A) they do not have her charm.
- B) they do not have the same social connections.
- C) there are more attractive women than there are wealthy men.
- D) there are fewer opportunities for indolent marriages.

#### 5

Which choice provides the best evidence for the previous question?

- A) Lines 8-11 ("She had ... advantage")
- B) Lines 12-14 ("But there ... them.")
- C) Lines 17-20 ("Louise's ... Mansfield")
- D) Lines 34-36 ("It was ... produces")

How did Maria differ from Louise when it came to reactions regarding their sister, Frances?

- A) Louise wanted to offer Frances a home to live, while Maria didn't.
- B) Maria wants to reunite with Frances, while Louise wanted to subsidize her children's education.
- C) Louise wants to speak with her husband, and Maria wants her husband to meet with Frances.
- D) Maria was ready to reject her sister, and Louise wanted to confront her with an angry letter.

<sup>6</sup> 

#### 7

Which choice provides the best evidence for the previous question?

- A) Lines 38-44 ("Maria ... Francis")
- B) Lines 46-52 ("Francis... period")
- C) Lines 55-59 ("A large ... wants")
- D) Lines 60-64 ("and she ... reconciliation")

#### 8

The narrator indicates that by the end of 11 years, Frances could no longer cherish pride or resentment because she

- A) missed her family deeply.
- B) believed her family would be able to help raise her eight children.
- C) wanted to live on Sir Thomas Bertam's sprawling estate.
- D) thought her family could help her alcoholic husband.

## 9

Which character expressed anger in a lengthy letter to a family member?

- A) Frances
- B) Sir Thomas Bertram
- C) The Rev. Mr. Morris
- D) Louise

#### 10

÷

In line 25, "untoward" most nearly means

- A) unfavorable.
- B) unexpected.
- C) unrivaled.
- D) unerring.

÷

This passage is from Greg Thompson's *Humming Along*. © 2018 *CPP Press*.

Hummingbirds are often viewed as exciting, fleeting manifestations by those moving about the garden or glancing up from breakfast to look at the *line* outdoor feeder. But underneath that small exterior is

- <sup>5</sup> a furnace that is in constant need of nutrition. Few stop to consider that because hummingbirds flap their wings at such a high rate to hover while they eat, they are often close to starvation due to their extreme metabolic rates.
- Hummingbirds—which can be as small as a penny—can beat their wings over 1000 times a minute. This extreme exercise means hummingbirds burn more calories than any other bird or mammal in existence. In fact, the metabolic rate, or the amount
- 15 of energy used by an animal per unit of time, of these birds can become 10 times higher than that of top human athletes. So, how do hummingbirds cope with such extraordinary metabolic rates?

For starters, hummingbirds often supplement

- 20 their typical diet, which consists of mostly nectar, with nutrition found in other places. Their bodies are designed to utilize nectar particularly well because they can use both fat and sugar to power their muscles. At any given moment, a hummingbird can
- 25 also switch from utilizing glucose to using fructose. Humans, in comparison, can only utilize sugar glucose to power their muscles, while fructose is metabolized in humans as fat.

However, hummingbirds cannot survive on

30 nectar alone; they have to find protein and calcium somewhere. Though it is not typically observed, hummingbirds do in fact hunt to add these core components to their diets. To obtain calcium, hummingbirds will often eat bits of silica-rich

- 35 dirt and minerals, or specks of rock. Their bodies have evolved to be able to extract nutrients from these minerals due to special stomach enzymes. For protein, the birds hunt for arthropods: insects, arachnids, and other tiny creatures that have an
- 40 exoskeleton and segmented body. The same jaw and beak that the birds place into flowers can be used to quickly catch one of these fast critters, making for an energetic jolt of much-needed protein. The hummingbirds then use this calcium and protein for
- 45 increased muscle development and bone density, and store any excess for later use in the event they can't find their next meal in a timely manner.

Perhaps the most extreme way of handling their diet is for hummingbirds to enter a state of torpor:

- 50 extreme physical inactivity. Hummingbirds enter this state at night, since only eight hours without eating can cause the birds to starve to death. Instead, torpor significantly cools the internal temperature of the bird, which allows the bird to burn fewer calories
- 55 than it would to maintain a higher core temperature. In addition, the bird conserves even more energy by slowing its breathing, which puts less stress on its respiratory and circulatory systems. Finally, the metabolic rate of the bird slows to almost 30 percent
- 60 of its regular rate, meaning the bird turns sugar storages into energy much slower than it does during the day. All of these factors allow the bird to lose only about one percent of its body weight during the night, allowing it to stay alive until it can eat again the 65 next day.
- There is one exception to the hummingbird's constant weight loss: when the birds prepare for migration. Despite having to make herculean efforts to keep weight on their feathery bones, it's been
- 70 reported that some populations of hummingbirds have been spotted with excess body weight, such as the Ruby-Throated birds that populate South Carolina. These birds, and other species that have to migrate a significant distance, have special sensory
- receptors around their bodies that are stimulated when daylight begins to lessen preceding winter.
   When this happens, the bird begins consuming and storing more food than it normally does, potentially doubling their body weight so they have enough
   energy stored for the long migration south
- 80 energy stored for the long migration south.



The graph above is adapted from Michael Denton, "Measuring the Metabolism of the Hummingbird" by Science Today.

#### 11

The central claim of the passage is that

- A) hummingbirds utilize great amounts of energy hunting for food.
- B) the heartbeat and metabolic rate of hummingbirds are much different from those of humans.
- C) hummingbirds have a number of ways to survive despite extreme physical activity.
- D) a hummingbird's diet consists of silica-rich rock and arthropods.

#### 12

As used in line 12, "extreme" most nearly means

- A) reckless.
- B) intense.
- C) maximal.
- D) radical.

#### 13

Which of the following can be reasonably inferred about hummingbirds?

- A) Only certain species of hummingbirds are equipped to migrate a significant distance.
- B) Special enzymes in hummingbirds' stomachs allow them to properly digest arthropods.
- C) The metabolic rate of hummingbirds drops by 30 percent at night.
- D) Hummingbirds utilize energy less efficiently than top human athletes.

14

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

- A) Lines 14–17 ("In fact ... athletes")
- B) Lines 35–40 ("Their ... body")
- C) Lines 58–62 ("Finally ... the day")
- D) Lines 73–76 ("These birds... winter")

#### 15

The second paragraph mainly serves to

- A) question a suggestion made earlier in the passage.
- B) introduce the central idea of the passage.
- C) provide information that will later be disputed.
- D) make a controversial claim about metabolic rate.

#### 16

As used in line 68, "herculean" most nearly means

- A) frenetic.
- B) grueling.
- C) hulking.
- D) shocking.

#### 17

Based on the passage, which of the following constitutes abnormal hummingbird behavior?

- A) Entering a state of decreased activity to keep itself from starving
- B) Eating silica-rich rocks to supplement its diet
- C) Relying solely on hunting animals for nutrition
- D) Utilizing both fructose and glucose for energy

#### 18

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

- A) Lines 24–25 ("At any ... fructose")
- B) Lines 31–33 ("Though it ... diets")
- C) Lines 33–35 ("To obtain ... rock")
- D) Lines 50–52 ("Hummingbirds ... death")

#### 19

Does the data in the graph support the author's claim about the state of torpor experienced by hummingbirds?

- A) Yes, because metabolic rate is lowered outside of torpor, and the graph shows a higher metabolic rate during the night.
- B) Yes, because metabolic rate is lowered during torpor, and the graph shows a lower metabolic rate during the night.
- C) No, because metabolic rate is lowered during torpor, and the graph shows a higher metabolic rate during the night.
- D) No, because metabolic rate is lowered outside of torpor, and the graph shows a lower metabolic rate during the night.

#### 20

Which of the following claims is supported by the figure?

- A) Hummingbirds instantly drop their metabolic rate when it becomes nighttime.
- B) The metabolic rate of hummingbirds is cyclical based on the time of day.
- C) There is great variation in the metabolic rate of hummingbirds across consecutive days.
- D) During the day and night, the metabolic rate of hummingbirds stays constant.

# Questions 21–30 are based on the following passage.

Passage 1 is adapted from "Woman Suffrage Must Fail" by Alice N. George. © 1915 *The Independent*. Passage 2 is adapted from a speech by J. Elizabeth Jones in *The History of Women Suffrage Vol. III* © 2009. Enfranchisement and suffrage both refer to one's ability to vote.

#### Passage 1

Woman suffrage must ultimately fail. It is based upon a fallacy, and no fallacy has ever made a permanent conquest over mankind.

*line* No question of superiority or equality is involved

5 in the opposition to votes for women. The test of woman's worth is her ability to solve the problems and do the work she must face as a woman if the race is not to deteriorate and civilization perish. The woman's suffrage movement is an imitation-of-man

10 movement, and as such merits the condemnation of every normal man and woman.

The attempt to interpret woman's service to the state in terms of political activity is a false appraisal of the contribution she has always made to the

- 15 general welfare. All this agitation for the ballot diverts attention from the only source from which permanent relief can come, and fastens it upon the ballot box. It is by physical, intellectual, and moral education that our citizenship is gradually improved,
- 20 and here woman's opportunities are supreme. If women are not efficient in their own dominion, then in the name of common sense let them be trained for efficiency in that dominion and not diffuse their energies by dragging them through the devious paths of political activity.

25 of political activity.

Equal suffrage is clearly impossible; double suffrage, tried under most favorable conditions in sparsely settled western states, has made no original contribution to the problem of sound government.

- 30 On the other side of the ledger we find that the enfranchisement of women has increased taxes, added greatly to the menace of an indifferent electorate, and enlarged the bulk of unenforced and unenforceable laws.
- This is not a question of what some women want or do not want—it is solely a question of how the average woman shall best contribute her part to the general welfare.

#### Passage 2

No wonder that so many of our politicians are

40 dough-faced serviles, without independence or manhood; no wonder our priests are time-serving and sycophantic: no wonder that so many men are moral cowards and cringing poltroons. What more could be expected of a progeny of slaves?

- 45 Slaves are we, politically and legally. How can we, who, it is said, are the educators of our children, present to this nation anything else but a generation of serviles, while we, ourselves, are in a servile condition, and padlocks are on our lips? No! If men
- 50 would be men worthy of the name, they must cease to disfranchise and rob their wives and mothers; they must cease to consign to political and legal slavery their sisters and their daughters. And, would we be women worthy the companionship of true and noble
- 55 men, we must cease longer to submit to tyranny. Let us rise in the might of self-respect, and assert our rights, and by the aid of truth, the instincts of humanity, and a just application of the principles of equality, we shall be able to maintain them.
- 60 You ask, would you have woman, by engaging in political party bickerings and noisy strife, sacrifice her integrity and purity? No, neither would we have men do it...We hold that whatever is essentially wrong for woman to do, can not be right for man.
- 65 If deception and intrigue, the elements of political craft, be degrading to woman, can they be ennobling to man? If patience and forbearance adorn a woman, are they not equally essential to a manly character? If anger and turbulence disgrace woman, what can they
- 70 add to the dignity of man? Nothing; because nothing can be morally right for man, that is morally wrong for woman. Woman, by becoming the executioner of man's vengeance on his fellow-man, could inflict no greater wrong on society than the same done by
- 75 man; but it would create a more intense feeling of shuddering horror, and would, we conceive, rouse to more healthful activity man's apathetic feelings of justice, mercy, and clemency. And so, also, if woman had free scope for the full exercise of the heavenly
- 80 graces that men so gallantly award her, truth, love, and mercy would be invested with a more sacred charm.

#### 21

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

- A) hazard.
- B) intimidation.
- C) torment.
- D) annoyance.

#### 22

Based on Passage 1, George would most likely agree with which claim about the right to vote?

- A) There are other, more preferable ways for women to improve their situation.
- B) Women's suffrage has driven the two sexes further apart than they were before.
- C) If achieved, equal suffrage would lead to a more efficient and fair government.
- D) Acquiring suffrage would allow women to best contribute to society.

#### 23

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

- A) Lines 4-5 ("No ... women")
- B) Lines 18-20 ("It is ... supreme")
- C) Lines 26–29 ("Equal ... government")
- D) Lines 35-38 ("This ... welfare")

#### 24

The author of Passage 2 mentions slavery in order to

- A) highlight differences between two historic periods.
- B) justify the emotional argument made in the passage.
- C) create a metaphor for the political situation of women.
- D) appeal to those who are sympathetic to abolitionism.

#### 25

Which of the following best summarizes Jones' view of the difference between men and women?

- A) The qualities of men are better suited for politics than the qualities of women.
- B) Whatever is done by men should be able to be done by women.
- C) Men have made important decisions throughout history, so now women should be able to do so.
- D) Women often act in the best welfare of society, while men generally do not.

#### 26

As used in line 52, "consign" most nearly means

- A) assign.
- B) allocate.
- C) transfer.
- D) submit.

#### 27

The main purpose of each passage is to

- A) compare the different ways in which the voting system can take gender into account.
- B) make an argument for increased representation of women in the government.
- C) comment on the inequality present within societal institutions.
- D) analyze the situation of women and their right to vote.

#### 28

Based on the passages, Jones would most likely describe the characterization of women's suffrage in lines 8–11 ("The ... woman") as

- A) wrong, because the right to vote is essential for the progression of women's rights.
- B) disappointing, because it represents an attitude that causes strife within the government.
- C) reasonable, because it acknowledges a central idea of Jones' argument.
- D) correct, because Jones is unsure of how voting will impact the status of women.

#### 29

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

- A) Lines 45-49 ("Slaves ... lips")
- B) Lines 56–59 ("Let ... them")
- C) Lines 60–62 ("You ask ... purity")
- D) Lines 78-82 ("And so ... charm")

#### 30

Which choice best identifies the central tension between the two passages?

- A) George blames women for their inability to impact society through their voting, while Jones claims that women require suffrage to properly impact on society.
- B) George believes that women should impact society without engaging in politics, whereas Jones argues that the principles of equality direct women to assert their right for political engagement.
- C) George emphasizes the lack of differences between men and women, but Jones believes that women will counteract the wrongs done by men.
- D) George emphasizes the apolitical avenues down which women can enact change, but Jones thinks those same avenues are what causes inequality between the genders.

#### STOP. BE CERTAIN NOT TO EXCEED THE ALLOTTED TIME. YOU MAY PROCEED TO SECTION 3 WHEN TOLD TO DO SO.

No Testing Material On This Page





## ACT MATHEMATICS TEST

31 Questions — 31 Minutes

**DIRECTIONS:** Solve the problems, select the correct answer, and fill the corresponding bubble on your bubblesheet.

Do not spend too much time on a single problem. Solve as many problems as you are able; once finished, return to any problem in the remaining time.

You are allowed to use a calculator on this section of the exam, but some problems on the exam may actually be

1. A card is randomly dealt from a deck of cards. The probability of selecting a face card is  $\frac{3}{13}$ . The probability of selecting an ace is  $\frac{1}{13}$ . What is the probability of selecting a face card or an ace?

(Note: no card in the deck is both an ace and a face card.)

**A.** 
$$\frac{1}{26}$$
  
**B.**  $\frac{2}{13}$   
**C.**  $\frac{3}{13}$   
**D.**  $\frac{4}{13}$   
**E.**  $\frac{3}{169}$ 

- 2. Consider the equation  $C = \frac{9}{5}F + 32$ . For what value of *C* is *F* equal to 5?
  - **F.** −15
  - **G.**  $-\frac{243}{5}$
  - **H.**  $\frac{5}{9}$
  - J.  $\frac{160}{9}$
  - **K.** 41

easier to solve without the use of a calculator.

**NOTE:** Unless stated otherwise, the following may be assumed.

- 1. Illustrated figures are NOT always drawn to scale.
- 2. Geometric figures are in a plane.
- 3. The word *line* means a straight line.
- 4. The word average means arithmetic mean.

## DO YOUR WORK HERE.




**DO YOUR WORK HERE.** 

- 3. What is |3-x|+|x-2| when x = 4?
  - **A.** −3
  - **B.** −1
  - **C.** 1
  - **D.** 3
  - **E.** 5
- 4. The floor plan for an L-shaped apartment is shown below with the distances marked in feet. What is the floor area of the apartment, in square feet?

(Note: walls meet only at right angles.)



- **F.** 609
- **G.** 745
- **H.** 990
- **J.** 1,143 **K.** 1,320
- 5. Given that  $f(x) = x^2 + 2x + 1$  and  $g(x) = \sqrt{x+7}$ , what is the value of f(3) + g(2)?
  - **A.** 10
  - **B.** 12
  - **C.** 16
  - **D.** 19
  - **E.** 25
- 6. In the (x,y) coordinate plane, what is the slope of the line 7x + 2y = 12?
  - **F.** −7

**G.** 
$$-\frac{7}{2}$$

- **H.**  $\frac{7}{12}$
- **J.** 7
- **K.** 12



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DO YOUR WORK HERE.

- 7. 6 percent of 40 is  $\frac{1}{5}$  of what number?
  - **A.** 0.48
  - **B.** 2.4
  - **C.** 4.8
  - **D.** 6
  - **E.** 12
- 8. A circle in the standard (x,y) coordinate plane passes through A(-2, 7) and B(0, 11). If  $\overline{AB}$  is a diameter of the circle and *C* is its center, what are the coordinates of point *C*?
  - **F.** (-4, -25)
  - **G.** (-1, 2)
  - **H.** (-1, 9)
  - **J.** (2, 11)
  - **K.** (3, 9)
- 9.  $\frac{5.6 \times 10^6}{1.4 \times 10^{-3}} =$ 
  - A.  $4.0 \times 10^{-2}$
  - **B.**  $4.0 \times 10^3$
  - C.  $4.0 \times 10^{9}$
  - **D.**  $4.2 \times 10^3$
  - **E.**  $4.2 \times 10^9$
- **10.** The greatest common factor of two positive integers is 10. Which of the following could NOT be the pair of integers?
  - **F.** 10 and 20
  - G. 20 and 50
  - **H.** 40 and 60
  - **J.** 40 and 110
  - **K.** 100 and 110
- **11.** A picture measures 5 inches by 7 inches. Helia would like to place it in a rectangular frame that extends 0.5 inches beyond the picture in all directions. What is the area, in square inches, of the part of the frame that is not covered by the picture?
  - **A.** 6.25
  - **B.** 7.5
  - **C.** 9
  - **D.** 13
  - **E.** 48
- 12. What are the solutions to the equation  $x^2 2x = 48$ ?
  - **F.** x = -6 and x = 4
  - **G.** x = -6 and x = 8
  - **H.** x = -8 and x = 6
  - **J.** x = 6 and x = 8
  - **K.** x = 4 and x = 8









13. When the positive number x is divided by its reciprocal, the

result is  $\frac{16}{9}$ . What is the value of x?

DO YOUR WORK HERE.

- **A.**  $\frac{3}{2}$ **B.**  $\frac{3}{4}$
- C.  $\frac{4}{3}$ D.  $\frac{4}{9}$
- **E.**  $\frac{16}{3}$
- 14. In the figure below, line *m* is perpendicular to line *n*, and both lines intersect line *q* at the same point. The measure of  $\angle 1$  is  $(5x-10)^\circ$  and the measure of  $\angle 3$  is  $(3x-4)^\circ$ . What is the measure of  $\angle 2$ ?



- **F.** 25°
- **G.** 35°
- **H.** 40°
- **J.** 50° **K.** 55°
- **K.** 33
- **15.** Shown below, a board 13 feet, 6 inches long is cut into two equal parts. What is the length, to the nearest inch, of each part?



- **A.** 6 feet 6 inches
- **B.** 6 feet 8 inches
- C. 6 feet 9 inches
- **D.** 7 feet 3 inches
- E. 7 feet 6 inches









#### DO YOUR WORK HERE.

Use the following information to answer questions 16-18.

A family plans to remodel a bathroom in their home. They have a total budget of \$12,000 to cover expenses in five categories. Not all of the budget has been assigned. The budget amounts that have been assigned are shown in the table below.

Expense Category	Budget Amount			
Toilet, Sink, and Bathtub	\$1,400			
Cabinets	?			
Tiling	\$800			
Plumbing Materials	\$4,000			
Labor	?			

- **16.** In a circle graph illustrating the budget amounts in the table, what should be the measure of the central angle of the Toilet, Sink, and Bathtub sector?
  - **F.** 12°
  - **G.** 18°
  - **H.** 21°
  - **J.** 42°
  - **K.** 60°
- **17.** A contractor estimates that the total cost of the cabinets will be one-half of the total cost of the tiling. If that statement is true, what percent of the budget will be dedicated to labor?
  - **A.** 33%
  - **B.** 45%
  - **C.** 47%
  - **D.** 52%
  - **E.** 55%
- **18.** When the family created their budget, it anticipated the cost of tiling to be \$12.50 per square foot. If the cost of tiling is actually \$15.00 per square foot, by how much will the family exceed its budget for tiling?
  - **F.** \$24
  - **G.** \$64
  - **H.** \$80
  - **J.** \$96
  - **K.** \$160







**19.** Point A lies at (4,-2) and point B lies at (-1, 5) in the standard (x,y) coordinate plane below. What is the length, in coordinate units, of  $\overline{AB}$ ?

#### **DO YOUR WORK HERE.**



 $\sqrt{20}$ Α. **B**.  $\sqrt{24}$ С. 6  $\sqrt{74}$ D. E. 12

- **20.** The component forms of vectors u and v are given by  $u = \langle 2,5 \rangle$  and  $v = \langle -7,6 \rangle$ . Which of the following is the unit vector notation of the vector u + v?
  - -5i + 11jF. **G.** -5i + jH. 9**i** – **j** 9i + 11jJ.
  - К. 6**i**
- 21. Student IDs at Woodrow Wilson High School are always 1 letter (from A to Z) followed by 5 digits (0 through 9). Digits may repeat. For example, one such Student ID is V00127. How many unique student IDs are possible under this system?
  - A.  $26 \cdot 10^5$
  - **B**. 6!
  - **C.** 10!
  - **D.** 26 10 9 8 7 6
  - **E.**  $26^{10}$





22. In the figure below, the portion of trapezoid ABCD that lies in Quadrant I is what percentage of the total area of trapezoid ABCD ?

#### DO YOUR WORK HERE.



- **F.** 50%
- **G.** 60%
- **H.** 70%
- **J.** 75%
- **K.** 80%

**23.** If  $270^\circ < \alpha < 360^\circ$  and  $\cos \alpha = \frac{15}{17}$ , then  $\sin \alpha =$  $\frac{17}{15}$ А.

- 8 15 B.
- $\frac{17}{15}$ C. \_\_\_\_8 D.

**E.** 
$$-\frac{8}{15}$$

**24.** For what real value of x is  $\frac{2^x \cdot 4^5}{(2^3)^5} = \frac{1}{8}$  true?

- F. 1 2
- G. 3 H.
- 8 J.
- **K.** 18 25. Grades in Chandler's AP Biology class are based on the percent of total possible points on five 100-point unit exams and one 200-point final exam. The number of points Chandler scored on the unit exams this term were 82, 91, 72, 99, and 83. Chandler's goal is to average at least 87%
  - for the class. What is the minimum number of points he must score on the final exam to reach this goal?
  - **A.** 182
  - **B.** 180
  - **C.** 174
  - **D.** 156 **E.** 144







26. Which of the following lines is a vertical asymptote of the

function 
$$f(x) = \frac{2x^2 + 8x}{x^2 + x - 2}$$
?  
**F.**  $x = -5$   
**G.**  $x = -2$   
**H.**  $x = -1$   
**J.**  $x = 0$   
**K.**  $x = 2$ 

27. Rebekah has  $3\frac{5}{6}$  feet of fabric she will use to make bookmarks. She will use  $\frac{2}{3}$  foot of fabric to make each bookmark. After Rebekah has made all the bookmarks possible with the fabric, what length of fabric, in feet, will NOT have been used to make bookmarks?

**A.** 0

**B.** 
$$\frac{1}{6}$$
  
**C.**  $\frac{1}{2}$   
**D.**  $\frac{2}{3}$   
**E.**  $\frac{11}{12}$ 

- **28.** In the standard (x,y) coordinate plane, the graph of which of the following equations is a circle with center (2,-4) that passes through the point (2,1)?
  - F.  $(x-2)^2 + (y+4)^2 = 25$ G.  $(x+2)^2 + (y-4)^2 = 25$
  - **H.**  $(x-2)^2 + (y-4)^2 = 25$
  - **J.**  $(x+2)^2 + (y-4)^2 = 9$
  - **K.**  $(x+2)^2 + (y+4)^2 = 9$
- **29.** The third term of a geometric sequence is 30. The sixth term of the same sequence is 0.03. What is the second term of this sequence?
  - **A.** 0.3
  - **B.** 3
  - **C.** 30
  - **D.** 300
  - **E.** 3000

DO YOUR WORK HERE.





**30.** The triangle shown below has side lengths of 15, 17, and 19 centimeters. Which of the following correctly expresses the value of  $\cos C$ ?

(Note: For every triangle with sides of length a, b, and c that are opposite  $\angle A$ ,  $\angle B$ , and  $\angle C$ , respectively,  $c^2 = a^2 + b^2 - 2ab \cos C$ .)



- F.  $\cos C = -\frac{15^2 17^2 19^2}{2(17)(19)}$
- G.  $\cos C = -\frac{19^2 15^2 17^2}{2(15)(17)}$
- **H.**  $\cos C = 15^2 19^2 17^2 + 2(17)(19)$
- J.  $\cos C = 17^2 15^2 19^2 + 2(15)(19)$

**K.** 
$$\cos C = 19^2 - 15^2 - 17^2 + 2(15)(17)$$

**31.** Aaron is playing a game in which he must draw a marble at random from a bag of solid-colored marbles. The probability of drawing each marble and each marble's point value is shown in the table below. Let the random variable *X* represent the number of points Aaron receives on any one draw. What is the expected value of *X* ?

Color	Probability	Points
Red	0.15	5
Blue	0.25	3
Yellow	0.10	10
White	0.50	2

**A.** 3.5

**B.** 4

- C. 5D. 6.25
- **E.** 7



# No Testing Material On This Page

# 4

# **SAT Writing and Language Test**

# 22 MINUTES, 27 QUESTIONS

Locate Section 4 of your bubblesheet to record your answers for this section.

## DIRECTIONS

Read each passage carefully and then choose the answer choice that either improves the quality of writing or that conforms to the conventional standards of written English.

Each passage has questions that require you to correct errors in sentence structure, usage or punctuation. Other questions ask that you revise sentences to improve the expression of ideas.

There will also be questions that directly refer you to a portion of the passage and other questions will require you to consider the passage as a whole. This portion of the test also involves evaluating graphs, tables, and figures.

Choose "NO CHANGE" if you believe that the sentence is grammatically correct and does not need to be improved.

#### Questions 1–9 are based on the following passage

#### Self-Driving Cars

Tech firms and start-ups have been developing selfdriving cars for years now, and the recent advancements have **1** <u>changed</u> the discussion of technology into the mainstream. Within the next decade, it is likely that self-driving cars will begin to take the place of human drivers when it comes to public transportation and on-demand driving services like Uber and Lyft. As the science behind the cars **2** <u>continue</u> to improve, a bigger question regarding ethics is beginning to dominate the discussion: how should self-driving cars avoid accidents that are caused by pedestrians who are at fault? 1

- A) NO CHANGE
- B) propelled
- C) impelled
- D) motivated
- 2
  - A) NO CHANGE
  - B) continued
  - C) continues
  - D) was continuing

3 Suppose an autonomous car is hypothetically driving down a road and two people decide to cross the street when they shouldn't. Should the car swerve sharply to the right and drive onto the sidewalk, potentially injuring innocent bystanders? Should the car decide to continue toward the jaywalkers and hope they move out of the way? 4 These types of responses will be hard-coded into the steering and navigation systems of autonomous cars, 5 so questions regarding how cars should respond to life and death situations will likely be studied further.

In a survey conducted by the University of Washington, respondents agreed that self-driving cars faced with crucial decisions should opt for the course of action that puts the least amount of human life in danger. In fact, over 80 percent of respondents said that they generally or strongly agree with that statement. To improve the decision-making capabilities of these cars, engineers are working to enhance existing sonar technology.

#### 3

- A) NO CHANGE
- B) Suppose an autonomous car is
- C) Suppose a theoretical, autonomous car is
- D) Suppose a hypothetical situation where an autonomous car is

#### 4

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

Or does it veer to the left and head into oncoming traffic, potentially endangering more passengers in other cars?

Should the writer make this addition here?

- A) Yes, because it completes all of the choices that are presented to the car in this situation.
- B) Yes, because it clarifies information presented earlier in the passage.
- C) No, because it is restates information presented earlier in the paragraph.
- D) No, because it adds information that is not relevant at this point in the paragraph.

#### 5

Which choice best connects the sentence with the next paragraph?

- A) NO CHANGE
- B) which poses a technological difficulty for automobile engineers.
- C) so the braking and hydraulic hardware will have to react accordingly.
- D) which offers a new way to utilize sonar technology.

Self-driving cars can visualize the road better and arrive at critical decisions faster than humans 6 can: sensors, cameras, and, connectivity hardware in the car have a response time that is almost 50% faster than human reaction. Sonar technology rapidly gauges the scenario and sends the correct inputs to the navigation and steering controls to make critical decisions. Ironically, this paves the way for ethical questions that do not have easy answers. For example, automated cars should be programmed in the event of a crash to choose the course that leads to the fewest number of deaths. But what if the fewest number of deaths involves a driver who is not at fault? Not surprisingly, 90 percent of respondents surveyed said they would not purchase a car that would sacrifice their life to save another life. 7 However, the answers to these difficult questions will play a large role in the success of selfdriving cars.

[1] In fact, these life and death questions are the biggest obstacles that the public and manufacturers of automated vehicles must reconcile. [2] One way to resolve the ethical conundrums is for the federal government to institute highly specific laws for autonomous vehicles in each state. [3] Another approach would be to have each individual state set up its own specific rules. [4] That, however, is not likely to succeed as it's rare that more than 32 percent the public supports any given federal government initiative. [5] While this addresses the specific conditions of each state, it is rare that state legislatures come to a consensus on new, controversial initiatives. [6] In short, it appears that the looming ethical problems are not likely to be resolved easily. **8** 

#### 6

#### A) NO CHANGE

- B) can: sensors, cameras, and connectivity hardware
- C) can; sensors, cameras, and connectivity hardware,
- D) can. Sensors, cameras, and connectivity hardware,

#### 7

- A) NO CHANGE
- B) Nevertheless,
- C) For instance,
- D) Therefore,

#### 8

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 2018 an autonomous vehicle struck and killed a pedestrian crossing the street in Tempe, **9** <u>Arizona,</u> <u>this caused</u> the debate to come crashing into the living rooms of the American public. A recent study determined that autonomous vehicles will likely need to drive on roads for decades to prove statistically that they are safer than traditional means of transportation.

#### 9

- A) NO CHANGE
- B) Arizona, it caused
- C) Arizona, causing
- D) Arizona; causing

#### Questions 10–18 are based on the following passage

#### **Frozen Seeds**

Ironically, one of mankind's greatest achievements lies beneath the surface, tucked into one of the most remote locations in the world on a snowy archipelago in the Arctic. On the ice-crusted surface, the entrance to the Svalbard Global Seed Vault can just barely be seen, and it is closed to visitors. That's because the vault houses a large collection of seeds that could be important for human survival. **10** <u>Due to the</u> <u>dangerous nature of its contents</u>, the location has been dubbed "The Doomsday Vault" as farmers can use the seeds found within its walls to replant crops in the event of an extensive catastrophic event.

Completed in 2008, the seed vault was placed in this barren Norwegian environment to protect it from outside threats. The location is also ideal because it is free from tectonic activity such as earthquakes, and the soil is characterized as **11** permafrost; the state of being below 32 degrees Fahrenheit for at least two years. Engineers also built the vault almost 400 feet below the surface, which, combined with the permafrost, provides exceptional protection for the valuable seeds inside. To ensure complete protection, a massive cooling system was also installed, which keeps the inside of the vault at a frigid zero degrees Fahrenheit.

#### 10

Which choice provides the most logical introduction to the sentence?

- A) NO CHANGE
- B) Because crop cultivation is so crucial to the survival of human civilization,
- C) In hopes of gaining more international attention,
- D) Because it protects farmland from large-scale disasters,

#### 11

- A) NO CHANGE
- B) permafrost: or the
- C) permafrost, that is
- D) permafrost-the

All that caution is needed: the vault is home to almost one third of the possible plant gene diversity found in the world. Recently it was documented that more than one million samples of different 12 seeds—from all over the world—are stored within the vault. Should a calamity require the use of these seeds, their diversity would allow people to replant and grow crops in varied locations and climates.

While there are similar vaults around the world (called gene banks), the Svalbard seed vault can be thought of as the central hub for all of them. It also stores a slightly different distribution of seeds from those of other vaults. Compared to average seed banks, the Svalbard Seed Vault **13** stores seeds for fewer vegetables and more cereals. Designed to be the safest repository in existence, **14** seeds from all over the world are housed within the seed vault's thick walls. Taking the natural cooling from the permafrost into account, engineers have estimated that most samples could last hundreds or even thousands of years without power.



# **Average Seed Vault**

#### 12

- A) NO CHANGE
- B) seeds from all over the world
- C) seeds, from all over the world,
- D) seeds, from all over the world

## 13

Which choice offers an accurate interpretation of the data in the chart?

- A) NO CHANGE
- B) uses more food legumes.
- C) houses less roots and tubers, but more forage crops.
- D) has equal percentages of forage crops and fiber crops.

## 14

- A) NO CHANGE
- B) the seed vault houses seeds from all over the world within its thick walls.
- C) the world houses their seeds from all over within the seed vault's thick walls.
- D) the seed vault's thick walls house seeds from all over the world.



# Svalbard Seed Vault

However, recent changes in the local climate have caused the resident researchers to begin upgrading the vault. In general, the arctic weather surrounding the vault has become warmer, causing more rain and endangering the valuable permafrost surrounding it. The Svalbard region typically sees around 10 inches of rain every year; in 2016, it saw 2.5 inches in one day. Last year the entrance of the vault was deluged with rain (instead of snow) that melted the permafrost. Luckily, the water froze within the entrance and did not reach the inner vault where the seeds are held.

**15** <u>Nevertheless</u>, the Norwegian government initiated a costly upgrade project to fully waterproof the inner vault, **16** <u>doubling</u> the amount of cooling systems within the vault, and provide additional living quarters in case researchers need to spend more time observing the inside of the vault.

Though Svalbard has the best chance of surviving a catastrophe in comparison to other gene banks, researches are now concerned about the rising arctic temperatures. Gene Trillow, lead scientist of the Svalbard Research team, claims that the environment that was meant to protect the vault has become **17** there biggest fear. "I have this nightmare that the permafrost melts," Trillow said, "and there's a torrent of water that smashes into and breaks through the vault door." Though humanity's agricultural history lies safely within the frozen vault at the moment, **18** the movement of the vault would require substantial time and effort from the international community.

#### 15

- A) NO CHANGE
- B) For example,
- C) Furthermore,
- D) DELETE the underlined portion and begin the sentence with a capital letter.

#### 16

- A) NO CHANGE
- B) and then doubled
- C) which doubled
- D) double

#### 17

- A) NO CHANGE
- B) the teams
- C) the researchers'
- D) its'

#### 18

Which choice most effectively concludes the paragraph and is consistent with the information in the rest of the passage?

- A) NO CHANGE
- B) the changing climate of the Svalbard region might soon force the vault to be moved.
- C) the vault will continue to safely store the seeds in its chilled walls.
- D) it must be protected because there are no other seed vaults in the world.

#### Questions 19–27 are based on the following passage

#### Ludington's Long Ride

The phrase "The British are coming!" is often attributed to **19** Paul Revere; who according to legend, rode his horse through Massachusetts at midnight to warn local soldiers of an impending British Invasion. Revere's ride is immortalized in poetry and taught in history classes, but few people realize that there were other riders that night. **20** In fact, one of them was actually a heroine.

Though she is often left out of history, Sybil Ludington rode to warn of the imminent attack. In fact, she rode 40 miles along unfamiliar roads through New York and 21 <u>Connecticut—covering twice the distance</u> <u>of Revere's ride—in the dark and the rain</u>. And she was just 16.

Sybil's main goal was to rouse some 400 troops to protect Danbury, Connecticut, where an important military depot housed ammunitions—along with clothing and cooking supplies—for much of the army in the Northeast. Because it was planting season, the militia that usually protected the depot had disbanded.

#### 19

- A) NO CHANGE
- B) Paul Revere; who, according to legend,
- C) Paul Revere, who, according to legend,
- D) Paul Revere, who, according to legend

#### 20

Which choice most effectively sets up the discussion that takes place in the rest of the passage?

- A) NO CHANGE
- B) However, many historians agree that Revere's ride was the most important because of its impact on American history.
- C) Nevertheless, one female rider was the only rider that successfully warned the American militia.
- D) As a result, many scholars attempt to compare Revere's ride to another female rider's.

#### 21

- A) NO CHANGE
- B) Connecticut, (covering twice the distance of Revere's ride), in the dark and the rain.
- C) Connecticut—covering twice the distance of Revere's ride, in the dark and the rain.
- D) Connecticut, covering twice the distance, of Revere's ride, in the dark and the rain.

Her father, Colonel Henry Ludington, received word of the attack from a messenger who arrived at their farm in New York. 22 <u>Colonel Ludington needed</u> to notify the soldiers. He had to plan the military defense and the messenger had exhausted his horse on the ride there, however, so Sybil was the best choice for the mission. No one knows if she was asked to go or if she volunteered, but at around 9 p.m. on April 26, 1777, Sybil left to carry the message to Connecticut.

Legend has it that she carried only a stick with her, which she used to knock on doors, prod her horse, 23 and to protect her from ruffians. At the time, the roads were filled with British loyalists and criminals who were ready to seize any opportunity to accost a young woman like Sybil.

## 22

Which choice most effectively combines the underlined sentences?

- A) Colonel Ludington needed to notify the soldiers, however, he had to plan the military defense and the messenger had exhausted his horse on the ride there, so Sybil was the best choice for the mission.
- B) Colonel Ludington needed to notify the soldiers, but because he had to plan the military defense and the messenger had exhausted his horse on the ride there, Sybil was the best choice for the mission.
- C) Colonel Ludington had to notify the soldiers and plan the military defense, and because the messenger had exhausted his horse on the ride there, however, Sybil was the best choice for the mission.
- D) Colonel Ludington needed to notify the soldiers, and Sybil was the best choice for the mission because he had to plan the military defense, and because the messenger had exhausted his horse on the ride there.

#### 23

- A) NO CHANGE
- B) which protected
- C) protecting
- D) and protect

To make matters worse, she rode the entire route sidesaddle, the preferred riding method for women back then. 24

While almost all 400 men arrived at Colonel Ludington's house at dawn, they didn't get there in time to stop the burning of Danbury by the British. However, the militia did aid in the Battle of Ridgefield, when British forces were in the process of overtaking that town. The additional men led by Colonel Ludington joined a nighttime raid on the British camps, allowing the Patriot forces to drive the British regiment back to 25 they're naval fleet on Compo Beach. Historians suggest that had Sybil not alerted the troop, the British occupation of Connecticut might have been successful. 26 In addition, Sybil's courageous ride proved to be a successful chapter in the fight against the British. It was even recounted in her father's memoir that "One who even now rides from Carmel to Cold Spring will find rugged and dangerous roads, with lonely stretches. Imagination only can picture what it was a century and a quarter ago, on a dark night, with reckless bands of 'Cowboys' and 'Skinners' abroad in the land."

To commemorate her bravery, state markers were created in 1935 so people could follow Ludington's historic route. Her portrait was also featured on a stamp in 1975 to celebrate her contribution to freedom. Additionally, a statue of Ludington was erected in Carmel, New York, where her ride began. The statue shows a 27 rebellious heroine with her mouth agape as she shouts into the night. Her two legs are to one side, and her right hand is clutching a stick high above her head. Viewing the statue, it's hard to believe that such a brave and important patriot was largely erased from the history books.

#### 24

At this point, the author is considering adding the following sentence.

This meant her silhouette would have made her gender easily identifiable.

Should the writer make this addition here?

- A) Yes, because it reinforces the passage's main point about the riding preference of women.
- B) Yes, because it provides elaboration for a claim made earlier in the paragraph.
- C) No, because it blurs the paragraph's focus on the details of Sybil's ride.
- D) No, because it introduces contradictory information at this point in the paragraph.

#### 25

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

#### 26

- A) NO CHANGE
- B) Nevertheless,
- C) Thus,
- D) Moreover,

#### 27

Which choice best maintains the tone established in the passage?

- A) NO CHANGE
- B) tenacious
- C) intimidating
- D) careless

#### STOP. BE CERTAIN NOT TO EXCEED THE ALLOTTED TIME. YOU MAY PROCEED TO SECTION 5 WHEN TOLD TO DO SO.

# ACT READING TEST

24 Questions—22 Minutes

**DIRECTIONS:** There are three passages. Each passage is followed by eight questions. After reading a passage, choose the best answer to each question and mark it on the bubblesheet. You may refer to the passages as often as you like.

#### PASSAGE I

**LITERARY NARRATIVE:** This passage is adapted from the short story *Banking on Change* by Norman Thaler (© 2018, *CPP Publishers*)

Over the past two months, the chief operating officer, chief marketing officer, and three senior level executives all defected to other companies, citing differing opinions with the new leadership. Meanwhile, I was promoted in

- 5 title, given more work and responsibility, and what only the bank could call a raise. This was not how I had expected a bank to operate. In fact, it was the polar opposite of how things were supposed to work in the business world—or so I had been taught in business school.
- I wasn't at all happy with my work as an analyst for Student's Bank, which was created, as I subsequently learned, to separate students from their money and to ring up more fees than it did the day before. Well, that might be a small overstatement. But really, looking back, the bank
- 15 was about making money hand over fist, while thinking it was grooming the latest crop of business school graduates (that's me) to strengthen earnings, and to turn SB into a household name. In reality it was running its workers around aimlessly.
- I thought I was ready for the competitive world of business because of my upbringing. I grew up with two older brothers and played ice hockey and tennis in college. I learned how to be resilient and resourceful at a young age, and I was proud of that. The only makeup I owned
- 25 was a drugstore travel kit that stood in stark contrast to the bank's upper management, who cared more about Tom Ford and Versache fashions than about proper banking.

The most clueless of all was Nessa Frigg, the newly appointed bank president who got her job for the same

- 30 reasons a mollycoddled child is given a toy in the checkout line. Her father, Lawrence Frigg, had purchased the bank two years ago, and in an unsurprising turn of events appointed Nessa its president at 28 years old, fresh out of The Wharton School, with zero banking experience: a
- clear indication that he was not thinking of any community outside of his own. The two of them instituted policies that were despised company-wide. They began by cutting employee's vacation time to increase profits, and then cancelled the two company retreats per year because they
  "presented a safety risk."

The fourth floor had been hectic since the transition, and I shied away from the infighting amongst the executives who worked there. I was disillusioned by the marketing department making ill-informed decisions 45 about which customers should be targeted for their next big email campaign. But above all, I was exhausted by the insincerity and uncertainty of it all. Because I had a mountain of college debt, I persevered even though deep inside I knew it was unsustainable.

- 50 Despite the poor leadership, our small analytics team kept the bank afloat. It was headed by Robert Cailin, an Amherst College graduate, who was characterized by most of his colleagues as hostile. I knew him well enough to know that when he debated, it wasn't because he had
- 55 to demonstrate his intelligence, or because he naturally plowed against the grain; it was because he cared deeply for our team and our work, and he was going to fight for our voice at the table.

Minakshi Vasu and Narinder Parvati rounded out our

60 team and were both bright spots in my dim existence at SB. Minakshi came from a wealthy family in Chennai, and Narinder from Dharavi in Mumbai, the third largest slum in the world. Despite their difference in upbringing, both of them cared deeply about everyone else on the team.

- 65 They both operated under the same assumption that the best chances for the team's success came from producing the highest quality work they could. They had an extraordinary wealth of knowledge on database structure and Structured Query Language (SQL), something that
- 70 the bank and our team relied on. Their positive energy and stories from life back in India oftentimes felt like the only reprieve from the cavalier behavior of my immediate bosses.

Last Monday, I was advised that Nessa wanted to

75 see me. I had spoken briefly at several meetings since the mass exodus, and I was careful at those meetings not to say anything that I thought might make her feel out of her league. Maybe she recognized my value as she had increased the frequency with which she asked for my

80 opinion during meetings. As I took the elevator to her office, I tried to force myself not to wonder what exactly she wanted.

"The board meets this Thursday," she began. I was now certain she wanted my counsel on the most sensitive

85 agenda ideas. Maybe Nessa wasn't as bad as we all thought. "I'm really troubled," she said, and grabbed a garment bag from a hanger by her bookcase. She came back diffidently with two Tom Ford dresses.

"I'm not sure which one helps me the most. Your 90 thoughts?"



5

**1.** The point of view from which the passage is told is best described as that of

**A.** a limited narrator who describes the thoughts and actions of characters who work at the same bank.

- **B.** a first person narrator whose main concern is to criticize Student's Bank and those who work there.
- C. an unreliable narrator who displays deceit in the workplace.
- **D.** a first person narrator who is disillusioned with her job due to poor leadership that doesn't take her seriously.
- 2. The character most likely to be misjudged by others is
  - **F.** Robert Cailin, because his devotion sometimes comes across as unnecessarily confrontational.
  - **G.** the narrator, because her conceptions of banking differ greatly from the reality of her workplace.
  - **H.** Nessa Frigg, because her employees do not agree that her attempts to help the bank are genuine.
  - J. Narinder, because her upbringing was in stark contrast with the leadership at Student's Bank.
- 3. As it is used in line 30, mollycoddled most nearly means
  - A. hyperactive.
  - **B.** deplorable.
  - C. spoiled.
  - **D.** cranky.
- **4.** The main point made in the third paragraph (lines 20–27) is that
  - **F.** the narrator's childhood left her unable to handle the rigors at the bank.
  - G. the narrator does not get along with the bank's leadership.
  - **H.** the narrator realizes that she was wrong about her preconceptions.
  - **J.** the narrator's priorities in life do not align with those of the bank's leadership.

- 5. The narrator believes Nessa Frigg finds her more useful because Nessa
  - **A.** considers the narrator's opinion of which dress Nessa should wear to the board meeting.
  - **B.** recognizes how integral the narrator's team is to the success of the bank.
  - **C.** has been increasingly asking for the narrator's input at meetings.
  - D. asks for the narrator's help when working with SQL.
- 6. According to the passage, the narrator's team at the bank was
  - F. under constant supervision from the leadership.
  - G. a major reason for the bank's continued operation.
  - H. headed by Minakshi and Narinder.
  - J. created once Nessa Frigg took over as president.
- 7. Which of the following statements is true about Nessa Frigg?
  - I. She is passionate about designer fashion.
  - II. She lacks significant banking experience.
  - III. She is the youngest president in the bank's history.
  - IV. She is interested in the narrator's opinions regarding banking.
  - A. II only
  - **B.** I and II only
  - C. II and IV only
  - **D.** I, II, and III only
- **8.** The passage indicates that the main reason the narrator continues to work at Student's Bank is because she is
  - **F.** resilient and does not want to quit a position she has worked hard to attain.
  - **G.** afraid of the uncertain job market if she were to leave her position.
  - H. burdened by a large amount of student debt.
  - **J.** proud of the work that her team provides to the company.

#### PASSAGE II

SOCIAL SCIENCE: Passage A is adapted from an article "The Mystical Dragon Children" by Lou Arthur Douglas (©2015 by The Interlocutor). Passage B is adapted from "Correlaries of the Nocebo Effect" by Mary Marsten (©2016 by Ethnographies).

Passage A by Lou Arthur Douglas

It is common for parents to think that their children are destined for greatness, or that their children are superior to other children. But what if actively believing in that reality actually helped it come true?

- A recent study investigated Chinese children born 5 in the Year of the Dragon, a special occurrence because the dragon, unlike the other animals that are part of the calendar, is a mystical creature. It is believed that those who are born during this year will be imbued with the
- 10 fantastical powers of a dragon. While the Chinese Zodiacs share many elements with Western Zodiac signs (including their reliance on superstition), investigators found that there may actually be some truth to the claim that "Dragon Children" have an advantage over their 15 Tiger or Ox brethren.

The study found that "Dragon Children" not only performed better on standardized tests, but also that these children had more schooling (on average) than other children. Specifically, these mystically-imbued children

- performed 50 points higher on the gaokao (a 750 on this Chinese college entrance is a perfect score) and had 0.4 more years of education. And, it was found that these students were 23 percent more likely to earn a bachelor's degree than students born during other years.
- Surprisingly, though, the children themselves did 25 not report higher self-esteem when compared to other children. In all the surveys conducted, Dragon Children did not view themselves significantly different from how their peers viewed themselves. Instead, the explanation of
- these children's success might be found in their parents. 30 When researchers switched their focus to parents, they found that expectations of these parents were higher than those of other children. "Dragon Children" parents also went out of their way to enroll their children in harder
- 35 classes earlier in the child's academic career, and were often more involved in their children's scholastic career than the parents of other children. "It's an interesting phenomenon," said lead researcher and cognitive specialist Dr. Andrew Wozak, "because these parents are
- 40 forcing their desires into reality. They strongly believe in a reality in which their children are more successful than their peers, so they choose actions that allow that reality to materialize."

Dr. Wozak, along with his colleagues in the field, 45 have highlighted this unlikely occurrence as a great example of the power of affirmative thinking. While we may not be able to wish ourselves a new car or a yacht, our belief that we are destined for great things can cause us to continuously choose options that bring us closer to

50 that goal.

#### Passage B by Mary Marsten

Many people are familiar with the placebo effect, whereby patients who take sugar pills might begin feeling better because they think they are taking medicine. Yet, few people are aware that the opposite is true as well;

- 55 and it is referred to as the "nocebo effect." This refers to negative expectations that a patient might have about medication. These expectations cause the patient's "ailments" to worsen.
- Just like the placebo effect, the nocebo effect has 60 been well-documented. In 2013, researchers gave patients sugar pills, but warned patients that the pills might produce adverse side effects. By the end of the study, five percent of participants had dropped out because they believed they were experiencing the possible negative effects revealed
- 65 at the experiment's onset. The researchers concluded that this outcome suggested the nocebo effect is not only real, but may also cause potentially harmful effects when a patient has no actual biological or physiological maladies. The recognition of the nocebo effect puts healthcare
- 70 professionals in a difficult position, since they are required to inform patients of potential side effects of prescribed medication. But if a dire description increases the likelihood that the patient will experience health issues, then the positive effects of the medication are less
- 75 likely to be realized. On that very note, physicians have also had to advise against patients seeking WebMD and other internet sources, since patients often think they are experiencing a rare reaction to medication once they learn of its existence.
- Beyond the world of prescription medicine, the 80 logic of the nocebo effect has been observed in cultures across the world. For instance, anthropologists have noted that Australian aboriginal tribes have performed a ritual called pointing the bone: an individual is cursed by an
- 85 evil spirit after a sharpened bone is pointed at the victim. The victims sometimes believe so strongly that they have been cursed that they die within 24 hours. When these cases first surfaced in the late 1800s, anthropologists were baffled as to why the curse was working. Modern research
- 90 suggests that cultural beliefs surrounding these practices were so strong that the friends and relatives of these cursed victims often refused to interact with the victims, causing negative psychological reactions that impact one's health and can lead to death.
- Today, doctors are circumspect when giving patients 95 negative prognoses for diseases such as cancer. In some cases, doctors have noticed that patients' vital signs have taken dramatic turns for the worse following grim prognoses, suggesting that there is a very real link between

patients' beliefs and their actual health.



#### Questions 9-11 ask about Passage A.

- **9.** Which of the following questions is specifically answered in Passage A?
  - **A.** What do Dragon Children think about other children from different years?
  - **B.** What factors influenced the success of Dragon Children?
  - C. What percent of Dragon Children attend graduate school?
  - **D.** How are children born in the Tiger or Ox years viewed by their parents?
- **10.** As it is used in line 43, the word *materialize* most nearly means
  - **F.** degrade.
  - G. improve.
  - H. succeed.
  - J. occur.
- **11.** The statement in lines 46–50 is representative of Passage A because
  - A. cars and yachts are examples of what Dragon Children typically want.
  - **B.** parents of children that are not born in the year of the Dragon are not utilizing positive thought.
  - C. belief in a certain reality can impact future success.
  - **D.** affirmative thinking will create desired reality.

Questions 12-13 ask about Passage B.

- **12.** Marsten's statement that early anthropologists were "baffled" most nearly suggests that they were
  - **F.** surprised that the tribe experienced the nocebo effect without prescription medication.
  - G. perplexed by the cause of deaths in the tribe.
  - H. poor researchers compared to today's standards.
  - **J.** confused by the tribe's reliance on ritual and superstition.

- **13.** Based on the description of the *pointing the bone* ritual, it can be reasonably inferred that the cursed aboriginals that passed away did so due to
  - A. poison-tipped bones.
  - **B.** evil spirits.
  - C. a physical reaction to psychological stressors.
  - **D.** adverse reaction to prescription medicine.

Questions 14–16 ask about both passages.

- **14.** Which of the following describes the clearest similarity between the two passages?
  - **F.** The authors of each passage make it clear that people are better off thinking only positive thoughts about themselves.
  - **G.** Both passages highlight how one's thoughts have little impact one's reality.
  - **H.** A scientific breakthrough is the central focus of both passages.
  - **J.** Both passages discuss how particular points of view can cause unexpected outcomes.
- 15. Unlike the author of Passage A, the author of Passage B
  - A. addresses difficulties healthcare professionals face.
  - **B.** uses real-life examples as evidence of his claim.
  - C. focuses only on recent events.
  - D. references reports of self-esteem.
- **16.** Passage A contains a rhetorical question on lines 3-4. In Passage B this question is
  - **F.** discredited, since the author of Passage B argues against the practicality of the question.
  - **G.** critiqued, since the author of Passage B disputes the psychological basis for the question.
  - **H.** advanced, since the author of Passage B provides an alternative way of viewing the question.
  - **J.** dismissed, since the author of Passage B disproves the logic behind the question.

# 5

5

#### PASSAGE III

**NATURAL SCIENCE:** This passage is adapted from *Terraforming Mars: Finding Blue and Green Among the Red* by Jackson Mudloch (© 2018, *CPP Publishers*)

In recent years, the interest of interstellar colonization has focused on one particular celestial body: Mars. Some space exploration firms have even hypothesized that there will be a significant human colony on Mars by the year 2040.

Admittedly, there are Martian characteristics that will make colonization difficult for humans. Just like Earth, Mars' axis is on a tilt, so it experiences seasonal weather. The surface temperature ranges from almost negative 200

- 10 degrees Fahrenheit in the winter to around 70 degrees Fahrenheit in the summer. As the temperature of the surface dust rises due to sunlight, the atmosphere around it stays cool because there is little atmosphere to trap the heat. The mixture of warm and cold air causes massive
- 15 dust storms that not only block sunlight, but also cause extreme winds sometimes higher than 110 mph, which could threaten any structure or equipment on the surface.

Mars once had a strong magnetic field-similar to that of Earth-which was caused by a dynamo effect

- 20 from heat trapped between the planet's surface and upper atmosphere. Scientists believe that the magnetic field was destroyed some 4.2 billion years ago due to erosion caused by solar wind, a stream of mainly protons and electrons that flows from the Sun. Based on data collected by NASA's
- 25 MAVEN spacecraft in 2014 and later, scientists better understand that exposure to strong solar wind produces an electric field that accelerates ions in the upper Martian atmosphere, which reach a velocity fast enough to strip Mars of its protective upper atmosphere. As a result, any
- 30 kind of protection from Mars' radiation would need to be thoroughly tested to ensure it can withstand such high levels of radiation.

The force of gravity on Mars is much lower than it is on Earth, which is likely to produce adverse health effects

- 35 such as muscle and bone degradation. Some scientists estimate that an average human could lose as much as 53.2% of his or her bone density after a mission to Mars. The health issues don't stop there though. Our hearts are designed to pump blood against gravity, causing unknown
- 40 side effects if they beat for years in an environment without gravity. Our inner ears rely on gravity to provide a fixed orientation to perceive the world, and a constant state of irregular gravity could cause a drop in red blood cells, insomnia, and a breakdown of common motor functions.
- 45 It therefore is a top research priority to develop artificial gravity systems to help combat these health concerns.

Still, these complications have invigorated a discussion over terraforming Mars to make it a planet more similar to Earth. For starters, technology exists that could

50 potentially extract water from the environment. One such option is a water-vapor absorption reactor, or WAVAR. This technology first absorbs Martian air through an intake fan, which is then passed through a chamber that removes the small amounts of water vapor present in the air. The

- 55 vapor is funneled to an airtight compartment where it is blasted with microwave emission to heat and condense the vapor into water. The output of WAVAR wouldn't be enough to supply a large settlement, so it would only be useful for individuals and small establishments. Scientists
- 60 have suggested that a similar technology could be used to extract water from the Martian soil, which could produce larger quantities of water.

To terraform mars on a grander scale, NASA has suggested launching an enormous, man-made magnetic

- 65 field into orbit around Mars in the hopes that the planet would naturally regenerate its atmosphere by helping to deflect the damaging solar winds back into space. Doing so would cause the atmosphere to thicken, increasing
- 70 carbon dioxide levels and eventually mimicking the greenhouse effect we have on Earth. As a result, the temperature on Mars should rise enough to naturally melt ice on the surface, providing the opportunity to grow crops in open-air greenhouses. NASA researchers
- 75 concede that the idea is hypothetical, but it represents the kind of far-reaching conceptualization that is required to colonize another planet.

To address the health concerns, teams such as Mars Open claim that pressurizing and airlocking living spaces

- 80 can combat the effects of low gravity. Utilizing immense amounts of solar energy on Mars would draw power through flexible solar panels, which would maintain airlocks and power essential systems like WAVAR. The panels would also power an air filtration system, which
- 85 would allow nitrogen into and expel carbon dioxide out of the living space. Mars Open claims that these living spaces should be able to extract about 1500 liters of water and 365 kilograms of oxygen per year on Mars. Critics of the project, however, have doubts about not only the
- 90 proposed technology, but also about the feasibility of the project. Furthermore, Mars Open has only funded a million dollars of private money for a project that is likely to cost billions of dollars.

- **17.** The overall organization of the passage can best be described as a
  - A. suggestion regarding the colonization of Mars, followed by a description of why it will be successful.
  - **B.** supposition that is followed by a series of technical obstacles that must be overcome to make Martian colonization a reality.
  - **C.** description of the Martian environment, followed by the ways in which humans have managed to survive there.
  - **D.** discussion of a term and its relevance to the colonization of Mars.
- 18. The main function of paragraph three is to
  - **F.** explain one reason why the Martian environment is so inhospitable.
  - G. introduce an idea that gets critiqued later in the passage.
  - **H.** present the argument that humans will never colonize Mars.
  - J. refute the origins of the Martian environment provided later in the passage.
- **19.** According to the passage, the destruction of the Martian magnetic field was caused by
  - **A.** a dynamo effect from heat trapped between atmospheres.
  - **B.** the high levels of radiation on the Martian surface.
  - C. the mixture of warm and cold air in the lower Martian atmosphere.
  - **D.** rapidly moving ions caused by strong solar wind.
- **20.** Based on the passage, which of the following is NOT considered a potential health risk of colonizing Mars?
  - F. Lowered bone density and muscle fitness
  - **G.** Exposure to high levels of radiation
  - **H.** Loss of common motor functions
  - J. Lack of oxygen

- **21.** Which of the following is reasonable to infer about the connection between dust storms and the lack of a Martian magnetic field?
  - **A.** The loss of the magnetic field caused dust storms to be more extreme.
  - **B.** If the magnetic field were still intact, dust storms would not exist .
  - **C.** The dissolution of the magnetic field caused dust storms to occur during different times of the year than they did millions of years ago.
  - **D.** There is not enough information in the passage to make a connection between dust storms and the magnetic field of Mars.
- 22. As used in line 75, concede most nearly means
  - F. quit.
  - G. recognize.
  - H. capitulate.
  - J. submit.
- **23.** According to the passage, the best source of water for a large Martian colony will most likely be found
  - A. within the soil found on Mars.
  - **B.** near living spaces similar to the ones suggested by the Mars Open project.
  - **C.** as water vapor in the Martian atmosphere.
  - D. underground after successfully terraforming Mars.
- **24.** Based on the passage, which of the following characteristics poses the biggest logistical obstacle for the colonization of Mars?
  - F. Dust storms on the surface would cause a lack of sunlight.
  - **G.** Equipment on Mars would face the threat of very strong winds.
  - **H.** High radiation levels could damage solar panels, rendering them useless.
  - **J.** Low temperatures during the Martian winters could freeze essential equipment like WAVAR.

STOP. BE CERTAIN NOT TO EXCEED THE ALLOTTED TIME. YOU MAY PROCEED TO SECTION 6 WHEN TOLD TO DO SO.



# SAT Math Test—No Calculator

14 MINUTES, 11 QUESTIONS

Turn to Section 6 of your bubblesheet to record your answers for this section.

## DIRECTIONS

For questions **1–8**, solve each problem, select the best answer from the list of choices, and be sure to mark your selection by filling in the appropriate circles on the bubblesheet. For questions **9–11**, solve each problem and record your response by filling in the appropriate circles on the bubblesheet. Please carefully read the detailed directions before question 9, and then proceed. You may use blank areas in the test booklet to do any figuring.

#### NOTES

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

#### REFERENCE



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

The number of radians of arc in a circle is  $2\pi$  .

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



i

A farmer sold 92 pounds of produce that consisted of *t* pounds of tomatoes and *c* pounds of carrots. The farmer sold the tomatoes for \$1.29 per pound and the carrots for \$1.79 per pound and collected a total of \$136.68. Which of the following systems of equations can be used to find the number of pounds of tomatoes that were sold?

- A) 1.29t + 1.79c = 92t + c = 136.68
- B) 1.29t + 1.79c = 136.68t + c = 92
- C) 1.79t + 1.29c = 92t + c = 136.68
- D) 1.79t + 1.29c = 136.68t + c = 92

2

#### x(x-3) = 18

Which of the following lists all solutions to the quadratic equation above?

A)  $\sqrt{21}$ 

- B) 18 and 15
- C) 6 and −3
- D) -6 and 3

# 3

#### c = 16 + 0.55y

The daily cost to rent a midsize vehicle from Hervis Car Rental, *c*, can be expressed in terms of the number of miles, *y*, that the renter will drive while in possession of the car. Which of the following expresses *y* in terms of *c*?

A) 0.55(c-16)

B) 
$$\frac{(c-16)}{0.55}$$

C) 
$$0.55c - 16$$

D) 
$$\frac{c}{0.55} - 16$$

\_\_\_\_

4

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When it was first built at the base of the Susquehanna River in 1928, the Conowingo Reservoir had a capacity of 300,000 acre-feet. However, over time, the river has dumped sediment into the reservoir and caused its capacity to decrease at a constant rate. The capacity of the reservoir *C*, in acre-feet, can be modeled by the number of years *T* since 1928, by the function C(T) = -1709T + 300000. Which of the following statements is the best interpretation of the number 1709 in this context?

- A) The number of years after the reservoir was built before its capacity will be 0 acre-feet
- B) The decrease, in acre-feet per year, of the available capacity of the reservoir
- C) The decrease, in acre-feet per year, of the amount of sediment that the river dumps into the reservoir
- D) The final capacity, in acre-feet, of the reservoir

#### 6

For a positive real number *x*, where  $x^5 = 2$ , what is the value of  $x^{-15}$ ?

A) -8

B) -6

C)  $\frac{1}{8}$ 

D)  $\frac{1}{6}$ 

#### 5

$$\frac{5}{x-3} + \frac{6}{2(x-3)}$$

Which of the following expressions is equivalent to the one above, where  $x \neq 3$ ?

A) 
$$\frac{8}{x-3}$$

B) 
$$\frac{10}{x-3}$$

$$C) \quad \frac{13}{2x-6}$$

D) 
$$\frac{17}{2x-6}$$



7

At sea level, atmospheric pressure is 14.5 pounds per square inch. For each additional 1,000 feet below sea level, atmospheric pressure increases by about 439 pounds per square inch. Which of the following equations gives the approximate atmospheric pressure P, in pounds per square inch, at h feet below sea level?

- A) P = 14.5h
- B) P = 439h + 14.5
- C) P = 0.439h + 14.5
- D) P = 0.439(14.5h)

## 8

What are the solutions to  $6x^2 + 12x + 3 = 0$ ?

A) 
$$-12 \pm 6\sqrt{2}$$
  
B)  $-12 \pm 6\sqrt{6}$   
C)  $-1 \pm \frac{\sqrt{2}}{2}$   
D)  $-1 \pm \frac{\sqrt{2}}{6}$ 



#### DIRECTIONS

For questions 9–11: Solve the problem and record your answer in the grid on your bubblesheet, as described below.

- 1. It is suggested, though not required, that you write your answers in the boxes at the top of the columns to help you mark the circles accurately. You will only receive credit if the circles are filled in correctly.
- 2. Only mark one circle in each column.
- 3. There are no negative answers.
- 4. Some problems may have more than one correct answer. In such cases, please grid only one answer.
- **Mixed numbers** such as  $3\frac{1}{2}$  must be 5. gridded as 3.5 or 7/2.(If 3 1 / 2 is 00

entered into the grid, it will be interpreted

as 
$$\frac{31}{2}$$
, not  $3\frac{1}{2}$ .)

6. Decimal answers: If a solution is a decimal and the decimal does not terminate after 1 or 2 places, carry it out to a third place, to fill the entire grid.

result.



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

	2	/	3		6	6	6		6	6	7
$\odot$	Ø ⊙	•	$\odot$		⊘ ⊙	0 0	$\odot$		0 0	0 0	$\odot$
12345 67	0 1 3 4 5 6 7	01034667	0 1 2 4 5 6 7	1234567	0 1 2 3 4 5 7		0 1 2 3 4 5 7	123460			0 1 2 3 4 5 6

#### Answer: 201 – either position is correct

	2	0	1	2	0	1	
$\odot$	⊘ ⊙	⊘ ⊙	$\odot$	$\odot$	⊘ ⊙	⊘ ⊙	$\odot$
1 2 3	0 1 3	• 1 2 3	0 0 0 0 0 0	<b>1</b> 3	• 1 2 3		0103

NOTE: You may start your answer in any column, space permitting. Columns that you do not use should be left blank.



9

The sum of  $-4x^2 + 6x + 17$  and  $-2x^2 - 3x - 5$  can be written in the form  $ax^2 + bx + c$ , where *a*, *b*, and *c* are constants. What is the value of a + b + c?

10

9x + 5y = 74x - 5y = 6

For the solution (x, y) to the system of equations above, what is the value of x + y? 11



In the circle above, point *A* is the center and the length of arc *BC* is  $\frac{3}{8}$  of the circumference of the circle. What is the value of *x* ?

STOP. BE CERTAIN NOT TO EXCEED THE ALLOTTED TIME. YOU MAY PROCEED TO SECTION 7 WHEN TOLD TO DO SO.



# SAT Math Test—Calculator

29 MINUTES, 20 QUESTIONS

Turn to Section 7 of your bubblesheet to record your answers for this section.

## DIRECTIONS

For questions 1–15, solve each problem, select the best answer from the list of choices, and be sure to mark your selection by filling in the appropriate circles on the bubblesheet. For questions 16–20, solve each problem and record your response by filling in the appropriate circles on the bubblesheet. Please carefully read the detailed directions before question 16, and then proceed. You may use blank areas in the test booklet to do any figuring.

#### NOTES

- 1. Use of a calculator **is permitted**.
- 2. Unless otherwise indicated, all variables and expressions used represent real numbers.
- 3. Unless otherwise indicated, figures provided in this test are drawn to scale.
- 4. Unless otherwise indicated, all figures lie in a plane.
- 5. The domain of a given function f is the set of all real numbers x for which f(x) is a real number, unless otherwise indicated.

REFERENCE



The number of degrees of arc in a circle is 360. The number of radians of arc in a circle is  $2\pi$ .

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



#### 1

2

$$(2x^2-3)-(-3x^2+1)$$

Which of the following expressions is equivalent to the one above?

- A)  $5x^2 4$
- B)  $5x^2 2$
- C)  $-x^2 4$
- D)  $-x^2 2$

#### 3

What is the slope of the line that passes through the points  $\left(5, -\frac{7}{2}\right)$  and  $\left(3, \frac{1}{2}\right)$ ?

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



The area of the triangle above is *A*. Which of the following represents *b* in terms of *A* and *h* ?

- A) b = 2A h
- B)  $b = \frac{2A}{h}$
- C) b = A 2h
- D)  $b = \frac{A}{2h}$

#### 4

i

How many seconds is 20% of 12 minutes?

- A) 2.4
- B) 12
- C) 24
- D) 144

Total



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Book Type	US History	European History	Total
Paperback	45	40	85
Hardcover	65	80	145

120

230

The table above summarizes the total collection of a high school's books about US and European history. If Ross selects a US History book at random from the collection, what is the probability that it is a paperback book?

110

A) 
$$\frac{45}{85}$$

- <u>45</u> 110 B)
- 45 C) 230
- $\frac{110}{230}$ D)

x	f(x)	g(x)
1	2	5
2	3.5	7
3	4.5	3
4	6	3
5	9	3.5

7

The functions f and g are defined in the table above. For what value of *x* does f(x) = 2g(x) ?

A) 1

B) 2

C) 3

D) 4

-



A sample of 50 high school juniors was selected at random from a certain school. The 50 students completed a survey about the school's athletic facilities. Of the students surveyed, 28 thought that the school's athletic facilities were well-maintained. To which of the following groups can the results of the survey be applied?

- I. All juniors at the high school
- II. All students at the high school
- III. All juniors in the state
- A) None
- B) I only
- C) I and II only
- D) I and III only

#### 8

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

- A)  $2(x-3)^3$
- B)  $2(x+9)^2$
- C)  $4(x-3)^3$
- D)  $4(x+9)^2$

#### 9

$$3r + 4s = 23$$
$$r - s = 3$$

What is the value of *s* in the system of equations above?

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

#### 10

Helia began charging her cell phone battery when it was 30% charged. After 36 minutes, her cell phone battery was 70% charged. If the cell phone battery charges at a constant rate, how many more minutes will it take for her cell phone battery to be exactly 80% charged?

- A) 4
- B) 9
- C) 12
- D) 18

÷

7



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#### 11

If a + b = 12 and  $a^2 - b^2 = 96$ , what is the value of a - b?

- A) 4
- B) 6
- C) 8
- D) 10

12

Student Absences				
Number of Days	Number of Students			
0	9			
1	6			
2	4			
3	3			
5	2			
11	1			

The frequency table above shows the distribution of the number of days that each of 25 students were absent from school last month. What is the mean number of days absent for these 25 students last month?

A) 1.76

B) 1.88

- C) 2.50
- D) 3.67




The graph above represents the temperature inside Greg's home on a certain day. From 6pm to 10pm, how many degrees Fahrenheit (°F) did the temperature decrease each hour?

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

14

$$(x-4)^2 + (y-5)^2 = 12$$

The graph of the equation above is a circle in the *xy*-plane. What is the area of the circle?

- A) 4π
- B) 6π
- C) 12π
- D) 24π

## 15

÷

The number of people living in an apartment building was 2,000 in 2015, and the population was projected to decrease by 20 people each year. Based on this projection, which of the following expressions models the population of the community *t* years after 2015?

- A) 2000(1-0.01t)
- B) 2000(1-0.1t)
- C)  $2000(1-0.01)^{t}$
- D)  $2000(1-0.1)^{t}$



## DIRECTIONS

For questions 16–20: Solve the problem and record your answer in the grid on your bubblesheet, as described below.

- It is suggested, though not required, that 1. you write your answers in the boxes at the top of the columns to help you mark the circles accurately. You will only receive credit if the circles are filled in correctly.
- 2. Only mark one circle in each column.
- 3. There are no negative answers.
- 4. Some problems may have more than one correct answer. In such cases, please grid only one answer.
- **Mixed numbers** such as  $3\frac{1}{2}$  must be 5.



entered into the grid, it will be interpreted

as 
$$\frac{31}{2}$$
, not  $3\frac{1}{2}$ .)

Decimal answers: If a solution is a decimal 6. and the decimal does not terminate after 1 or 2 places, carry it out to a third place, to fill the entire grid.

in boxes.

Grid-in result.



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

	2	/	3		6	6	6		6	6	7
$\odot$	0 0	•	$\odot$		0 0	0 0	$\odot$		0 0	0 0	$\odot$
0000000	0 1 ● 3 4 5 6 7 8	01034567		1234567	0 1 2 3 4 5 7 8		0 1 2 3 4 5 7 8	1234567			0 1 2 3 4 5 6

#### Answer: 201 – either position is correct

	2	0	1	2	0	1	
$\odot$	⊘ ⊙	⊘ ⊙	$\odot$	$\odot$	⊘ ⊙	⊘ ⊙	$\odot$
123	0 1 3	• 1 2 3		<b>1</b> 3	• 1 2 3		0103

**NOTE:** You may start your answer in any column, space permitting. Columns that you do not use should be left blank.

i

#### 16

Atmospheres and pascals are units of measure of pressure. They are directly proportional such that 0.04 atmospheres is equal to 4053 pascals. How much pressure, in pascals, is equal to 0.007 atmospheres? (Round to the nearest pascal.)

## 18

A solution contains 4.5 grams of glucose per 100 milliliters. Each mole of glucose weighs 180 grams. How many moles are there in 3 liters of the glucose solution? (Note: 1 liter = 1000 milliliters)

## 17

The graph of linear function *f* in the *xy*-plane has the equation  $y = -\frac{3}{4}x + 6$ . What is the *x*-intercept of this line?



÷



The graph of the linear function f is shown in the *xy*-plane above. The graph of the linear function g is perpendicular to the graph of f. If the graph of g passes through the point (0, -4), what is the value of g(6)?

## 20

After a 20% discount code has been applied to its retail price, a paperback book costs \$7.60. What is the retail price, in dollars, of this book?

(Note: Disregard the \$ sign when gridding in your answer. For example, if your answer is \$1.37, grid in 1.37.)

## STOP. BE CERTAIN NOT TO EXCEED THE ALLOTTED TIME. YOU MAY PROCEED TO SECTION 8 WHEN TOLD TO DO SO.

No Testing Material On This Page

 $\bigcirc$  (

# ACT SCIENCE TEST

20 Questions — 18 Minutes

**DIRECTIONS:** There are three passages in this section. Each of them is followed by either six or seven questions. Read the passage, choose the best answer, and fill in the corresponding letter on your bubblesheet. You may refer to any passage on the exam as many times as you need.

You may NOT use a calculator on this section.

#### Passage I

Students conducted a number of experiments to investigate four properties of gases: pressure, temperature, volume and number of molecules. The experiments illustrate how each property is affected by the others.

#### Experiment 1

Students attached a 50 mL syringe to a Gas Pressure Sensor and waited until the pressure reading stabilized. Students depressed the plunger in 5-mL increments, waited for the pressure in the syringe to stabilize and then recorded the pressure in pounds per square inch (psi). The results are represented in Table 1 and Figure 1 below.

Table 1					
Volume (mL)	Pressure (psi)				
50	14.70				
45	16.33				
40	18.37				
35	21.00				
30	24.50				
25	29.40				
20	36.75				
15	49.00				
10	73.50				
5	147.00				



Figure 1

#### **Experiment** 2

Students attached the Gas Pressure Sensor to a hose that was connected to a 100-mL Erlenmeyer flask containing air, and then submerged the flask in a water bath that was positioned on a hot plate. Using a valve connector, students attached a 50 mL syringe to the flask. A thermometer was placed in the water bath to record the temperature in Kelvin (K). As the students increase the temperature of the water bath, they recorded the volume of air in the syringe. They recorded their results in Table 2 below.

T-1-	1. 0
lab	le Z
Temperature (K)	Volume (mL)
293	35.16
308	36.96
323	38.76
338	40.56
353	42.36
368	44.16

#### Experiment 3

Students removed the flask from the water bath in Experiment 2, leaving the Gas Pressure Sensor and syringe attached. After waiting 30 minutes, the students depressed the plunger in regular increments and recorded the pressure and volume of gas introduced to the system. Because the volume of gas introduced to the system is proportional to the number of molecules introduced, students used the *ideal gas law* (PV = nRT) to calculate the number of moles, and therefore number of molecules, introduced at each volume. They assumed the temperature was constant at 2022 K = 141

293 K and the gas constant, R, was  $8.314 \frac{L \cdot kPa}{K \cdot mol}$ 

(See Table 3 and Figure 2).

Table 3							
kPa	mL	n (moles)	Molecules				
105.52	20	$8.7 \times 10^{-4}$	$5.2 \times 10^{20}$				
112.36	25	$1.2 \times 10^{-3}$	$6.9 \times 10^{20}$				
119.26	30	$1.5 \times 10^{-3}$	$8.8 \times 10^{20}$				
126.11	35	$1.8 \times 10^{-3}$	$1.1 \times 10^{21}$				
132.81	40	$2.2 \times 10^{-3}$	$1.3 \times 10^{21}$				
139.50	45	$2.6 \times 10^{-3}$	$1.6 \times 10^{21}$				

8 0



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4.



Figure 2

- 1. Based on the results of Experiment 3, when the recorded gas pressure in the flask was 117 kPa, approximately how many molecules of air did the flask contain?
  - A.  $6.8 \times 10^{20}$
  - **B.**  $7.8 \times 10^{20}$
  - C.  $6.8 \times 10^{21}$
  - **D.**  $7.8 \times 10^{21}$
- **2.** According to Experiment 2, as temperature of the bath increased, the volume of gas in the syringe:
  - F. decreased only.
  - **G.** increased, then decreased.
  - H. decreased, then increased.
  - J. increased only.
- **3.** After the conclusion of Experiment 2, what was the most likely reason that the students waited 30 minutes before depressing the plunger in Experiment 3?
  - **A.** They were waiting for the temperature in the flask and syringe to increase.
  - **B.** They were waiting for the temperature in the flask and syringe to stabilize.
  - **C.** They were waiting for the pressure in the syringe to become lower than that of the flask.
  - **D.** They were waiting for the pressure in the flask to become lower than that of the syringe.

- Based on the results of Experiment 1, if the plunger of the syringe measured 22.5 mL, then the pressure, in pounds per square inch, would most likely be:
- **F.** less than 36.75.
- G. between 36.75 and 49.
- **H.** between 49 and 73.5.
- **J.** greater than 73.5.
- 5. Suppose a student claimed that the volume of an ideal gas is inversely proportional to the pressure exerted by that gas. Is this statement supported by the results of Experiment 1?
  - **A.** Yes, as the pressure in the syringe in Experiment 1 increased, the volume of air in the syringe increased.
  - **B.** Yes, as the pressure in the syringe in Experiment 1 increased, the volume of air in the syringe decreased.
  - **C.** No, as the pressure in the syringe in Experiment 1 increased, the volume of air in the syringe increased.
  - **D.** No, as the pressure in the syringe in Experiment 1 increased, the volume of air in the syringe decreased.
- 6. When the pressure of the gas in Experiment 1 was equal to 21 psi, the volume of the gas in the syringe was closest to the volume of the gas at which temperature in Experiment 2?
  - **F.** 338 K
  - **G.** 323 K
  - **H.** 308 K
  - **J.** 293 K
- 7. A scientist informed the students that the volume occupied by one molecule of any ideal gas is constant. The students were also informed that nitrogen, oxygen, hydrogen, helium, and carbon dioxide are all ideal gases. If the students repeat the trials in Experiment 3 with nitrogen instead of air, they should expect the resulting number of gas molecules in each trial to be:
  - A. higher, because air contains more nitrogen than oxygen.
  - **B.** equal, because air is composed of majority parts non-ideal gases.
  - C. equal, because air is composed of majority parts ideal gasses.
  - **D.** lower, because air contains less oxygen than nitrogen.



#### Passage II

Green algae (*Scenedesmus quadricauda*) are cells or groups of cells that contain chloroplasts filled with *chlorophyll a* and *chlorophyll b* (green pigments) just like other plants. Photosynthesis takes place in these chloroplasts when there is enough light for the reaction to proceed. The generalized equation for photosynthesis is:

carbon dioxide	+	water	light and chlorophyll	glucose	+	oxygen
6CO <sub>2</sub>	+	$6H_2O$	>	$C_6H_{12}O_6$	+	60 <sub>2</sub>

Bijou sampling containers filled with 20 Algal balls containing green algae were filled with an indicator solution of red hydrogen carbonate (pH 8.4), which reacts with pH changes caused by  $CO_2$  levels in the solution. When there are high levels of  $CO_2$  in the solution, it will lighten from red through orange to yellow. When  $CO_2$  is removed from the solution, it will darken from red through magenta to dark purple (Table 1).

Table 1		
Color	pН	
	рН 9.2	
purple	pH 9.0	
magenta	pH 8.8	
magenta	pH 8.6	
mad	pH 8.4	
red	pH 8.2	
	pH 8.0	
orange	pH 7.8	
yellow	рН 7.6	

Researchers investigated how light intensity and specific wavelengths of light affected the rate of photosynthesis.

#### Study 1

Respiration produces  $CO_2$  and photosynthesis uses  $CO_2$ . The *compensation point* occurs when the two processes are in balance and there is no net production of  $CO_2$ . *Neutral density* (ND) *filters*, which reduce transmittance of all wavelengths of light, were used to find the light level at which this compensation point is reached. The study used five sampling containers: three wrapped with different ND filters, one left uncovered, and a fifth wrapped in black sugar paper. The containers were placed equidistant from a 200-watt halogen light source for 30 minutes in a darkened room. Samples of each indicator solution were then placed in a colorimeter set to an absorbance of 550 nanometers (nm). Researchers then recorded their findings (Table 2 and Figure 1).

Table 2						
Filter on bottle	Amount of light transmitted into bottle (%)Absorbance of indicator 		pH Value			
None (0.0 ND)	100	0.34	9.00			
0.15 ND	71	0.30	8.95			
0.3 ND	50	0.17	8.75			
0.6 ND	25	-0.03	8.35			
Black paper (1.0 ND)	0	-0.15	8.00			



#### Figure 1

#### Study 2

The same process from Study 1 was repeated, except this time three sampling containers were covered with different color *acetate* sheets (transparent films colored red, blue, and green). A fourth bottle was covered with clear acetate and a fifth was covered with black sugar paper (Table 3).

Table 3							
Type of filter on bottle	Color of light allowed into bottle	Absorbance of indicator (550 nm)	pH value				
Clear acetate	All (400-680 nm)	0.94	9.0				
Red acetate	Red (600-680 nm)	0.74	8.6				
Blue acetate	Blue (425-500 nm)	0.56	8.4				
Green acetate	Green (475-590 nm)	0.32	7.8				
Black paper	None	0.24	7.6				





- **8.** If the researchers had used a 0.8 ND filter on a sixth container, based on the results of Study 1, the resulting pH value of the indicator solution would most likely have been:
  - **F.** Less than 8.00
  - **G.** Between 8.00 and 8.35
  - **H.** Between 8.35 and 8.75
  - J. Greater than 8.75
- **9.** Consider Table 1 and also the bottles with the 0.15 ND filter and 0.3 ND filter in Study 1. Given that photosynthesis consumes  $CO_2$ , which filter allowed a higher rate of photosynthesis to occur within its bottle?
  - **A.** The 0.15 ND filter, because higher pH values correspond to lighter colors indicating higher levels of CO<sub>2</sub>.
  - **B.** The 0.15 ND filter, because higher pH values correspond to darker colors indicating lower levels of CO<sub>2</sub>.
  - C. The 0.3 ND filter, because lower pH values correspond to lighter colors indicating higher levels of  $CO_2$ .
  - **D.** The 0.3 ND filter, because lower pH values correspond to darker colors indicating lower levels of  $CO_2$ .
- **10.** The researchers who conducted the studies most likely kept the room darkened when the algal balls were placed into the sampling containers prior to being placed under a light source in order to:
  - F. minimize the temperature of the indicator solution.
  - G. minimize the pH levels of the indicator solutions.
  - **H.** maximize the amount of glucose produced by the algal balls.
  - **J.** prevent photosynthesis in the algal balls from occurring.

**11.** Based on Table 1 and Study 1, as the amount of light that was transmitted into the container increased, do the results suggest that the absorbance of the indicator solution increases or decreases, and do the results suggest that the pH of the indicator solution increases or decreases?

	Absorbance of indicator	pH
A.	Increases	Decreases
B.	Increases	Increases
C.	Decreases	Decreases
D.	Decreases	Increases

- **12.** The algal balls in the bottle with the 0.6 ND filter in Study 1 produced an indicator solution with a color most similar to the color of the indicator solution produced by which filter in Study 2?
  - F. Clear
  - G. Red
  - H. Blue
  - J. Green
- **13.** According to the results of Study 1 and the information provided, the compensation point was reached when approximately what percent of light is transmitted into the bottle?
  - **A.** 0%
  - **B.** 25%
  - **C.** 30%
  - **D.** 50%





0 0 0

## Passage III

Bottlenose dolphins (*Tursiops truncates*) are social mammals that live in *pods* (generally groups of two to 30 dolphins) in warm oceans and tropical seas. In areas with copious amounts of food (fish, crustaceans, and cephalopods), pods can merge, forming a *superpod*, which may exceed 1,000 dolphins.

Four students each proposed a hypothesis describing how the hunting method used by Bottlenose dolphins was affected by water depth and pod size. Students wrote their hypotheses using the following terms and definitions:

- *Large pods* were pods comprised of nine or more dolphins.
- *Shallow water* was any area whose water depth was less than 35 feet.
- *Corralling Method*—when a hunting pod corrals and traps its prey between the pod and a physical barrier.
- *Herding Method*—when a hunting pod encircles a group of fish and take turns swimming through the school to feed.

To assess the accuracy of their hypotheses, students then reviewed a study conducted by a group of marine biologists (Table 1).

#### Student 1

Bottlenose dolphins prefer to hunt using the corralling method regardless of depth and pod size because this method results in the most successful hunting expeditions. In shallow water, dolphins find great success by utilizing the proximity of sandy shores to trap their prey. In deep water without shores, dolphins can still utilize large physical objects as barriers.

#### Student 2

Bottlenose dolphins prefer to hunt in large pods and in deep water because the colder climate tends to contain more of their desired prey, and larger pods can effectively employ the herding method. Herding results in highly successful hunting expeditions because the entire pod works together to ensure that prey cannot escape.

#### Student 3

Bottlenose dolphins choose their hunting method by pod size and not by water depth. A large pod of dolphins can effectively block off a substantial school of fish for successful hunts, while dolphins that are not in large pods employ the corralling method and other individualized hunting methods, such as creating mud nests with their tails in shallow water or making bubbles to corral fish in deeper water.

#### Student 4

Bottlenose dolphins choose their hunting method at the time of feeding. The corralling method has been observed in deeper water when large pods of dolphins use fishing nets (or other deep-sitting objects) as barriers; small pods of dolphins have been observed using the herding method in shallow water. Therefore, neither factor should have a strong impact on the hunting method used or on the success of the hunt.

#### Study

The students received data from marine biologists who observed four dolphin pods off Florida's Gulf Coast and recorded their hunting patterns in relation to sea depth and pod size over the course of a three-month period.

	Table 1							
Pod	Most Commonly Observed Feeding Method	Average Depth of Feeding Area (ft)	Average Pod Size					
А	Herding	1049	19					
В	Herding	656	8					
С	Corralling	18	13					
D	Corralling	426	673					







- **14.** A fifth student claimed that the deep-sitting hull of a cruise ship within a pod's feeding ground could influence that pod's feeding method. This claim is consistent with the hypothesis or hypotheses of which student(s)?
  - F. Student 1 only
  - G. Students 1 and 4 only
  - H. Students 3 and 4 only
  - **J.** Students 1, 2, 3, and 4
- **15.** Based on Student 2's hypothesis, a Bottlenose dolphin pod would most likely use the herding method under which of the following conditions?
  - **A.** A sea depth of 15 ft with a pod size of sixteen dolphins.
  - **B.** A sea depth of 200 ft with a pod size of three dolphins.
  - C. A sea depth of 15 ft with a pod size of three dolphins.
  - **D.** A sea depth of 200 ft with a pod size of sixteen dolphins.
- **16.** Consider the results of the study and the information provided. Are the observed data collected from Pods A and B consistent with Student 3's hypothesis?
  - F. Yes; Pods A and B both contained at least 9 dolphins.
  - **G.** Yes; Pods A and B both hunted in deep water.
  - **H.** No; Pod A contained at least 9 dolphins, but Pod B didn't.
  - J. No; Pod A hunted in deep water, but Pod B didn't.
- **17.** Before the study was conducted, which student would most likely have predicted that larger pod sizes would have been observed feeding at greater average depths?
  - A. Student 1
  - **B.** Student 2
  - C. Student 3
  - **D.** Student 4
- **18.** Which of the following questions was addressed by each hypothesis but cannot be directly answered by the results of the study?
  - **F.** Does the pod size and feeding method affect the success rate of the hunt?
  - **G.** Does the pod size and feeding method influence where dolphin pods reside?
  - **H.** What is the greatest depth at which dolphins employ the corralling method?
  - **J.** Do shallower feeding areas result in more common use of the corralling method?

- **19.** According to the information provided, Pod D in the study would be characterized as a superpod. The most likely explanation for Pod D's size is that its feeding area:
  - A. contained a large cephalopod population.
  - **B.** did not contain a large crustacean population.
  - **C.** was deep enough to support such a large dolphin population.
  - **D.** was warm enough so support such a large dolphin population.

**20.** Over the course of the three-month period, another group of marine biologists conducted a study of a pod of 23 dolphins to determine whether specific feeding methods in deep or shallow water affected the success rate of the hunt. The results of the study are displayed in the figure below.



The results of this study weaken claims by which of the following students?

- F. Student 1 only
- G. Student 4 only
- H. Students 1, 3, and 4 only
- **J.** Students 1, 2, 3, and 4



## SOLUTION GUIDE

ANSWER KEY									
Section 1 1. $A$ 2. $H$ 3. $A$ 4. $G$ 5. $B$ 6. $J$ 7. $C$ 8. $G$ 9. $D$ 10. $H$ 11. $D$ 12. $G$ 13. $C$ 14. $H$ 15. $A$ 16. $J$ 17. $D$ 18. $G$ 19. $D$ 20. $F$ 21. $D$ 22. $H$ 23. $C$ 24. $F$ 25. $C$ 26. $J$ 27. $B$ 28. $F$ 29. $A$ 30. $G$ 31. $A$ 32. $H$ 33. $D$ 34. $G$ 35. $D$ 36. $J$ 37. $B$ 38. $H$ 39. $A$	Section 2 1. B 2. D 3. B 4. C 5. B 6. D 7. A 8. B 9. D 10. A 11. C 12. B 13. A 14. D 15. B 16. B 17. C 18. B 19. B 20. B 21. D 22. A 23. B 24. C 25. B 26. D 27. D 28. A 29. B 30. B	Section 3 1. D 2. K 3. D 4. G 5. D 6. G 7. E 8. H 9. C 10. H 11. D 12. G 13. C 14. K 15. C 16. J 17. B 18. K 19. D 20. F 21. A 22. K 23. D 24. G 25. A 26. G 27. C 28. F 29. D 30. G 31. A	Section 4          1.       B         2.       C         3.       B         4.       A         5.       A         6.       B         7.       D         8.       D         9.       C         10.       B         11.       D         12.       B         13.       A         14.       B         15.       A         16.       D         17.       C         18.       B         19.       C         20.       A         21.       A         22.       B         23.       D         24.       B         25.       B         26.       C         27.       B	Section 5 1. D 2. F 3. C 4. J 5. C 6. G 7. B 8. H 9. B 10. J 11. C 12. G 13. C 14. J 15. A 16. H 17. B 18. F 19. D 20. J 21. D 22. G 23. A 24. G	Section 6 1. B 2. C 3. B 4. B 5. A 6. C 7. C 8. C 9. 9 10. 3/5 or 0.6 11. 135	Section 7 1. A 2. B 3. A 4. D 5. B 6. D 7. B 8. C 9. C 10. B 11. C 12. A 13. B 14. C 15. A 16. 709 17. 8 18. $3/4$ or 0.75 19. 14 20. 9.5 or 19/2	Section 8 <ol> <li>B</li> <li>J</li> <li>B</li> <li>F</li> <li>B</li> <li>F</li> <li>B</li> <li>G</li> <li>J</li> <li>C</li> <li>C</li> <li>G</li> <li>H</li> <li>C</li> <li>H</li> <li>C</li> <li>H</li> <li>C</li> <li>H</li> <li>C</li> <li>H</li> <li>C</li> <li>H</li> <li>A</li> <li>H</li> </ol>		

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# **SECTION 1 | ACT ENGLISH | SOLUTIONS**

### Passage I – The Olympic Cost

**Question 1.** The correct answer is A. The two em dashes surrounding "especially those in developing countries" allows that section to be nonessential to the sentence. It could be eliminated from the sentence and still make sense.

**Question 2.** The correct answer is H. The next sentence mentions that the "bids often become more costly than the host cities anticipate," suggesting that this underlined portion should mention the cost of the bid.

**Question 3.** The correct answer is A. Montreal is an instance of the hosting cost ultimately being much higher than it was originally planned to be. Therefore, Choice A is the best.

**Question 4.** The correct answer is G. If "construction projects could not meet deadlines," it suggests that they may have been mismanaged. Options F and H indicate there is danger involved, and "contingent" would require some evidence that the projects may not happen for some reason.

**Question 5.** The correct answer is B. The underlined portion should be kept here because it helps the reader understand the scale of the money being discussed at this point in the passage. Without this sentence, the reader wouldn't understand that it took Montreal more than 40 years to pay off the debt from hosting the Olympics.

**Question 6.** The correct answer is J. Choice J is the shortest answer, and the other choices add in elements that are not needed. It is also understood that building would follow the planning and designing, so H is unnecessary.

**Question 7.** The correct answer is C. This sentence contains a list of verbs, which therefore have to be in the same tense, and must be separated by a comma. The punctuation in the other answers is all incorrect.

**Question 8.** The correct answer is G. Choice G modifies "issues," which means "spiral" is the correct conjugation of the verb. Note that H is incorrect because it separates two independent clauses with a comma.

**Question 9.** The correct answer is D. This part of the sentence refers to the city of Rio, which is singular. Therefore, "its" is the correct word choice.

**Question 10.** The correct answer is H. The question asks for the most specific description, which often means the longest answer on the ACT. This question is no different because Choice H offers the longest and most specific description of the Olympic impact on the city. Because public workers are integral to the functionality of the city, this is the best answer.

**Question 11.** The correct answer is D. Choice D offers the shortest, most concise (and correct) answer to this underlined portion.

**Question 12.** The correct answer is G. It is correct to say "stadiums were built for the games" because the sentence requires the past tense, and "stadiums" is plural.

**Question 13.** The correct answer is C. Sentence 4 begins with "In fact," which means the sentence must add information to whatever sentence comes before it. Sentence 1 offers exactly that because it claims that "hosting the Olympics isn't worth it" most of the time. Sentence 4 also has to come after Sentence 1 because it establishes the contrast with the current Sentence 2.

#### Passage II - The Paradox of Miki Dora

**Question 14.** The correct answer is H. The fact that surfing became mainstream allowed surfers to capitalize on their talents. Choices F and G would require another verb later in the sentence, which doesn't exist.

**Question 15.** The correct answer is A. The current sentence states that some surfers did not enjoy the popularity of surfing at the time, so Choice A sets up the contrast by mentioning some surfers who enjoyed that popularity.

Question 16. The correct answer is J. The best placement for "surfing" is before "world" so that the sentence discusses "the big

# SECTION 1 | ACT ENGLISH | SOLUTIONS

names of the surfing world."

**Question 17.** The correct answer is D. This underlined portion is being modified by the clause before it: "Born in Hungary..." Therefore, the correct answer must begin with an entity that could have been born in Hungary. The only answer that satisfies this is Choice D, which begins with "Dora."

**Question 18.** The correct answer is G. Reading through the other answers should highlight why their are syntactically wrong. "Constantly" has to modify "maintaining," and "somehow" has to come before that.

**Question 19.** The correct answer is D. The last two sentence of this paragraph focus on Dora's physical abilities on a surfboard. This sentence, which discusses a Dora's rival Dirk Masterson, does not fit with that discussion at this point in the paragraph.

**Question 20.** The correct answer is F. To be an "affront" to someone means to offend the values of that person. In this context, the commercialization of surfing offended the values of how Dora saw the sport.

**Question 21.** The correct answer is D. At this point, the sentence has to be separated into two different sentences. "Towards the end of his career" is the introductory clause to another sentence.

**Question 22.** The correct answer is H. The sentence is referring to Dora, a singular legend. Therefore, choice H provides the correct possession for only one legend.

**Question 23.** The correct answer is C. The em dash here is acting as a colon: it introduces elaboration for what came before it. In this case, the information that follows explains why people originally flocked to surfing.

**Question 24.** The correct answer is F. Currently, the underlined portion contains information that helps the reader to understand the legacy of Dora within the context of surfing history.

**Question 25.** The correct answer is C. Choice C offers the shortest answer, while the other options are all either redundant with themselves or with the rest of the sentence.

**Question 26.** The correct answer is J. The passage's main purpose is not to focus on the history of surfing, but instead to focus on Miki Dora as a character within the surfing world. Note that the title can help with this question; it specifically talks about Dora, and not about the beginning and spread of surfing as a sport.

#### Passage III - Climbing Over It

**Question 27.** The correct answer is B. Choice C correctly uses two em dashes to set off a nonessential clause in the sentence. Note that Choice A would be correct if it did not place a comma after "climbers."

**Question 28.** The correct answer is F. This situation requires the use of a colon to introduce elaboration. It is also the only answer that correctly and efficiently separates two independent clauses.

**Question 29.** The correct answer is A. The sentence currently includes a description of how the narrator was feeling before he began climbing: he was anxious and his heart was beating quickly. This should be kept because it adds information to the text and is not redundant.

**Question 30.** The correct answer is G. This choice provides the proper punctuation for a list by dividing the first two verbs with a comma, and then adding "and" before the third verb.

**Question 31.** The correct answer is A. Because "after my left foot found another" can be taken out of the sentence, then two commas should surround it to create a nonessential clause.

**Question 32.** The correct answer is H. This portion of the sentence is a dependent clause, which means Choice H provides the best answer. Note that Choice J makes this an independent clause, which is grammatically incorrect.

## **SECTION 1 | ACT ENGLISH | SOLUTIONS**

**Question 33.** The correct answer is D. Because a professional would have better skills than the narrator, Choice D offers the best option to suggest the narrator thought his ability to climb was improving.

**Question 34.** The correct answer is G. Choice G provides the best, most concise answer. Choice F introduces an incorrect transition, while the other choices do not warrant their lengths.

**Question 35.** The correct answer is D. The "instantly" earlier in the sentence means that all of the answer choices besides D are redundant.

**Question 36.** The correct answer is J. It is correct to say the narrator hoisted himself "over" the precipice, since that refers to the face of a mountain.

**Question 37.** The correct answer is B. The clause following the comma must contain the subject performing the action in the first clause. The person "catching my breath" is the narrator, so "I" should directly follow the comma to properly receive the modification.

**Question 38.** The correct answer is H. The primary lesson learned by the narrator in the passage is that sometimes struggle is worth it, since he struggled up the mountain but ultimately felt rewarded. Choice H is the best summary of this lesson.

**Question 39.** The correct answer is A. Point A is the only place where this sentence makes sense, since it provides the best context for discussing a mountain face.

## SECTION 2 | SAT READING | SOLUTIONS

#### Passage I – Mansfield Park

**Question 1.** The correct answer is B. The discord between the three sisters is outlined in lines 36-46, when Maria and Louise both react to Francis. The explanation of the reconciliation after 11 years begins on line 53.

**Question 2.** The correct answer is D. Lines 5-7 detail that Maria was raised in rank, and had the comforts of a house and income. This all came from marrying Sir Thomas Bertram.

Question 3. The correct answer is B. Frances avoided writing her family to save herself from remonstrance, or criticism.

**Question 4.** The correct answer is C. Lines 12-14 mention that there are not as many "men of large fortune in the world as there are pretty women to deserve them." It can be inferred, then, that Maria's sisters might not be able to find suitable husbands because there are other, more attractive women who might win the men's favor.

**Question 5.** The correct answer is B. These lines provide the best answer for the previous question. Choice B is also the only one with evidence that mentions a reason why Maria's sisters might not find suitable husbands.

**Question 6.** The correct answer is D. The different reactions of the two sisters to Francis can be found in lines 38-44, where the passage outlines how Maria would be content "giving up her sister," while Louise "had written a long and angry letter" to her.

**Question 7.** The correct answer is A. These lines provide the best answer for the previous question. Choice A is also the only evidence listed that mentions both of the sisters and their reaction to Francis.

**Question 8.** The correct answer is B. Lines 64-69 state that Frances "could not conceal how important she felt [her family] might be" in helping to raise her eight children.

Question 9. The correct answer is D. Louise write Frances an angry letter, which is mentioned in lines 42-43.

**Question 10.** The correct answer is A. France's choice of husband was "unfavorable" because lines 21-24 claim that he was "without education, fortune, or connections."

#### Passage II – Humming Along

**Question 11.** The correct answer is C. The extreme activity of hummingbirds is detailed in the second paragraph, while paragraphs three through five each detail a way for hummingbirds to avoid death: energy utilization, diet diversification, and torpor.

**Question 12.** The correct answer is B. In the context, the passage is talking about the exercise of the hummingbirds, which could be classified as "intense."

**Question 13.** The correct answer is A. Line 70 states that only "some populations" of hummingbirds gain weight in order to migrate south, which implies that not all species make the flight.

**Question 14.** The correct answer is D. These lines provide the best answer for the previous question because answers B, C, and D in Question 13 do not match up with the corresponding answers in Question 14.

**Question 15.** The correct answer is B. The central idea of the passage is to investigate how hummingbirds cope with their extreme physical activity, which is the question posed in lines 17-18.

**Question 16.** The correct answer is B. Hummingbirds keep weight on their bones by constantly foraging for nutrients and by entering torpor, which could be classified as "grueling."

# **SECTION 2 | SAT READING | SOLUTIONS**

**Question 17.** The correct answer is C. Lines 31-33 state that hummingbirds hunt and forage for nutrition, but not that this activity is their sole source of nutrition. Therefore, only hunting would constitute abnormal hummingbird behavior.

**Question 18.** The correct answer is B. These lines provide the best answer for the previous question because they prove that choice C in Question 17 is abnormal.

**Question 19.** The correct answer is B. The details of torpor are outlined in lines 58-62, which state that metabolic rate is lowered while in this state. The graph shows the same drop during the nighttime, which supports the author's claims.

**Question 20.** The correct answer is B. The other answer options are not supported by the graph, whereas choice B can be seen by the recurring pattern of high metabolic rate during the day, followed by lower rates at night.

#### Passage III - Women Suffrage (Paired Passage)

**Question 21.** The correct answer is D. An "indifferent" electorate would find the constant discussion of women's suffrage an "annoyance." The other answers are not supported by the depiction of men in the passage.

**Question 22.** The correct answer is A. In lines 18-20, George highlights how women should focus on "physical, intellectual, and moral education" to impact society, instead of on voting.

**Question 23.** The correct answer is B. These lines provide the best answer for the previous question, and none of the other answers match up correctly with the answer options in Question 22.

**Question 24.** The correct answer is C. Women are referred to as slaves in lines 45-49, where it becomes clear that this depiction is used to help describe the oppression that women feel as a result of not voting.

**Question 25.** The correct answer is B. Lines 63-75 outline how Jones believes that women should be able to perform all of the actions that men can.

**Question 26.** The correct answer is D. In the context, men are "submitting" their sisters and daughters to slavery, or forcing a condition on them.

**Question 27.** The correct answer is D. Both passages are analyzing women's suffrage, as well as its impact on society. This can be seen throughout each passage, but specifically on lines 18-20 in Passage 1 and on lines 56-59 in Passage 2.

**Question 28.** The correct answer is A. In lines 56-59, Jones claims that women require the right to vote in order to achieve equality. Lines 8-11, however, state that women's suffrage is just "an imitation-of-man movement" that should be condemned. Jones would likely say these lines in Passage 1 misrepresent the role that women's suffrage plays in society.

**Question 29.** The correct answer is B. These lines provide the best evidence for the previous question because they highlight how Jones views women's suffrage and its relation to human rights.

**Question 30.** The correct answer is B. Lines 30-34 highlight how George thinks women can impact society in ways other than voting, and Jones argues in lines 45-49 that voting is the only way for women to impact society positively.

## SECTION 3 | ACT MATHEMATICS | SOLUTIONS

#### **Multiple Choice**

Question 1. The correct answer is D. The probability of selecting an ace or a face card is the sum of the individual probabilities

of selecting aces or faces. Thus, the total probability is  $\frac{1}{13} + \frac{3}{13} = \frac{4}{13}$ .

**Question 2.** The correct answer is K. The value of *C* when F = 5 is calculated by substituting 5 for *F*. Therefore,  $C = \frac{9}{5}(5) + 32 = 41$ .

**Question 3.** The correct answer is D. We need to substitute 4 and evaluate. Note that the value of an absolute value expression is equal to its distance from zero on the number line. Therefore, |3-4|+|4-2| = |-1|+|2| = 1+2=3.

**Question 4.** The correct answer is G. The figure can be divided into two rectangles of dimensions 8 x 23 and 17 x 33 by drawing from the corner of the "L" down to the bottom of the apartment. The areas of those two rectangles are found using A = bh, and therefore are 204 ft<sup>2</sup> and 561 ft<sup>2</sup>, and so the total area is 745 ft<sup>2</sup>.

Question 5. The correct answer is D. The value of g(2) is  $\sqrt{2+7} = 3$ . The value of f(3) is  $3^2 + 2(3) + 1 = 16$ . Thus f(3) + g(2) = 19.

**Question 6.** The correct answer is G. The slope of a line in standard form (ax + by = c) is  $-\frac{a}{b}$ . Alternatively, the line can be rewritten in slope-intercept form as  $y = -\frac{7}{2}x + 6$ .

**Question 7.** The correct answer is E. The problem can be rewritten as  $.06(40) = \frac{1}{5}x$ . Thus,  $2.4 = \frac{1}{5}x$  and 12 = x.

**Question 8.** The correct answer is H. The center of a circle is the midpoint of the endpoints of any diameter. Therefore, using the midpoint formula,  $x = \frac{-2+0}{2} = -1$  and  $y = \frac{-7+11}{2} = 2$ . Therefore, the coordinates of point C are (-1,2).

**Question 9.** The correct answer is C.  $\frac{5.6}{1.4} = 4$ . By the rules of exponents,  $\frac{10^6}{10^{-3}} = 10^9$ .

Question 10. The correct answer is H. The largest integer that divides evenly into both 40 and 60 is 20.

**Question 11.** The correct answer is D.The area of the picture is A = bh, which gives (5)(7) = 35. The base of the picture with the fame is 5 + 2(0.5) = 6. The height of the picture with the frame is 7 + 2(0.5) = 8. Then the area of the total surface, including the picture and the frame, is (6)(8) = 48. Thus the area of the frame not covered by the picture is 48 - 35 = 13.

**Question 12.** The correct answer is G. By factoring, we obtain (x-8)(x+6) = 0. Thus, the solutions are x = -6 and x = 8.

**Question 13.** The correct answer is C. The reciprocal of x is  $\frac{1}{x}$ . Thus,  $\frac{x}{\frac{1}{x}} = \frac{16}{9}$ , and thus  $x^2 = \frac{16}{9}$ . Therefore,  $x = \pm \frac{4}{3}$ . However, the problem specifies that x must be positive, so  $x = \frac{4}{3}$ .

**Question 14.** The correct answer is K. Because  $\angle 1$ ,  $\angle 3$  and the right angle form a linear triple, it must be true that  $\angle 1 + \angle 3 = 90^\circ$ . Therefore, (5x - 10) + (3x - 4) = 90, so 8x - 14 = 90 and x = 13. Thus,  $\angle 1$  measures 55° and  $\angle 3$  measures 35°. Thus, because  $\angle 2$  is vertical to  $\angle 1$ ,  $\angle 2$  also measures 55°.

**Question 15.** The correct answer is C. Half of 13 feet is 6 feet 6 inches. Half of 6 inches is 3 inches. Thus, half of 13 feet 6 inches is 6 feet 9 inches.

## SECTION 3 | ACT MATHEMATICS | SOLUTIONS

**Question 16.** The correct answer is J. The sector represents  $\frac{1400}{12000}$  or  $\frac{7}{60}$  of the circle. Thus, the central angle of the sector measures  $\frac{7}{60}$  of 360°, which is 42°.

**Question 17.** The correct answer is B. The budget for cabinets will be \$400. The total budget assigned to the categories except labor is \$6,600. Therefore, \$5,400 of the \$12,000 budget is assigned to labor. Since the fraction assigned to labor is  $\frac{5400}{12000} = 0.45$ , the percentage assigned to labor is 45%.

**Question 18.** The correct answer is K. The number of square feet can be calculated as  $\frac{800}{12} \approx 66.67$  square feet. Because the price is increased by \$2.40 per square foot, the budget will be exceeded by  $66.67 \times 2.40 = \$160$ .

Question 19. The correct answer is D. By the distance formula,  $d = \sqrt{(4 - (-1))^2 + ((-2) - 5)^2}$ , so  $d = \sqrt{74}$ .

**Question 20.** The correct answer is F. The sum of the vectors is given by  $\langle 2,5 \rangle + \langle -7,6 \rangle = \langle -5,11 \rangle$ , and the unit vector notation for  $\langle -5,11 \rangle$  is  $-5\mathbf{i} + 11\mathbf{j}$ .

**Question 21.** The correct answer is A. The fundamental counting principle states that we can multiply the number of outcomes for each of the six individual events (the letter and each of the 5 digits) in order to get the number of possibilities. The number of possibilities for the letter is 26, and the number of possibilities is 10 for each digit (because they may repeat). Therefore, the total number of possibilities is  $26 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 26 \cdot 10^5$ .

**Question 22.** The correct answer is K. The area of the trapezoid is found using the formula  $A = \frac{1}{2}(b_1 + b_2)h$ , where  $b_1$  and  $b_2$  are the lengths of the bases of the trapezoid and *h* is the height of the trapezoid. Therefore, the area of the whole trapezoid is  $A = \frac{1}{2}(6+9)4 = 30$ . The area of the triangle located in the second quadrant is  $\frac{1}{2}(4)(3) = 6$ . Therefore, the area of the region located in the first quadrant must be 24. Thus, because  $\frac{24}{30} = .8$ , the portion of the trapezoid lying in Quadrant 1 is 80% of the total area of the trapezoid.

**Question 23.** The correct answer is D. Because this is a fourth quadrant angle,  $sin \theta$  is negative. We can create a triangle on the *xy*-plane and use the Pythagorean theorem to calculate that the remaining side is equal to 8. Then, we can calculate the

remaining trig functions of  $\theta$ . Because  $\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$ ,  $\sin \theta = -\frac{8}{17}$ 

Question 24. The correct answer is G. If we rewrite 4 as  $2^2$  and 8 as  $2^3$ , the problem becomes  $\frac{2^x (2^2)^5}{(2^3)^5} = \frac{1}{2^3}$ . Therefore,  $\frac{2^x \cdot 2^{10}}{2^{15}} = \frac{1}{2}^3$ . Applying rules of exponents,  $\frac{2^{x+10}}{2^{15}} = 2^{-3}$ ,  $\frac{2^{x+10}}{2^{15}} = 2^{-3}$ , and  $2^{x+10-15} = 2^{-3}$ . Therefore, x + 10 - 15 = -3, so x - 5 = -3, and x = 2.

**Question 25.** The correct answer is A. The final grade in this course is out of 700 points. In order for Chandler to achieve an average of 87%, he needs to earn at least  $0.87 \times 700 = 609$  of those points. Because he has so far earned 82 + 91 + 72 + 99 + 83 = 427 points, he needs to score at least 182 points on the final.

**Question 26.** The correct answer is G. The line x = -2 is an asymptote because the denominator of the function evaluates to zero when x = -2, but the numerator of the function does not evaluate to zero when x = -2.

**Question 27.** The correct answer is C. To divide  $3\frac{5}{6}$  by  $\frac{2}{3}$ , we must multiply by the reciprocal. Then  $3 \times \frac{3}{2} = \frac{9}{2} = 4.5$  and  $\frac{5}{6} \times \frac{3}{2} = \frac{15}{12} = \frac{5}{4} = 1.25$ . Thus, we can make 5 full bookmarks, and have  $\frac{3}{4}$  of  $\frac{2}{3}$  feet of fabric left over, which is  $\frac{1}{2}$  foot.

## SECTION 3 | ACT MATHEMATICS | SOLUTIONS

**Question 28.** The correct answer is F. The center-radius form of the circle is  $(x - h)^2 + (y - k)^2 = r^2$ , where (h, k) is the center of the circle and *r* is the radius. The distance between the center, (2, -4) and the point (2, 1) is 5, so the radius is 5. We can then plug in h = 2, k = -4, and r = 5.

**Question 29.** The correct answer is D. Let  $a_0$  be the first term of the sequence and r be the common ratio of the terms in the sequence. Then  $30 = a_0 r^3$ ,  $0.03 = a_0 r^6 = (a_0 r^3) r^3$ , and the second term of the sequence is equal to  $a_0 r^2$ . By substitution,  $0.03 = (30) r^3$ , so  $.001 = r^3$  and 0.1 = r. By substitution,  $30 = a_0(0.1)^3$ , so  $a_0 = 30000$ . Thus,  $a_0 r^2 = 300$ .

Question 30. The correct answer is G. The note gives the formula  $c^2 = a^2 + b^2 - 2ab \cos C$ . Because we are solving for the largest angle, c = 19, a = 15, and b = 17. Thus,  $19^2 = 15^2 + 17^2 - 2(15)(17)(\cos C)$ . Rearranging,  $19^2 - 15^2 - 17^2 = -2(15)(17)\cos C$ , and  $\cos C = -\frac{19^2 - 15^2 - 17^2}{2(15)(17)}$ .

**Question 31.** The correct answer is A. The expected value can be found by multiplying each outcome by the probability of that outcome, and summing across all possible outcomes. Therefore, the expected number of points Aaron receives is equal to (0.15)(5) + (0.25)(3) + (0.10)(10) + (0.50)(2) = 3.5.

## SECTION 4 | SAT WRITING | SOLUTIONS

#### Passage I – Self-Driving Cars

**Question 1.** The correct answer is B. To "propel" means to urge forward, which fits the context here. The recent advancements have pushed the discussion of self-driving cars forward.

**Question 2.** The correct answer is C. "Science" is performing this action, which means the verb has to be conjugated to match. Because it is singular, "continues" is the best choice.

**Question 3.** The correct answer is B. The answer choices suggest that this question is testing redundancy, so the shortest answer is most likely the best.

**Question 4.** The correct answer is A. The rationale for the two "No" options do not make sense in this case. The sentence being added is the final option that the car would have: right, straight, or left. It also is adding information rather than clarifying previous information.

**Question 5.** The correct answer is A. The next paragraph elaborates on the questions that surround the ethics of self-driving cars. The paragraph does not mention the ideas presented in the other answer options.

**Question 6.** The correct answer is B. There is no comma needed after "hardware" since it would separate an action from the entity that is performing that action (sensors, cameras, and connectivity hardware...have a response time). Answers C and D add in this comma, while choice A adds an unnecessary comma after "and."

**Question 7.** The correct answer is D. Because so few of the respondents said they would purchase a car that might choose to sacrifice the driver, the questions discussed in the passage will play a large role in how self-driving cars are sold. Choice D represents the only transition that suggests a causal transition.

**Question 8.** The correct answer is D. Sentence 7 begins with "In other words," which is meant to refer to Sentence 3. Sentence 3 mentions a situation where humans would not be at fault, and Sentence 7 states that there are still ethical issues even when human error is removed.

**Question 9.** The correct answer is C. A comma must be used to separate the independent clause from the dependent clause. Therefore, Choice C is the best because Choice A and B each make the clause following the comma independent. Choice D incorrectly separates the independent from the dependent clause with a semicolon.

## Passage II – Frozen Seeds

**Question 10.** The correct answer is B. A catastrophic event would threaten human civilization, so it is important to be have the ability to replant crucial crops. Note that choice A is incorrect because there is nothing inherently "dangerous" about the contents of the vault: they are just seeds.

**Question 11.** The correct answer is D. In this context, the single em dash is being used as a colon: it introduces elaboration for what comes before it. Choice A is wrong because the second clause is not independent.

**Question 12.** The correct answer is B. There is no need for the punctuation in the other answers. Note that choices A and C are the same, so they are instantly wrong.

**Question 13.** The correct answer is A. The Svalbard Seed Vault has only 2% vegetables compared to the 6% of the average seed vault; the Svalbard vault has 65% cereals compared to the 48% of the average seed vault.

## SECTION 4 | SAT WRITING | SOLUTIONS

**Question 14.** The correct answer is B. The modification from the first clause in the sentence ("Designed to be the safest repository in existence") needs to describe the vault itself. Choice B is the only option that puts the seed vault first so that it can properly receive that modification.

**Question 15.** The correct answer is A. Even though the water was not a threat, the government is moving along with the project to waterproof the inner vault. "Nevertheless" suggests that despite the first element, the second event happened.

**Question 16.** The correct answer is D. The context requires this verb to maintain the pattern elsewhere in the sentence, so it must match with "waterproof" and "provide." Choice D is the only option that achieves this.

**Question 17.** The correct answer is C. There is no plural noun in the sentence, so "their" cannot work. To specify who owns the "fear," we need to use "the researchers." Choice B incorrectly makes "team" plural, and Choice D could refer to the vault as "it," but the vault cannot have fear.

**Question 18.** The correct answer is B. The previous paragraph highlights the impact of rising temperatures on the longevity of the Svalbard Seed Vault. Choice A is not mentioned in the passage, Choice C is redundant with the previous clause, and Choice D is not true.

#### Passage III - Ludington's Long Ride

**Question 19.** The correct answer is C. The comma after "Revere" is needed to separate the independent from the dependent clause. The two commas surrounding "according to legend" are needed to make that section nonessential. The sentence could also be read "...attributed to Paul Revere, who rode his horse..." Because that sentence works, both of those commas are needed.

**Question 20.** The correct answer is A. The discussion that takes place in the rest of the passage concerns Sybil Ludington, whom the passage depicts as a heroine of the Revolutionary War that warned of a British invasion.

**Question 21.** The correct answer is A. The two em dashes on either side of "covering twice the distance of Revere's ride" are needed to make that section nonessential. Note that Choice B is incorrect because of the commas before and after the parentheses.

**Question 22.** The correct answer is B. Choice B is the only option that contains no grammatical errors: Choices A and C are comma splices, and choice D is a run-on sentence.

**Question 23.** The correct answer is D. This answer has to be parallel with the rest of the list that begins with "to knock" and "prod." Because the sentence already contains the "to" before "knock," it is not needed in Choice A. Choice D continues the pattern.

**Question 24.** The correct answer is B. This addition explains how ruffians would have known Sybil was a woman, and therefore an easier target on the road than a man would have been. This elaborates on the claim that riding sidesaddle "[made] matters worse."

**Question 25.** The correct answer is B. The entity performing this action is "regiment," which is singular. Therefore, "its" will be the best answer.

**Question 26.** The correct answer is C. The sentence before the underlined portion mentions that Sybil's ride helped to repel the British from Connecticut. There is a causal relationship with the next sentence, which states the "proved to be a successful chapter in the fight against the British."

**Question 27.** The correct answer is B. Sybil seemed determined throughout her ride, meaning she was "tenacious." For instance, she left at night, in the rain, and faced dangerous encounters during her ride. Still, she persevered and completed her mission.

# SECTION 5 | ACT READING | SOLUTIONS

### Passage I – Banking on Change

**Question 1.** The correct answer is D. The first person narration can be seen through the passage, but lines 41-47 specifically highlight how the narrator felt disillusioned by her job and the work environment that it presented. That the leadership does not take her seriously can be observed when Nessa Frigg asks her which dress to wear in lines 89-90.

**Question 2.** The correct answer is F. Lines 51-58 claim that most coworkers found Robert to be combative, but the narrator "knew him well enough" to know otherwise. The fact that he often debated belies his true intention of "car[ing] deeply for [his] team."

**Question 3.** The correct answer is C. Much like a child who is rewarded after crying for a toy in a checkout line, Nessa was given this appointment because she is spoiled by her father.

**Question 4.** The correct answer is J. The fact that the narrator does not care about makeup very much suggests that her appearance is not terribly important to her. On the other hand, these lines show how the bank's upper management "care more about Tom Ford and Versace fashions than about proper banking.

**Question 5.** The correct answer is C. The narrator mentions her relationship with Nessa in lines 78-80, which detail how Nessa has asked for the narrator's opinion at meetings with increasing frequency.

Question 6. The correct answer is G. Lines 50-51 highlight how the "small analytics team kept the bank afloat."

**Question 7.** The correct answer is B. Roman numeral I can be found in lines 86-90, where it is clear that Nessa Frigg wants advice regarding designer fashion. Roman numeral II is stated on line 34. The other options have no evidence in the text.

**Question 8.** The correct answer is H. The narrator states in lines 47-49 that the only reason she stays at her job is because of a "mountain of college debt."

#### Passage II – Placebo / Nocebo Effect (Paired Passage)

**Question 9.** The correct answer is B. The many factors that impact the success of Dragon Children are outlined in lines 31-43.

**Question 10.** The correct answer is J. At this point in the passage, the author is referring to one possible reality that could "occur," or become an actuality.

**Question 11.** The correct answer is C. Passage A is concerned with the positive outcomes that can result from a belief in a certain reality. Therefore, choice C connects this idea with lines 46-50, which describe how striving for a certain reality can bring people "closer to that goal."

**Question 12.** The correct answer is G. Lines 88-90 state that the early anthropologists were "baffled as to why the curse was working." The curse "works" by killing the victim, suggesting the anthropologists were not sure why the victims were actually suffering adverse effects. The following lines offer a modern explanation of how the curse works.

**Question 13.** The correct answer is C. One explanation for how the curse might work is detailed in lines 90-95, in which the passage suggests that social ostracization might lead to adverse health effects for the victim.

**Question 14.** The correct answer is J. Both passages discuss how one's thoughts and beliefs can manifest realities based on those beliefs. In Passage A, this is mentioned in lines 44-50, and in lines 65-69 in Passage B.

## SECTION 5 | ACT READING | SOLUTIONS

**Question 15.** The correct answer is A. On lines 69-70, Passage B mentions that "The recognition of the nocebo effect puts healthcare professionals in a difficult position," and goes on to explain why. Healthcare professionals are not mentioned in Passage A.

**Question 16.** The correct answer is H. Lines 3-4 offer a question of how belief impacts reality. While Passage A discusses a positive outcome of belief, Passage B advances this idea by highlighting that negative outcomes are also possible based on an individual's belief in a certain reality.

#### **Passage III – Terraforming Mars**

**Question 17.** The correct answer is B. The primary supposition of the passage is given in the first paragraph: "there will be a significant human colony on Mars by the end of the year 2040." The next four paragraphs each introduce obstacles to that colonization.

**Question 18.** The correct answer is F. This paragraph makes it clear that the Martian environment is inhospitable because there are high levels of radiation due to the absence of a protective magnetic field.

**Question 19.** The correct answer is D. Lines 26-29 state that "strong solar wind produces an electric field that accelerates ions in the upper Martian atmosphere, which reach a velocity fast enough to strips Mars of its protective upper atmosphere."

**Question 20.** The correct answer is J. Choice F can be found on line 35, choice G on lines 30-33, and choice H on lines 44. A lack of oxygen is never mentioned in the passage.

**Question 21.** The correct answer is D. While the other options mention topics that are discussed in the passage, there are issues with each of them. The passage does not have enough information to make the connection between the magnetic field and the dust storms on the Martian surface.

**Question 22.** The correct answer is G. Though the NASA researchers suggest this solution, they concede that it is problematic. In other words, they "recognize" that critiques of the solution might be valid.

**Question 23.** The correct answer is A. The scientists mentioned on line 59 believe that larger quantities of water might be extracted from the Martian soil.

**Question 24.** The correct answer is G. Lines 15-17 claim that the high winds on the Martian soil "could threaten any structure or equipment on the surface." While the other answers mention ideas and concepts cited in the passage, none of them conform to the information in the passage.

## SECTION 6 | SAT MATHEMATICS (NO CALCULATOR) | SOLUTIONS

#### **Multiple Choice**

**Question 1.** The correct answer is B. The first equation combines the dollar cost of the tomatoes and dollar cost of the carrots to equal the total dollar amount collected (136.68). The second equation combines the number of pounds of tomatoes and pounds of carrots to equal the total pounds of produce (92).

Question 2. The correct answer is C. The equation becomes  $x^2 - 3x = 18$ , and so  $x^2 - 3x - 18 = 0$ , which can be rewritten as (x - 6)(x + 3) = 0. Therefore, x = 6 and x = -3.

**Question 3.** The correct answer is B. In order to isolate *y*, you can subtract 16 from both sides to obtain c - 16 = 0.55y. Then divide by 0.55.

**Question 4.** The correct answer is B. The linear function relates the number of years (input) to the capacity of the reservoir in acre-feet (output). Therefore, the meaning of the slope in this linear equation is the change in capacity over time, in acre-feet per year. It is a decrease because the slope is -1709.

**Question 5.** The correct answer is A. The expression can be reduced to  $\frac{5}{(x-3)} + \frac{3}{(x-3)} = \frac{8}{(x-3)}$ . **Question 6.** The correct answer is C. If  $x^5 = 2$ , then  $(x^5)^{-3} = 2^{-3}$ , and so  $x^{-15} = \frac{1}{8}$ .

**Question 7.** The correct answer is C. The rate of change in atmospheric pressure is equal to  $\frac{439 \text{ pounds per square inch}}{1,000 \text{ feet below sea level}}$ .

**Question 8.** The correct answer is C. Divide both sides by 3 to obtain  $2x^2 + 4x + 1 = 0$ , then apply the quadratic formula with A = 2, B = 4, and C = 1. Therefore,  $x = \frac{-4 \pm \sqrt{4^2 - 4(2)(1)}}{4}$ . This can be reduced to  $x = \frac{-4 \pm 2\sqrt{2}}{4}$ , and so  $x = -\frac{4}{4} \pm \frac{\sqrt{2}}{2}$ , which is the same as  $x = -1 \pm \frac{\sqrt{2}}{2}$ .

## SECTION 6 | SAT MATHEMATICS (NO CALCULATOR) | SOLUTIONS

## **Student-Produced Responses**

**Question 9.** The correct answer is 9. The sum of the two expressions is  $-6x^2 + 3x + 12$ , and so a = -6, b = 3, and c = 12.

Question 10. The correct answer is  $\frac{3}{5}$  or 0.6. We can combine the two equations by elimination to get 13x = 13, so x = 1. Therefore, 9(1) + 5y = 7, so 9 + 5y = 7, and 5y = -2. Therefore,  $y = -\frac{2}{5}$ .

**Question 11.** The correct answer is 135. The length of the arc is proportional to the central angle of the arc. Therefore, the central angle measures  $\frac{3}{8}(360^\circ) = 135^\circ$ .

## SECTION 7 | SAT MATHEMATICS (CALCULATOR) | SOLUTIONS

#### **Multiple Choice**

**Question 1.** The correct answer is A. To subtract the expressions, distribute the minus sign to get  $2x^2 - 3 + 3x^2 - 1$ , and then combine to get  $5x^2 - 4$ .

**Question 2.** The correct answer is B. If  $A = \frac{1}{2}bh$ , then 2A = bh and  $b = \frac{2A}{h}$ .

Question 3. The correct answer is A. The formula for calculating the slope of the line given two points is  $m = \frac{y_2 - y_1}{x_2 - x_1}$ , and so  $m = \frac{\frac{1}{2} - (-\frac{7}{2})}{3 - 5} = \frac{4}{-2} = -2$ .

**Question 4.** The correct answer is D. 12 minutes is equal to  $12 \cdot 60 = 720$  seconds. Therefore, 20% of 12 minutes is .2(720) = 144 seconds.

**Question 5.** The correct answer is B. Ross is selecting among the 110 US History books. The probability of selecting a paperback book from only those books is  $\frac{45}{110}$ .

**Question 6.** The correct answer is D. The equation f(4) = 2g(4) is true, because f(4) = 6 and g(4) = 3.

**Question 7.** The correct answer is B. The results can only be applied to juniors at that high school because the random sample only consisted of juniors at that school.

**Question 8.** The correct answer is C. By substitution,  $ab = 2(x-3)^2 \cdot 2(x-3)$ , which is equal to  $4(x-3)^3$ .

**Question 9.** The correct answer is C. Because r = s + 3, we can rewrite the first equation as 3(s+3) + 4s = 23, and thus 3s + 9 + 4s = 23. Therefore, 7s + 9 = 23, 7s = 14, and s = 2.

**Question 10.** The correct answer is B. Helia's cell phone charged 40% in 36 minutes. Because it charges at a constant rate, it will take one-fourth as long to charge 10% as it will to charge 40%. Therefore, to reach a charge of 80% will take an additional 9 minutes.

Question 11. The correct answer is C. Because  $a^2 - b^2 = 96$ , we know that (a + b)(a - b) = 96, and because a + b = 12, we know that 12(a - b) = 96, and so a - b = 8.

**Question 12.** The correct answer is A. The students had a combined  $0 \cdot 9 + 1 \cdot 6 + 2 \cdot 4 + 3 \cdot 3 + 5 \cdot 2 + 11 \cdot 1 = 44$  absences. The average absences per student was therefore  $\frac{44}{25} = 1.76$ .

Question 13. The correct answer is B. The temperature decreased six degrees in four hours, and so the change in temperature

per hour is  $\frac{-6}{4} = -1.5$  degrees per hour.

**Question 14.** The correct answer is C. The center-radius form of a circle in the *xy*-plane is  $(x - h)^2 + (y - k)^2 = r^2$ , where (h,k) is the center of the circle and *r* is its radius. Therefore, the radius of the circle is  $\sqrt{12}$ , and its area is  $A = \pi(\sqrt{12})^2 = 12\pi$ .

**Question 15.** The correct answer is A. The function is linear because it changes by a constant amount (20 people) per year. Therefore, the answer is not C or D. To determine which answer is correct, we can distribute the two possible options to obtain slope-intercept form: A) becomes 2000 - 20t, and B) becomes 2000 - 200t.

## SECTION 7 | SAT MATHEMATICS (CALCULATOR) | SOLUTIONS

#### **Student-Produced Responses**

Question 16. The correct answer is 709. If 0.04 atmospheres is 4053 pascals, then we can set up a proportion to solve this problem:  $\frac{0.04 \text{ atmospheres}}{4053 \text{ pascals}} = \frac{0.007 \text{ atmospheres}}{x \text{ pascals}}$ . By cross-multiplication, 0.007(4053) = 0.04x, and  $x = 0.007(\frac{4053}{0.04})$ , which is equal to 709.275.

Question 17. The correct answer is 8. We can solve for the *x*-intercept by setting y = 0. Therefore,  $0 = -\frac{3}{4}x + 6$  and thus  $\frac{3}{4}x = 6$ . Therefore, 3x = 24 and x = 8.

**Question 18.** The correct answer is 0.75 or  $\frac{3}{4}$ . Because each 100 milliliters of this solution contains 4.5 grams of glucose, we know that each liter of this solution contains 45 grams of glucose. We have 3 liters of this solution, and so there are  $45 \cdot 3 = 135$  grams of glucose in the solution. Because each mole is 180 grams of glucose, the number of moles of glucose in the solution is  $\frac{135}{180} = 0.75$ .

**Question 19.** The correct answer is 14. The slope of the function f is  $-\frac{1}{3}$ , and so the slope of the function g is 3. Therefore, the equation of function g is g(x) = 3x - 4, and thus g(6) = 18 - 4 = 14.

**Question 20.** The correct answer is 9.5. If the original price of the book is *x*, then 0.80x = 7.60, because the book costs \$7.60 with a 20% discount. Therefore, x = 9.50.

# SECTION 8 | ACT SCIENCE | SOLUTIONS

#### Passage I – Ideal Gasses

**Question 1.** The best answer is B. According to Table 3, when the recorded gas pressure in the flask was 112.36 kPa, the flask contained  $6.9 \times 10^{20}$  molecules of air. When the recorded gas pressure in the flask was 119.26 kPa, the flask contained  $8.8 \times 10^{20}$  molecules of air. Therefore, when the pressure in the flask was equal to 117 kPa, the number of molecules was likely between these two values.

**Question 2.** The best answer is J. According to Table 2, as temperature increases from 293 K to 368 K, volume increases from 35.16 mL to 44.16 mL.

**Question 3.** The best answer is B. In Experiment 3, students transitioned the flask from a heated water bath. Experiment 3 states that the students conducted the experiment at a constant temperature of 293 K (room temperature). It is reasonable to infer that the students wanted to wait for the temperature inside the flask to stabilize before proceeding.

**Question 4.** The best answer is F. According to Table 1, when the plunger measured 20 mL, pressure in the syringe was 36.75 psi. When the plunger measured 25 mL, the pressure in the syringe was 29.40 psi. Therefore, when the plunger measured 22.5 mL, the amount of pressure in the syringe was likely between those two values.

**Question 5.** The best answer is B. An inverse proportion is defined as a relation between two quantities such that one increases in proportion as the other decreases. According to Table 1, as volume increased, pressure decreased proportionally.

**Question 6.** The best answer is J. According to Table 1, a pressure of 21 PSI corresponds to a volume of 35 mL. In Table 2, the closest volume to 35 mL is 35.16 mL, which corresponds to a temperature of 293 K. Since 35 mL is less than 35.16 mL and the volume of the gas decreases as its temperature decreases, it is reasonable to assume that the temperature should be lower than 293 K.

**Question 7.** The best answer is C. Experiment 3 states that the volume of gas introduced into the system is proportional to the number of molecules introduced. The question adds that nitrogen is an ideal gas and that the volume of one molecule of an ideal gas is the same across all ideal gasses so it is reasonable to infer that since air is composed of majority parts nitrogen and oxygen (which are both ideal gases) the number of molecules measured using nitrogen in the experiment should be approximately equal.

## Passage II – Algal Balls

**Question 8.** The best answer is G. As the neural density of the filter increased from 0.0 ND to 1.0 ND, the pH Value of of the indicator solution decreased. Because a 0.6 ND filter corresponded to a pH value of 8.35 and a 1.0 ND filter corresponded to a pH value of 8.00, it is most reasonable to assume that a 0.8 ND filter would correspond to a pH value between 8.00 and 8.35.

**Question 9.** The best answer is B. Because we are told that "...when  $CO_2$  is removed from the solution, it will darken from red through magenta to dark purple" we can conclude that the 0.15 ND filter allowed for a higher rate of photosynthesis due to its higher pH value in comparison to the 0.3 ND filter.

**Question 10.** The best answer is J. Because the researchers "...investigated how light intensity and specific wavelengths of light affected the rate of photosynthesis", the scientists who conducted the studies kept the room dark prior to the study so as not to let photosynthesis occur before the study began.

**Question 11.** The best answer is B. According to the table, as the amount of light that was transmitted into the container increased from 0% to 100%, the absorbance of the indicator increased from –0.15 to 0.34, and the pH value of the indicator solution increased from 8.00 to 9.00. Based on Table 1, as the pH value of the indicator solution increases, its color darkens.

**Question 12.** The best answer is H. The algal balls in the bottle with the 0.6 ND filter produced an indicator solution with a pH value of 8.35 which is closest to the blue acetate covered bottle in Study 2, which had a pH value of 8.4.

# SECTION 8 | ACT SCIENCE | SOLUTIONS

**Question 13.** The best answer is C. The compensation point is reached when the net  $CO_2$  production is 0 (that is, the  $CO_2$  produced by respiration is equal to the  $CO_2$  used by photosynthesis). According to the information in the introduction, the indicator solution lightens when  $CO_2$  is removed from the solution and darkens when  $CO_2$  is added. Therefore, when the net absorbance measured by the colorimeter is zero, no net  $CO_2$  has been added and the compensation point is reached. According to Figure 1, that is most nearly when the percentage of light transmitted into the bottle is 30.

### Passage III - Dolphin Pods

**Question 14.** The best answer is G. Student 1 states "In deep water, a large object can sometimes serve as a barrier" which could refer to the deep sitting hull of a cruise ship. Student 4 states "the corralling method has been observed in open water when large pods of dolphins use fishing nets (or other deep-sitting objects) as substitute barriers to the sandbank." Neither Student 2 nor Student 3 mentions that deep-sitting objects might influence feeding method.

**Question 15.** The best answer is D. Student 2 states "Bottlenose dolphins primarily prefer to hunt in large pods and in deep water." The information in the passages defines shallow water as having a depth less than 35 ft, so it is reasonable to assume a depth of 200 ft is characterized as deep. The information also states that dolphin pods comprised of nine or more individuals are considered large, so a pod of 16 dolphins qualifies.

**Question 16.** The best answer is H. Student 3 indicates that the main factor in determining feeding method is whether a pod contains nine or more dolphins, but Pod B didn't.

**Question 17.** The best answer is B. According to Student 2, "Bottlenose dolphins are more likely to use the herding method when the size of the pod is large and they are in deep water." This statement is most consistent with the prediction of a positive correlation between average depth of feeding area and pod size. Student 1 does not mention anything about pod size. Student 3 states that "Bottlenose dolphins always opt for the herding method if the pod size is large", and Student 4 states that "The hunting method chosen by Bottlenose dolphins is not impacted by either pod size or by the depth of water, but instead decided on by the pod at the time of feeding."

**Question 18.** The best answer is F. Student 1 states, "In shallow water, dolphins find great success by utilizing the proximity of sandy shores to trap their prey." Student 2 states, "This method results in highly successful hunting expeditions because the entire pod of dolphins works together to ensure that prey cannot escape until feeding is complete." Student 3 states, "Because a large pod of dolphins can effectively block off a substantial school of fish, a large pod will almost always have successful hunts with the herding method." And Student 4 states "Therefore, neither factor should have a strong impact on the hunting method chosen by the group or on the success of the hunting expedition." The study looks at feeding method, depth of feeding area, and pod size, but does not look at how successful the pods were over the course of the study.

**Question 19.** The best answer is A. The introduction states, "In areas with copious amounts of food, pods can merge temporarily, forming a superpod, which in certain cases may exceed 1,000 dolphins."

**Question 20.** The best answer is H. The study contradicts Student 1's statement that, "Bottlenose dolphins prefer to hunt using the corralling method regardless of depth and pod size because this method results in the most successful hunting expeditions." The study contradicts Student 3's statement that, "Because a large pod of dolphins can effectively block off a substantial school of fish, a large pod will almost always have successful hunts with the herding method.". The study contradicts Student 4's statement that "Therefore, neither factor should have a strong impact on the hunting method chosen by the group or on the success of the hunting expedition."

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# How Learning Hits Home

