PRINTABLE PRACTICE TEST · FORM A

Free ACT Practice Test

A full-length practice test in the enhanced ACT format, written by Prep36: four timed sections, an answer sheet, an answer key and a scoring table. Print it, set a timer and sit it in one go.

	SECTION	QUESTIONS	TIME	STARTS ON
1	English	50	35 minutes	page 3
2	Math	45	50 minutes	page 14
3	Reading	36	40 minutes	page 21
4	Science (optional)	40	40 minutes	page 34

English, Math and Reading: 131 questions in 2 hr 5 min. With Science: 171 questions in 2 hr 45 min.

Before you start

- Print it all, or at least the answer sheet (page 2) and the four sections.
- Bring a pencil, an eraser and a timer. A calculator is for the Math section only.
- Sit the sections in order and stop each one when its time runs out. Take a short break after Math.
- Answer every question. A wrong answer costs nothing, so guess before time runs out.
- Then check your answers on page 47 and score the test on page 48.

Take it online, timed

Rather use a screen? The same Form A runs in the Prep36 app with the clock built in, a score report at the end and a worked explanation for every question. Free, no account needed.

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VELA
One sitting, timed sections. Then score it at the back.

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Answer sheet

Name _____ **Date** _____

Fill in one bubble for each question, completely and darkly. To change an answer, erase the first mark completely. Number your answers by section: every section starts again at 1.

Section 1 · English

50 questions · 35 minutes

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

Section 2 · Math

45 questions · 50 minutes

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

Section 3 · Reading

36 questions · 40 minutes

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

Section 4 · Science (optional)

40 questions · 40 minutes

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

SECTION 1 OF 4

English

50 questions | 35 minutes

Directions. Each passage has numbered underlined portions. For each one, pick the choice that makes the underlined portion best. If the original is best, pick NO CHANGE. Some questions ask about a numbered sentence, a paragraph or the passage as a whole. Read each passage through before you answer. Mark each answer on the answer sheet.

PASSAGE I Relighting the Palmetto

[1] For sixty-one years, the Palmetto Theater anchored the corner of Grandview Avenue and Ninth Street, its neon marquee washing the sidewalk in rose-colored light. [2] Neighbors who had grown up with Saturday matinees still paused at the corner, describing the balcony and the velvet curtain to children who had never seen either. [3] When the theater closed in 1987, its lobby doors were chained shut, and the building sat behind plywood for two decades. [4] By 2009, the structure seemed destined for demolition. [5] Therefore, [3] a group of neighbors had other plans.

That spring, the group came to the decision to [4] restore the Palmetto and reopen it as a community cinema. The historical society announced that they [6] had secured a matching grant, and small donations soon arrived from former ushers, projectionists, and patrons. A collection of ticket stubs, playbills, and lobby cards were [2] donated by one family that had saved them since the 1950s; the items now hang, framed, in the lobby.

Restoration began with the interior. The plasterwork, which had crumbled in patches along the ceiling, required [5] the most delicate labor, so craftspeople cast new rosettes from molds of the surviving originals. Coated in decades of grime, volunteers scrubbed the terrazzo floor [8] until its gold and green pattern reappeared. Volunteers logged more than four thousand hours over three years. In the projection booth, the team made a quiet discovery: the projector, a carbon-arc model installed in 1948, still bore its original brass nameplate.

As word spread, the restoration assembled [9] national attention. Preservation groups toured the site, and a documentary crew filmed the final months of work. When the marquee was relit in the fall of 2015, hundreds of people filled the block to watch the neon flicker, steady itself, and glow. The Palmetto now screens classic films every weekend, and its calendar sells out weeks in advance, proof that a neighborhood landmark can earn a second life.

QUESTIONS 1 TO 10

1 The sentences in Paragraph 1 are numbered. Where should Sentence 2 be placed to make the paragraph most logical?

- **A** Where it is now
- **B** At the start of the paragraph, before Sentence 1
- **C** Between Sentences 3 and 4
- **D** At the end of the paragraph, after Sentence 5

2 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** have been
- **C** are
- **D** was

3 Which transition word or phrase best fits at the underlined portion?

- **A** NO CHANGE
- **B** In other words,
- **C** However,
- **D** Similarly,

4 Which choice is the most concise version of the underlined portion?

- **A** NO CHANGE
- **B** arrived at a decision in order to
- **C** made up its mind in favor of a plan to
- **D** decided to

5 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** The plasterwork which had crumbled in patches along the ceiling, required
- **C** The plasterwork, which had crumbled in patches along the ceiling required
- **D** The plasterwork, that had crumbled in patches along the ceiling, required

6 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** it
- **C** them
- **D** this one

7 The writer wants to add the following sentence:

Water damage had also warped the stage floor, so carpenters replaced each board with reclaimed maple.

The sentence would most logically be placed in:

- **A** Paragraph 1, before the final sentence.
- **B** Paragraph 2, after the sentence about the matching grant.
- **C** Paragraph 3, after the sentence about the terrazzo floor.
- **D** Paragraph 4, after the sentence about the documentary crew.

8 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** Coated in decades of grime, the terrazzo floor was scrubbed by volunteers
- **C** Volunteers, coated in decades of grime, scrubbed the terrazzo floor
- **D** Coated in decades of grime, the scrubbing of the terrazzo floor by volunteers continued

9 Which choice is the most precise word for the underlined portion?

- **A** NO CHANGE
- **B** collected
- **C** grabbed at
- **D** attracted

10 The writer is considering deleting the sentence in Paragraph 3 about the carbon-arc projector and its brass nameplate. Should the writer make this deletion?

- **A** Yes, because the sentence repeats information about the theater's opening date.
- **B** Yes, because the sentence interrupts the paragraph's discussion of fundraising.
- **C** No, because the sentence adds a specific detail supporting the paragraph's focus on what survived inside the theater and was restored.
- **D** No, because the sentence explains why the theater closed in 1987.

PASSAGE II Saturdays at the Bike Kitchen

On the first Saturday of last June, I wheeled a rusted ten-speed into the Fourth Street Bike Kitchen, a volunteer-run workshop where anyone, can learn [11] to repair a bicycle. I had expected to drop the bike off for a quick tune-up. Instead, a volunteer named Marisol handed me a wrench and pointed to an empty repair stand. "You do the work," she said. "We just talk you through it."

My first task was humbling. The chain, orange with rust, were jammed [12] between the smallest gear and the frame. In a span of about roughly twenty minutes [13], I pried it loose, cleaned each link, and threaded it back into place. Therefore, [14] the shifting still felt clumsy, so Marisol showed me the tiny screw on the derailleur that limits how far the chain can travel. One quarter turn, and the gears clicked into line.

In contrast, [15] I learned my way around the workshop's collection of donated tools: spoke wrenches, chain whips, and cone spanners worn smooth by other people's hands. Hunched over a rear wheel one afternoon, the brake cable finally slipped loose in my fingers [16], and I let out a cheer that startled everyone at the neighboring stands. Marisol never simply bestowed [17] the answers. She asked questions instead, nudging me toward the moment when a repair suddenly made sense.

[1] By August I could true a wobbly wheel, I could even repack [18] the bearings in a hub. [2] More importantly, I had stopped seeing my bicycle as a mysterious machine that only experts could touch. [3] These days I volunteer at the Bike Kitchen myself, handing wrenches to nervous newcomers. [4] When they ask me to just fix it for them, I point to the repair stand and repeat what Marisol told me on my first Saturday.

QUESTIONS 11 TO 20

11 Which choice best punctuates the underlined portion?

- **A** NO CHANGE
- **B** where, anyone can learn
- **C** where anyone can learn
- **D** where anyone can learn,

12 Which choice best completes the sentence?

- **A** NO CHANGE
- **B** are jammed
- **C** have been jammed
- **D** was jammed

13 Which choice expresses the idea most concisely?

- **A** NO CHANGE
- **B** In about twenty minutes
- **C** Within a duration of approximately twenty minutes or so
- **D** In roughly about twenty minutes

14 Which transition word or phrase provides the most logical connection to the preceding sentence?

- **A** NO CHANGE
- **B** As a result,
- **C** In other words,
- **D** Even so,

15 Which choice most logically links Paragraph 3 to the events described in Paragraph 2?

- **A** NO CHANGE
- **B** Over the following weeks,
- **C** For example,
- **D** Before that first Saturday,

16 Which choice best corrects the underlined portion?

- **A** NO CHANGE
- **B** I finally worked the brake cable loose
- **C** the brake cable's release finally happened in my fingers
- **D** my fingers finally worked the brake cable loose

17 Which choice best maintains the tone and meaning of the essay?

- **A** NO CHANGE
- **B** surrendered
- **C** supplied
- **D** propagated

18 Which choice best fixes the underlined portion?

- **A** NO CHANGE
- **B** wheel, however, I could even repack
- **C** wheel; I could even repack
- **D** wheel I could even repack

19 The writer is considering adding the following true statement after Sentence 2 of the final paragraph:

The Bike Kitchen also hosts an annual fundraising ride each October that draws hundreds of cyclists.

Should the writer make this addition?

- **A** Yes, because it demonstrates that the Bike Kitchen is well known throughout the community.
- **B** Yes, because it explains how the workshop is able to acquire its donated tools.
- **C** No, because it contradicts the essay's earlier claim that the workshop is run by volunteers.
- **D** No, because it interrupts the paragraph's focus on the narrator's growth from student to volunteer.

20 Suppose the writer's primary purpose had been to show how a community workshop helped the narrator gain skill and confidence. Would this essay accomplish that purpose?

- **A** Yes, because it traces the narrator's progress from a hesitant first repair to teaching newcomers at the workshop.
- **B** Yes, because it identifies every tool a beginner needs in order to maintain a bicycle at home.
- **C** No, because it focuses mainly on Marisol's history as a volunteer rather than on the narrator's experiences.
- **D** No, because the narrator never successfully completes a repair without Marisol's direct help.

PASSAGE III Eyes on the Storm

Long before a hurricane's outer bands brush the coast, forecasters have usually been tracking the storm for days. High above the Atlantic, a fleet of weather satellites orbits the planet, they capture [21] images of swirling clouds every few minutes. Geostationary satellites hover 22,236 miles above a fixed point on the equator, matching Earth's rotation so that each of their cameras stays locked on the same stretch of ocean. From that height, a single satellite can spot a tropical wave leaving the coast of Africa and follow it all the way across the Atlantic. [22]

Therefore, [23] a second group of satellites takes a closer look. Polar-orbiting satellites circle the planet from pole to pole at a much lower altitude, passing over each storm about twice a day. Their microwave sensors peer through the cloud tops to reveal the hidden structure concealed inside the storm's interior [24], including the eyewall, where the strongest winds form. When forecasters see that eyewall tightening into a compact ring, they know the hurricane may be about to intensify.

All of these measurements feed into computer models that simulate the atmosphere hours and days into the future. The National Hurricane Center, which issues official forecasts, relies [25] on dozens of model runs before drawing a single line on a map. When a model updates their [26] projected track, specialists compare the new guidance with radar, aircraft data, and earlier runs. Having weighed the evidence for hours, the forecast is finally released by the specialists. [27]

The payoff is measured in time. In the 1990s, a three-day track forecast might miss a landfall point by hundreds of miles; today's models spit out [29] tracks that are, on average, more than twice as accurate. Every extra hour of warning lets emergency managers open shelters, reroute traffic, and move supplies before the wind arrives. Satellites cannot stop a hurricane, but by turning scattered clouds into readable data, they give coastal communities their most valuable resource: a head start.

QUESTIONS 21 TO 30

21 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** orbits the planet; capturing
- **C** orbits the planet, capturing
- **D** orbits the planet, and capturing

22 Which choice best describes the role the underlined sentence plays in Paragraph 1?

- **A** It illustrates how much ocean a single geostationary satellite can watch from its fixed position.
- **B** It explains how geostationary satellites manage to stay above one point on the equator.
- **C** It introduces the polar-orbiting satellites that Paragraph 2 goes on to describe.
- **D** It shows that geostationary satellites capture storms in finer detail than any other satellites do.

23 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** Meanwhile,
- **C** As a result,
- **D** In other words,

24 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** to reveal the concealed structure hidden within the storm's inner interior
- **C** to reveal the structure hidden inside the storm
- **D** to reveal the structure that is hidden and concealed inside the storm

25 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** which issues official forecasts, relies
- **C** , which issues official forecasts relies
- **D** , which, issues official forecasts, relies

26 Which choice is the best version of the underlined portion?

- **A** NO CHANGE
- **B** it's
- **C** they're
- **D** its

27 Which choice is the best version of the underlined sentence?

- **A** NO CHANGE
- **B** Having weighed the evidence for hours, the specialists finally release the forecast.
- **C** Having weighed the evidence for hours, the release of the forecast finally happens.
- **D** The forecast, having weighed the evidence for hours, is finally released by the specialists.

28 At the end of Paragraph 3, the writer is considering adding the following sentence:

TIROS-1, launched in 1960, was the world's first weather satellite and weighed about 270 pounds.

Should the writer make this addition?

- **A** Yes, because it gives readers historical context for the computer models described in the paragraph.
- **B** Yes, because it emphasizes how much satellite technology has advanced since 1960.
- **C** No, because it introduces a loosely related historical detail that interrupts the paragraph's focus on how forecasters use model guidance.
- **D** No, because it repeats information about satellite weight given earlier in the passage.

29 Which choice best maintains the informative tone established in the essay?

- **A** NO CHANGE
- **B** cough up
- **C** crank out
- **D** generate

30 The writer wants to add the following sentence to the essay:

Each pass adds fresh detail that the distant geostationary fleet cannot capture on its own.

The sentence would most logically be placed:

- **A** after the first sentence of Paragraph 1.
- **B** after the second sentence of Paragraph 2.
- **C** after the first sentence of Paragraph 3.
- **D** after the last sentence of Paragraph 4.

PASSAGE IV The Hands That Laid the Rails

When the Central Pacific Railroad began carving its route eastward from Sacramento in 1863, the company faced a labor shortage so severe that construction nearly stalled. Charles Crocker, the executive in charge of construction, proposed hiring Chinese immigrants, many of whom had come to California during the Gold Rush. His construction superintendent objected at first, arguing that the workers slight builds made them [31] unsuited for heavy labor. Crocker prevailed, and by 1867 more than ten thousand Chinese workers, nearly ninety percent of the Central Pacific workforce, were [32] grading roadbeds, boring tunnels, and laying track through the Sierra Nevada.

Meanwhile, [33] the work these crews performed was among the most dangerous in nineteenth-century America. To cut ledges into sheer granite cliffs above the American River, workers were lowered in woven baskets, where they drilled holes, packed them with black powder, and lit fuses before being hauled up [34]. Winter brought new hazards: avalanches swept away entire camps, and some crews tunneled beneath forty-foot snowdrifts, they lived and worked [35] for weeks without seeing daylight. Historians estimate that hundreds of workers died, though the company kept no careful count.

The workers were not passive in the face of these conditions. In June 1867, roughly three thousand Chinese laborers put down their tools and walked off the job [36], demanding higher wages and shorter shifts in one of the largest labor actions the country had yet seen. The strike ended after a week when the company cut off food supplies to the remote camps, but it demonstrated [38] a collective resolve that contradicted the era's dismissive stereotypes.

On May 10, 1869, when the golden spike joined the Central Pacific to the Union Pacific at Promontory Summit, Utah, the famous photograph of the ceremony included almost none of the Chinese workers who had made the moment possible. For more than a century afterward, their contribution went largely unrecognized in textbooks and monuments alike. [39] Only in recent decades have historians, descendants, and public institutions worked [40] to restore these builders to the center of the story they built.

QUESTIONS 31 TO 40

31 Which choice best punctuates the underlined portion?

arguing that the workers slight builds made them

- **A** NO CHANGE
- **B** arguing that the workers' slight builds made them
- **C** arguing that the workers's slight builds made them
- **D** arguing that the workers slight build's made them

32 Which choice best punctuates the underlined portion?

nearly ninety percent of the Central Pacific workforce, were

- **A** NO CHANGE
- **B** nearly ninety percent of the Central Pacific workforce were
- **C** nearly ninety percent, of the Central Pacific workforce, were
- **D** nearly ninety percent of the Central Pacific workforce; were

33 Which transition word or phrase, if any, best fits at the underlined portion?

Meanwhile, the work these crews performed was among the most dangerous...

A NO CHANGE
B For example,
C DELETE the underlined portion and capitalize the following word.
D In contrast,

34 Which choice maintains parallel structure in the underlined portion?

workers were lowered in woven baskets, where they drilled holes, packed them with black powder, and lit fuses before being hauled up.

A NO CHANGE
B lighting fuses before being hauled up
C fuses were lit before they were hauled up
D to light fuses before being hauled up

35 Which choice best corrects the underlined portion?

some crews tunneled beneath forty-foot snowdrifts, they lived and worked for weeks without seeing daylight.

A NO CHANGE
B living and working
C they were living and working
D and lived, and worked,

36 Which choice most concisely expresses the idea in the underlined portion without losing meaning?

roughly three thousand Chinese laborers put down their tools and walked off the job, demanding higher wages and shorter shifts...

A NO CHANGE
B ceased and halted their ongoing labor activities
C stopped working and quit doing their jobs by walking away
D went on strike

37 The writer is considering adding the following sentence to the end of the third paragraph:

The Central Pacific's own payroll records, preserved in university archives, list many workers only by nicknames or numbers.

Should the writer make this addition?

A Yes, because it explains why the company cut off food supplies during the strike.
B Yes, because it provides evidence of how incompletely the workers were documented, reinforcing the passage's point about their erasure.
C No, because it contradicts the paragraph's claim that the workers showed collective resolve.
D No, because payroll practices are unrelated to the history of the railroad's construction.

38 Which choice best conveys that the strike offered clear, undeniable proof of the workers' resolve, while maintaining the passage's formal tone?

but it demonstrated a collective resolve that contradicted the era's dismissive stereotypes.

A NO CHANGE
B hinted at
C totally showed off
D implied

39 The writer wants to divide the final paragraph into two paragraphs so that the second one focuses on the workers' long period of being overlooked and the recent efforts at recognition. The best place to begin the new paragraph is at the sentence beginning:

A "On May 10, 1869, when the golden spike..."
B "For more than a century afterward..."
C "Only in recent decades..."
D The paragraph should not be divided, because it discusses a single event.

40 Which choice best completes the sentence?

Only in recent decades have historians, descendants, and public institutions worked to restore these builders to the center of the story they built.

A NO CHANGE
B has historians, descendants, and public institutions worked
C have historians, descendants, and public institutions, worked
D historians, descendants, and public institutions have worked

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PASSAGE V

The Wall Is Patient

On a scaffold six stories above Harmon Street, Marisol Vega dips a wide roller into a tray of cobalt paint. For a decade she has been turning the citys' [41] blank walls into landmarks, and the scale of her projects demands patience from everyone involved. A single mural can require three hundred gallons of paint, a lift rented by the month, and permits from four agencies, leaving owners, neighbors, and Vega herself waiting more than a year for a finished wall. [42] "A wall is patient," Vega likes to say. "It waits for you to figure it out."

Vega first began [43] her career as a sign painter, lettering storefront windows for bakeries and hardware stores. The job taught her how color behaves outdoors, where sunlight bleaches reds and rain streaks cheap primer. Therefore, [44] sign painting rarely let her tell a story taller than a doorway. When a community center offered her its rear wall in 2014, she covered it with a flock of herons lifting off a river, and she never went back to lettering.

Preparation consumes most of her schedule. Sketching from a folding chair on the sidewalk, passersby often stop to offer Vega their opinions. [45] She writes the best suggestions in a notebook and folds many of them into the final design. Her latest mural a tribute to the neighborhood's retired steelworkers, [46] includes a lunch pail that a ninety-year-old resident described to her from memory.

When the painting finally starts, Vega works ten-hour days, racing the weather. Finished sections look totally epic [47] against the gray concrete, their bands of cobalt, ochre, and rust catching the morning light. Paint rollers, first patented in the 1940s, made large flat surfaces faster to cover. Although a mural can take a year to plan. It [49] may be painted in only three weeks. On the morning Vega signs a finished wall, she says, the neighborhood owns it more than she does: strangers photograph it, kids reproduce it in chalk, and the wall begins its long, patient life as a landmark.

QUESTIONS 41 TO 50

41 Which of the following best replaces the underlined portion?

A NO CHANGE
B the cities
C the citys
D the city's

42 Which choice provides the strongest support for the writer's claim, in the preceding sentence, that the scale of Vega's projects demands patience from everyone involved?

- **A** NO CHANGE
- **B** A single mural can cover more surface than a basketball court, with figures so large that one painted hand stands taller than Vega does on the top rung of her ladder.
- **C** A single mural can draw a steady stream of visitors to a block, and nearby shop owners say that weekend business picks up within days of a wall being finished.
- **D** A single mural can call for a dozen shades each of cobalt, ochre, and rust, and Vega mixes every one of them by hand, sometimes for days, before she climbs the scaffold.

43 Which of the following best replaces the underlined portion?

- **A** NO CHANGE
- **B** began
- **C** first began initially
- **D** began for the first time

44 Which transition word or phrase best fits at the underlined portion?

- **A** NO CHANGE
- **B** For example,
- **C** Similarly,
- **D** However,

45 Which choice best corrects the underlined sentence?

- **A** NO CHANGE
- **B** While Vega sketches from a folding chair on the sidewalk, passersby often stop to offer her their opinions.
- **C** Sketching from a folding chair on the sidewalk, opinions are often offered to Vega by passersby.
- **D** Passersby often stop to offer their opinions, sketching from a folding chair on the sidewalk.

46 Which of the following best replaces the underlined portion?

- **A** NO CHANGE
- **B** , a tribute to the neighborhood's retired steelworkers
- **C** , a tribute to the neighborhood's retired steelworkers,
- **D** ; a tribute to the neighborhood's retired steelworkers,

47 Which choice best maintains the tone established in the essay?

- **A** NO CHANGE
- **B** striking
- **C** super cool
- **D** seriously mind-blowing

48 The writer is considering deleting the following sentence from the last paragraph: "Paint rollers, first patented in the 1940s, made large flat surfaces faster to cover." Should the sentence be kept or deleted?

- **A** Kept, because it explains why Vega is able to work ten-hour days.
- **B** Kept, because it provides historical background that deepens the essay's portrait of Vega.
- **C** Deleted, because it interrupts the profile with a detail about product history that is unrelated to Vega's work.
- **D** Deleted, because it contradicts the essay's earlier claim that murals require months of planning.

49 Which of the following best replaces the underlined portion?

- **A** NO CHANGE
- **B** plan; it
- **C** plan, and it
- **D** plan, it

50 Suppose the writer's primary purpose had been to profile an artist whose work draws on and gives back to her community. Would this essay accomplish that purpose?

A Yes, because it shows Vega folding neighbors' suggestions and memories into her designs and describes how residents come to treat each finished wall as their own.

B Yes, because it explains the technical steps required to prime and seal a concrete wall before painting begins.

C No, because it focuses mainly on the history of mural painting rather than on Vega herself.

D No, because it presents Vega's murals as private commissions rather than as public art.

End of Section 1. If you finish before time is called, check your work on this section only.

SECTION 2 OF 4

Math

45 questions **50 minutes**

Directions. Solve each problem and choose the correct answer. Do not get stuck on one problem: answer the ones you can, then come back. You may use a calculator on this section. Mark each answer on the answer sheet.

---

1 What is the value of $3 + 4 \times 2^2 - 5$?

A 24
B 23
C 14
D 6

2 Let i stand for the imaginary unit, so $i^2 = -1$. The expression $4 + 3i(2 - i)$ is equivalent to which of the following?

A $1 + 6i$
B $4 + 5i$
C $4 + 6i$
D $7 + 6i$

3 A jacket regularly priced at $80 is on sale for 15% off. How much money does a customer save by buying the jacket on sale?

A $1.20
B $12
C $15
D $68

4 If $3x - 7 = 14$, then $x = ?$

A $\frac{7}{3}$
B 7
C 21
D 63

5 What is the value of $\sqrt{81} + \sqrt{16}$?

A $\sqrt{97}$
B 13
C 36
D 97

6 On a map, 1.5 inches represents an actual distance of 60 miles. Two cities are 4 inches apart on the map. What is the actual distance between the two cities, in miles?

A 90
B 120
C 160
D 240

7 Which of the following expressions is equivalent to $(3x^2)^3$?

A $9x^5$
B $9x^6$
C $27x^5$
D $27x^6$

8 Which of the following is equivalent to $(4 \times 10^5)(2 \times 10^{-2})$?

A 6×10^3
B 8×10^{-10}
C 8×10^3
D 8×10^7

9 Which of the following describes all solutions of the inequality $-3x + 5 > 20$?

A $x < -5$
B $x > -5$
C $x < 5$
D $x > 5$

10 A commuter train travels at a constant speed of 66 feet per second. What is the train's speed in miles per hour? (Note: 1 mile = 5,280 feet)

A 45
B 60
C 66
D 96.8

11 Marcus recorded the number of pages he read on each of six days: 12, 18, 9, 15, 21, and 12. What is the median number of pages he read?

A 12
B 13.5
C 14.5
D 15

12 The price of a sweater is increased by 20%. One month later, the new price is decreased by 20%. The final price is what percent of the original price?

A 104%
B 100%
C 96%
D 90%

13 What is the sum of all values of x that satisfy the equation $|2x - 6| = 10$?

A -6
B 6
C 8
D 10

14 A jar contains red and blue marbles in the ratio 3:5. After 12 red marbles are added to the jar, the ratio of red marbles to blue marbles becomes 3:4. How many blue marbles are in the jar?

A 20
B 48
C 60
D 80

15 Kayla scored 82, 88, 90, and 94 on her first four quizzes. What is the minimum score she needs on her fifth quiz so that her average (arithmetic mean) score for all five quizzes is at least 90?

A 90
B 94
C 96
D 98

16 What is the slope of the line that passes through the points (2, 5) and (6, 17) in the standard (x, y) coordinate plane?

A $\frac{1}{3}$

B 3

C -3

D 12

17 If $f(x) = 3x^2 - 4x + 1$, what is the value of $f(-2)$?

A -3

B 5

C 17

D 21

18 If $x + y = 12$ and $x - y = 4$, what is the value of x?

A 4

B 6

C 8

D 16

19 In the standard (x, y) coordinate plane, what is the midpoint of the line segment with endpoints (-3, 7) and (5, -1)?

A (1, 3)

B (4, -4)

C (2, 6)

D (1, 4)

20 What are the solutions to the equation $x^2 - 5x - 24 = 0$?

A $x = 8$ and $x = -3$

B $x = -8$ and $x = 3$

C $x = 6$ and $x = -4$

D $x = 12$ and $x = -2$

21 A biology class begins an experiment with 500 bacteria in a dish. The population doubles every 3 hours. If the doubling pattern continues, how many bacteria will be in the dish after 12 hours?

A 2,000

B 4,000

C 8,000

D 16,000

22 At a school concession stand, 3 soft pretzels and 2 lemonades cost $14.50, and 2 soft pretzels and 4 lemonades cost $17.00. What is the price of 1 soft pretzel?

A $2.50

B $2.75

C $3.00

D $3.50

23 Given $f(x) = 2x + 1$ and $g(x) = x^2 - 3$, what is the value of $f(g(2))$?

A 1

B 3

C 5

D 22

24 In the standard (x, y) coordinate plane, what is the vertex of the parabola $y = x^2 - 6x + 11$?

A (3, 2)
B (-3, 38)
C (6, 11)
D (3, -2)

25 In the standard (x, y) coordinate plane, what is the distance, in coordinate units, between the points (-2, 4) and (4, -4)?

A 6
B 10
C 14
D $2\sqrt{17}$

26 In an arithmetic sequence, the 3rd term is 14 and the 8th term is 39. What is the 20th term of the sequence?

A 95
B 100
C 104
D 99

27 What is the solution to the equation $\log_2 x + \log_2(x - 6) = 4$?

A -2
B 4
C 8
D 11

28 The 2 × 2 matrices A and B are shown below.

A

$$\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$$

B

$$\begin{bmatrix} 1 & 0 \\ -2 & 5 \end{bmatrix}$$

What is the entry in row 2, column 1 of the matrix product AB?

A -8
B -5
C 3
D 11

29 A soccer ball is kicked from a platform. Its height above the ground, in feet, t seconds after the kick is modeled by $h(t) = -16t^2 + 64t + 80$. What is the maximum height, in feet, that the ball reaches?

A 80
B 128
C 144
D 208

30 Mia invests $2,000 in an account that triples in value every 8 years. According to this model, in how many years will the account be worth $54,000?

A 16
B 27
C 32
D 24

31 A bag contains 4 red marbles, 5 blue marbles, and 3 green marbles. If one marble is drawn at random, what is the probability that it is blue?

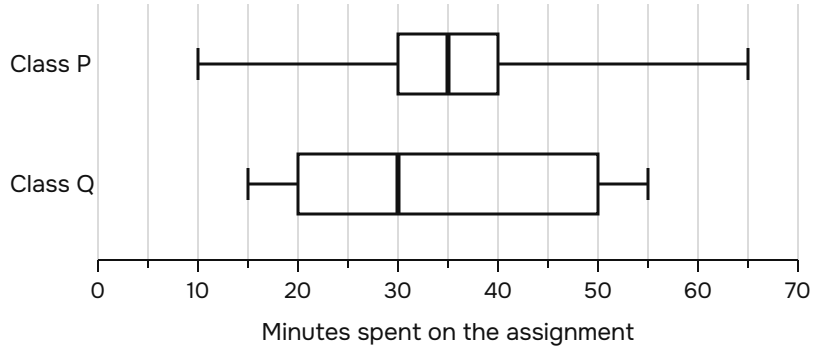
A $\frac{1}{3}$

B $\frac{5}{12}$

C $\frac{7}{12}$

D $\frac{5}{7}$

32 The box plots below summarize hypothetical data: the number of minutes each student in Class P and each student in Class Q spent on the same homework assignment.



Based on the box plots, the interquartile range of the times for Class Q is how many minutes greater than the interquartile range of the times for Class P?

A 5

B 15

C 20

D 30

33 A circular fountain has a circumference of 16π meters. What is the area, in square meters, of the fountain?

A 16π

B 32π

C 64π

D 256π

34 A 6-foot-tall park ranger casts a shadow 4 feet long. At the same time, a nearby tree casts a shadow 18 feet long. What is the height, in feet, of the tree?

A 12

B 20

C 24

D 27

35 A 20-foot ladder leans against a vertical wall, making an angle of 65° with the level ground. Which expression gives the height, in feet, that the ladder reaches up the wall?

A $20 \sin 65^\circ$

B $20 \cos 65^\circ$

C $20 \tan 65^\circ$

D $\frac{20}{\sin 65^\circ}$

36 Priya scored 82, 88, 90, and 79 on her first four science quizzes. What score does she need on her fifth quiz so that her mean score for all five quizzes is exactly 85?

A 84

B 85

C 86

D 90

37 A robotics club has 8 members. In how many different ways can the club choose a president, a vice president, and a treasurer, if no member can hold more than one office?

A 24

B 56

C 336

D 512

38 Each of the 4 data sets in the table below has a mean of 10.

Data set	Values
J	5, 8, 10, 10, 12, 15
K	6, 6, 6, 14, 14, 14
L	1, 10, 10, 10, 10, 19
M	2, 6, 10, 10, 14, 18

Which data set has the smallest standard deviation?

A Data set J

B Data set K

C Data set L

D Data set M

39 The function f is defined piecewise as follows.

$f(x) = 2x + 5$ for $x < 1$
$f(x) = x^2 - 3$ for $x \geq 1$

Consider every value of x for which $f(x) = 6$. What is the sum of those values?

A 0

B $\frac{1}{2}$

C 3

D $\frac{7}{2}$

40 For $f(x) = \frac{\sqrt{x + 5}}{x^2 - 9}$, which of the following describes the domain of f?

A All real numbers except -3 and 3

B All real numbers $x \geq -5$ except 3

C All real numbers $x > -5$ except -3 and 3

D All real numbers $x \geq -5$ except -3 and 3

41 Which of the following gives all real solutions of the equation $\frac{x}{x-3} + \frac{1}{x+1} = \frac{12}{x^2-2x-3}$?

A $x = -5$ only
B $x = -5$ and $x = 3$
C $x = -3$ and $x = 5$
D $x = 3$ only

42 In triangle ABC, the measure of angle A is 30°, the measure of angle B is 45°, and the side opposite angle A has length 10. What is the length of the side opposite angle B? (Note: $\sin 30° = \frac{1}{2}$ and $\sin 45° = \frac{\sqrt{2}}{2}$)

A $5\sqrt{2}$
B $10\sqrt{2}$
C 20
D $20\sqrt{2}$

43 If $\sin\theta = \frac{3}{5}$ and θ lies in Quadrant II, what is the value of $\cos\theta$?

A $-\frac{4}{5}$
B $-\frac{3}{5}$
C $\frac{16}{25}$
D $\frac{4}{5}$

44 A grain silo is shaped like a cylinder with a hemisphere on top. The cylinder has a radius of 6 feet and a height of 20 feet, and the hemisphere has the same radius. What is the total volume of the silo, in cubic feet?

A 720π
B 792π
C 864π
D 1008π

45 A committee of 3 people is to be selected from a group of 5 women and 4 men. How many different committees are possible that include at least 2 women?

A 40
B 50
C 70
D 84

End of Section 2. If you finish before time is called, check your work on this section only.

SECTION 3 OF 4

Reading

36 questions | 40 minutes

Directions. Read each passage, then answer the questions after it. Answer from what the passage says or implies. You may look back at the passage as often as you like. Mark each answer on the answer sheet.

PASSAGE I — What He Gave Back

The summer I turned sixteen, my mother delivered me to the dock at Cutler's Cove the way a person returns something borrowed. My grandfather stood beside the *Adelaide*, the fishing boat he had named for my grandmother, wiping his hands on a rag that had long ago given up being any particular color. He looked me over the way he looked at weather he did not trust. "You'll want boots," he said, and that was my whole welcome.

The arrangement was my mother's. She had grown up on that boat and left it at eighteen without, as far as I knew, ever looking back. Now she had a new job in the city, a lease that began in June, and a daughter she believed spent too much time indoors narrating her life to a phone. Pop needed a deckhand because his knees had started arguing with the ladder. Two problems, one boat.

Those first weeks we spoke maybe forty words a day, and half of them were *bait* and *haul*. I filled bait bags, iced the catch, and coiled line the way I imagined line should be coiled. Pop would come along behind me without a word, shake out my coils, and lay them down again in flat, patient circles. I decided he thought I was useless. I filled the silences by building a list of everything I would tell my mother in August, an inventory of grievances I kept as carefully as he kept his logbook.

The engine quit on a Tuesday in July, two miles off Spruce Point, with fog sliding in like a drawn curtain. Pop opened the hatch, folded himself down into the smell of diesel, and put out his hand. "Light," he said. I held the flashlight while he traced the fuel line, and for once the silence between us had a job to do. When the engine coughed back to life, he sat up and looked at me. "Your grandmother used to hold that light. Never once held it steady as that." It was fourteen words, and I ran on them for a week.

After that I began paying a different kind of attention. Praise, I learned, was not Pop's currency; he paid in small permissions. He let me set the course home. He stopped re-coiling my lines. When he handed me the gaff one morning without being asked, I understood the gesture the way other people understand applause. By August I could read his silences the way he read water, and most of them, it turned out, were not disapproval at all. They were simply the shape his attention took.

One evening, while we scrubbed down the deck, I asked why he never called my mother to report on me. He straightened and considered the question. "Your mother left because I told her what she was every day of her life," he said. "Figured I'd let you tell me what you are instead." Then he took the hose from me as though the conversation had been about hoses. That night I noticed I had stopped adding to my August list weeks earlier.

On my last morning, Pop stepped back from the wheel and nodded at it. The channel out of Cutler's Cove runs narrow between ledges, and he had never once let me steer it. I brought the *Adelaide* through with my heart in my ears while he stood beside me, hands in his pockets, saying nothing, which by then I understood was the point.

When my mother's car pulled up to the dock that afternoon, she hugged me and asked, twice, whether it had been terrible. I looked past her at Pop, coiling a line in flat, patient circles, and could not find one word of the list I had spent June writing. Whatever she had handed over at the start of the summer, it was not what he gave back.

QUESTIONS 1 TO 9

1 Which of the following statements best describes the passage as a whole?

- **A** A narrator explains how she persuaded her reluctant grandfather to modernize his fishing operation over the course of a summer.
- **B** A narrator recounts learning the technical skills of commercial fishing from a grandfather who instructed her patiently, step by step.
- **C** A narrator recalls a summer of work on her grandfather's boat during which she gradually revised her understanding of his silence and of their relationship.
- **D** A narrator describes a conflict with her mother that was resolved when her grandfather agreed to act as a go-between.

2 According to the passage, Pop needed help aboard the *Adelaide* because:

- **A** his catch had grown too large for one person to manage.
- **B** he planned to sell the boat at the end of the summer.
- **C** his logbook demanded more attention than the deck work allowed.
- **D** his knees made parts of the physical work difficult for him.

3 The narrator's remark that Pop's comment about the flashlight "was fourteen words, and I ran on them for a week" most strongly suggests that she:

- **A** was confused about what he had meant by comparing her to her grandmother.
- **B** valued his rare expression of approval more than she would have predicted.
- **C** resented being measured against a relative she had never met.
- **D** intended to repeat the compliment to her mother in August.

4 Pop's explanation in the sixth paragraph most strongly implies that he:

- **A** believes his constant criticism helped drive the narrator's mother away.
- **B** wishes the narrator's mother had stayed to take over the boat.
- **C** was asked by the narrator's mother to withhold praise from the narrator.
- **D** regrets having named the boat after the narrator's grandmother.

5 As it is used in the passage, the word *currency* most nearly means:

- **A** money earned from the sale of a catch.
- **B** customary means of exchange.
- **C** general acceptance among a group.
- **D** the state of being up to date.

6 The main function of the fourth paragraph, in which the engine fails, is to:

- **A** demonstrate that the narrator was more skilled at engine repair than Pop was.
- **B** explain why the narrator's mother had worried about the boat's safety.
- **C** present the moment when working together first begins to change the relationship between the narrator and Pop.
- **D** introduce the fog as a danger that the remainder of the passage resolves.

7 The point of view from which the passage is told is best described as that of:

- **A** a first-person narrator looking back on a summer during which her view of her grandfather changed.
- **B** a first-person narrator reporting events as they happen, without knowing how the summer will end.
- **C** a third-person narrator with access to the private thoughts of both the narrator and Pop.
- **D** a detached observer who reports the characters' actions but not their feelings.

8 Which of the following details from the passage most directly supports the narrator's claim that Pop "paid in small permissions"?

- **A** He told the narrator on the first day that she would want boots.
- **B** He stopped re-coiling the lines the narrator had coiled.
- **C** He folded himself into the hatch to trace the fuel line.
- **D** He kept his logbook as carefully as the narrator kept her list.

9 The passage's final sentence, "Whatever she had handed over at the start of the summer, it was not what he gave back," most strongly supports which of the following ideas developed in the passage?

- **A** The narrator's mother regretted sending her daughter away for the summer.
- **B** Pop came to see the narrator as a substitute for the grandmother he had lost.
- **C** The narrator decided to remain in Cutler's Cove and work as Pop's deckhand.
- **D** The summer changed the narrator in ways that go beyond the chores she learned to perform.

PASSAGE II

Redrawing the Bus Map

City buses rarely inspire the ribbon cuttings that greet a new rail line, yet in most American cities they carry the majority of transit riders. Over the past decade, dozens of transit agencies have concluded that the problem with the bus is not the vehicle but the map. Many bus networks are accretions of history, with routes that trace streetcar lines abandoned before World War II or that zigzag to serve a shopping center that closed years ago. Redrawing that map, planners have discovered, can change how a city moves without laying a single mile of track.

Every redesign confronts the same arithmetic. An agency has a fixed number of buses and drivers, and it must divide those resources between two competing goods. It can concentrate service on a few corridors, running buses so often that riders need not consult a schedule, or it can spread service thinly across the whole city so that nearly every resident lives near some kind of stop. Planners call the first strategy frequency and the second coverage, and the tension between them cannot be engineered away. A bus that is sent to a cul-de-sac on the edge of town is a bus that is not shortening waits downtown.

The case for frequency rests on how people actually experience transit. Riders do not measure a trip from boarding to alighting; they measure it from the moment they want to leave. A bus that arrives every ten minutes turns the network into something like an elevator, available whenever it is wanted. A bus that arrives every forty-five minutes is, for anyone with an alternative, hardly available at all. Frequent lines also reinforce one another: when two of them cross, a rider can transfer without a long wait, so a grid of frequent routes multiplies the destinations reachable in a reasonable time.

Coverage answers a different question, one about obligation rather than efficiency. A route through a low-density neighborhood may attract few riders per hour, but for those riders, many of them elderly, young, or too poor to own a car, it may be the only motorized transportation available. Coverage routes also have a political constituency. Every neighborhood pays taxes toward the transit system, and council members hear quickly from constituents whose stop disappears.

Ridership data has sharpened the debate. When one large Sunbelt city rebuilt its network around a grid of frequent routes in the mid-2010s, weekend ridership rose by nearly a third within a year, and weekday ridership grew even as bus ridership fell nationally. Cities that copied the approach saw similar, if smaller, gains. The data revealed a consistent pattern: service concentrated where many people live, work, and shop yields more riders per dollar than service dispersed to the fringes. Boardings per bus, an ordinary measure of productivity, often doubled on corridors upgraded to high frequency.

The same data, however, cautions against treating frequency as a formula. Frequent buses fill up only where the surrounding streets supply riders, which means density, walkable blocks, and destinations lined up along a corridor. Agencies that boosted frequency in sprawling districts with vast parking lots found they had merely scheduled more empty seats. Frequency, the numbers suggest, is a multiplier, not a cure; it amplifies the ridership potential that land use has already created.

Nor do the numbers settle the ethical question. A redesign that maximizes ridership will strand some existing riders, and no spreadsheet can say how many longer walks to a stop are justified by shorter waits for everyone else. The planners most respected in the field have stopped pretending otherwise. Their role, they argue, is not to choose between frequency and coverage but to make the tradeoff explicit, so that a community can decide, with its eyes open, what its buses are for. The final map is less a technical document than a statement of values.

QUESTIONS 10 TO 18

10 The main purpose of the passage is to:

- **A** argue that cities should eliminate low-ridership coverage routes and reinvest in frequent corridors.
- **B** explain the tradeoff transit planners face between frequency and coverage and examine what ridership data reveals about each strategy.
- **C** trace the history of American bus networks from the streetcar era to the present day.
- **D** criticize transit agencies for celebrating new rail lines while neglecting bus riders.

11 According to the passage, in the year after one large Sunbelt city rebuilt its bus network around a grid of frequent routes, weekend ridership:

- **A** fell, matching the national decline in bus ridership.
- **B** doubled on every corridor in the network.
- **C** rose by nearly a third.
- **D** stayed flat while weekday ridership grew.

12 The passage indicates that a grid of frequent routes multiplies the destinations a rider can reach because:

- **A** riders can transfer between crossing frequent lines without a long wait.
- **B** frequent routes travel at higher speeds than coverage routes.
- **C** a grid layout allows buses to bypass congested downtown streets.
- **D** frequent routes charge lower fares, encouraging riders to take more trips.

13 As it is used in the passage, the word *goods* (second paragraph) most nearly means:

- **A** products offered for sale.
- **B** desirable aims.
- **C** items shipped as freight.
- **D** personal belongings.

14 The primary function of the fourth paragraph (beginning "Coverage answers") is to:

- **A** refute the case for frequency by showing that its predictions have failed.
- **B** demonstrate that coverage routes generate more revenue than frequent routes do.
- **C** introduce the ridership statistics that are analyzed later in the passage.
- **D** identify the social and political considerations that sustain coverage service.

15 The author's attitude toward the planners described in the final paragraph as making the tradeoff explicit can best be described as:

- **A** admiring of their candor about the limits of technical analysis.
- **B** skeptical of their unwillingness to make difficult decisions themselves.
- **C** dismissive of their reliance on community opinion rather than expertise.
- **D** puzzled by their refusal to consult ridership data.

16 In the sixth paragraph, the author describes frequency as "a multiplier, not a cure" most likely to emphasize that:

- **A** frequent service reliably doubles ridership wherever it is introduced.
- **B** frequency lowers operating costs without changing how many people ride.
- **C** frequency increases ridership only where land use already supplies potential riders.
- **D** transit agencies should shift their investments away from frequent service.

17 Which of the following findings mentioned in the passage most directly supports the claim that service concentrated "where many people live, work, and shop yields more riders per dollar"?

- **A** Council members hear quickly from constituents whose stops disappear.
- **B** Many bus routes still trace streetcar lines abandoned before World War II.
- **C** Riders measure a trip from the moment they want to leave.
- **D** Boardings per bus often doubled on corridors upgraded to high frequency.

18 In the final paragraph, the author supports the claim that a redesigned bus map is "less a technical document than a statement of values" primarily by:

- **A** asserting that no calculation can determine how much harm to some riders is justified by benefits to everyone else.
- **B** citing survey data showing that most residents prefer coverage to frequency.
- **C** quoting council members who opposed the removal of stops in their districts.
- **D** contrasting the low cost of redrawing a bus map with the expense of building rail.

PASSAGE III The Weight of Words

The first thing a visitor notices in a letterpress studio is the weight. Cabinets of metal type stand shoulder high, each shallow drawer holding a single size of a single typeface, thousands of letters sorted into small compartments. The presses themselves, cast iron and often more than a century old, can outweigh a car. To set a line, a compositor stands at the case, plucking letters one by one and clicking them into a handheld composing stick, working upside down and backward. Nothing about the process is convenient. That, it turns out, is the attraction.

For roughly five centuries after Gutenberg, letterpress was not a style of printing; it was printing. Books, newspapers, handbills, and tickets all came off beds of inked metal pressed into paper. Then, within a single generation, the trade collapsed. Offset lithography captured commercial work in the mid-twentieth century, and digital typesetting finished the job. By the 1980s, printers were selling presses for scrap and melting down type by the ton. Trade schools shuttered their programs, and the knowledge of how to run the machines began to die with the people who held it.

What followed was an unlikely resurrection. Beginning in the late 1990s and accelerating ever since, young designers began hauling presses out of barns and basements and teaching themselves a trade the industry had abandoned. Community print shops opened in converted warehouses. University book-arts programs developed waiting lists. A market emerged for letterpress wedding invitations, posters, and greeting cards, work whose deeply pressed letters can be read with the fingertips as well as the eyes.

The revival's most striking feature is who led it: not, for the most part, retired printers pining for the old trade, but graphic designers raised on screens, people who could summon ten thousand fonts with a click. On a laptop, every choice is provisional: any typeface, any size, infinite undo. At the type case, a designer has only the faces the shop owns and only the sizes in the drawer. Run out of lowercase e's halfway through a paragraph, and you do not download more; you rewrite the line. Designers who work this way describe the constraint not as a limitation but as a relief. When you cannot do everything, each decision starts to matter.

The medium also registers every decision. Roll on too much ink and the bowls of the letters fill in; apply too much pressure and the paper buckles. Even the depth of the print is contested territory. Traditional printers aimed for what they called a *kiss impression*, ink transferred with barely a dent in the page, since crushing the type wore it out. Today's letterpress customers generally want the opposite: a deep bite they can feel. Veteran printers wince at the practice, but the bite is precisely the point for a generation whose work otherwise lives behind glass, untouchable.

Skeptics see all this as fashionable nostalgia, an artisanal affectation of a piece with vinyl records and hand-ground coffee. They also note an irony: most letterpress jobs today begin as digital files, which are output to photopolymer plates rather than set from metal type at all. There is some truth in the charge, and an honest account of the revival has to admit it.

But the deeper draw, I think, is pedagogical. Setting type by hand slows a designer down enough to see letterforms as objects: the counter of an o, the shoulder of an n, the sliver of metal that holds two words apart. On screen, spacing is a keystroke; at the case, it is a physical thing you hold, and choosing a slightly wider one changes the line in a way you feel before you can explain. Students who spend a semester at the press routinely report returning to their screens with changed eyes, noticing crowded margins and clumsy spacing that had been invisible before.

The press will not replace the laptop, and no serious printer argues that it should. What the revival offers is not an escape from digital work but ballast for it. The hand, patiently sorting cold metal into words, teaches a kind of attention that the eye alone, skimming a glowing screen, never quite learns.

QUESTIONS 19 TO 27

19 The main purpose of the passage is to:

- **A** explain why letterpress printing declined after the rise of offset lithography.
- **B** explore why a printing technology abandoned by industry has been revived by designers who value its physical constraints.
- **C** argue that letterpress printing produces higher-quality results than digital design tools.
- **D** provide a complete history of printing technology from Gutenberg to the present.

20 According to the passage, by the 1980s many printers were:

- **A** opening community print shops in converted warehouses.
- **B** selling presses for scrap and melting down type.
- **C** converting their presses to print from photopolymer plates.
- **D** training young designers to operate their machines.

21 It can most reasonably be inferred from the passage that veteran printers wince at deep impressions because they:

- **A** were trained to avoid denting the page, since heavy pressure wore out the type.
- **B** believe digital files should never be used to create printing plates.
- **C** consider wedding invitations and greeting cards unworthy of the craft.
- **D** doubt that customers can actually feel the difference in the paper.

22 According to the passage, a designer at a type case who runs out of a particular letter partway through a paragraph would most likely:

- **A** download the missing characters from a digital archive.
- **B** borrow matching type from a nearby print shop.
- **C** rewrite the line to avoid needing the missing letter.
- **D** finish the job using a photopolymer plate instead.

23 As it is used in the passage, the word *registers* most nearly means:

- **A** enrolls
- **B** records
- **C** notices
- **D** certifies

24 The author mentions vinyl records and hand-ground coffee primarily to:

- **A** offer additional examples of crafts the author believes deserve revival.
- **B** show that letterpress printing is less expensive than other artisanal pursuits.
- **C** argue that outdated technologies inevitably regain popularity over time.
- **D** illustrate how skeptics characterize the letterpress revival as a fashionable trend.

25 The author's attitude toward the letterpress revival can best be described as:

- **A** unqualified enthusiasm for a movement that will transform commercial printing.
- **B** sympathetic appreciation that nonetheless concedes some merit to the skeptics' criticisms.
- **C** detached neutrality that avoids taking a position on the revival's value.
- **D** gentle mockery of designers who romanticize an obsolete trade.

26 In responding to skeptics of the revival, the author acknowledges that:

- **A** letterpress wears out metal type faster than offset lithography does.
- **B** university book-arts programs have struggled to attract serious students.
- **C** most letterpress jobs today begin as digital files output to photopolymer plates.
- **D** deep impressions make letterpress text noticeably harder to read.

27 The author supports the claim that the revival's deeper draw is pedagogical primarily by:

A citing enrollment statistics from university book-arts programs.

B quoting veteran printers who praise the discipline of setting type by hand.

C comparing the cost of letterpress training with the cost of design software.

D describing how handling physical type changes what designers perceive, both at the press and later on screen.

PASSAGE IV

Listening for Giants

Long before satellites could track a tagged animal across an ocean basin, whales had a communication problem of their own solved: how to stay in contact across enormous distances. Baleen whales, including the blue and the fin, produce low-frequency calls that travel for hundreds of miles through seawater. For decades those calls were an untapped resource for scientists. The animals were, in effect, broadcasting their own locations, but no one was set up to listen at the right scale.

That changed with the spread of hydrophones, underwater microphones that convert pressure waves in water into electrical signals. A single hydrophone anchored to the seafloor can register a whale's call, but it cannot tell a researcher where the call came from. To locate an animal, teams deploy several hydrophones in a grid across a region and record the exact moment a call reaches each one. Because sound travels through cold, deep water at a nearly constant speed, the tiny differences in arrival time reveal how far the whale was from each sensor. Where those distance estimates intersect, the whale is presumed to be. The method, called acoustic triangulation, can pin a swimming animal to within a few hundred meters without a boat ever leaving port.

The payoff has been a map of migration drawn not from a handful of sightings but from a continuous stream of sound. Fin whales that were once thought to scatter randomly in winter turn out to follow predictable corridors, returning to the same feeding grounds year after year. Researchers can now count the calls passing a fixed line of sensors and estimate how many animals move through a strait in a season, a figure that visual surveys, limited to daylight and calm weather, could never approach. Some listening stations have run for more than a decade, long enough to show that certain populations are shifting their routes as the water warms.

Yet the same recordings that reveal the whales also capture something the animals never made. When scientists first reviewed years of continuous audio, they were struck less by the whale calls than by the din surrounding them. The deep ocean, it turns out, is not the silent world of popular imagination. It hums with the drone of distant cargo ships, the sharp reports of seismic air guns used in oil exploration, and the grind of coastal construction. This human-made contribution, known as anthropogenic noise, has risen steadily as global shipping has expanded.

The concern is not merely that the ocean has grown louder but that the noise overlaps the exact frequencies whales use. A blue whale's call and a container ship's engine occupy much of the same low-frequency band. When the background rises, a whale's effective communication range shrinks, a phenomenon researchers call masking. A call that once reached a potential mate a hundred miles away may now fade into the noise within twenty. The whale is not deafened; it is simply harder to hear, and harder to be heard.

Documenting masking has given the acoustic data a second life. The same sensor arrays built to track migration now serve as long-term monitors of ocean noise, and the two records can be read together. In one study, researchers noticed that whales fell silent for hours after a nearby ship passed, then resumed calling once it moved off. Whether that silence reflects stress, a deliberate pause, or a failed attempt to be heard remains debated. What is not debated is that the animals respond.

These findings have begun to reach policy. Because shipping noise is generated by a relatively small number of loud vessels, modest changes can have outsized effects. Slowing ships in sensitive corridors lowers the noise they radiate, and quieter propeller designs promise further reductions. Acoustic monitoring offers a way to test whether such measures work, since a drop in background noise should be audible in the record almost immediately. The whales, having broadcast their locations for millennia, may finally be heard clearly again, this time because people chose to listen.

Table 1 shows results from a hypothetical study, invented for illustration and not based on real measurements. In it, one researcher sorted a year of recordings from a single listening station into four kinds of hours: hours with no ship within 30 miles, and hours when one cargo ship passed within 5 miles at 10, 14, or 18 knots (nautical miles per hour).

Table 1

Kind of hour	Background noise (decibels)*	Detection range (miles)**	Whale calls recorded per hour
No ship within 30 miles	86	90	18
Ship passing at 10 knots	92	45	14
Ship passing at 14 knots	96	28	9
Ship passing at 18 knots	100	18	5

*Average noise in the low-frequency band that blue whales use for their calls.
**Estimated greatest distance from the station at which a typical blue whale call could still be picked out of the noise.

QUESTIONS 28 TO 36

28 The main idea of the passage is that acoustic monitoring:

A has replaced satellite tagging as the only reliable method for studying marine animals.

B both reveals patterns in whale migration and exposes the growing problem of human-made ocean noise.

C proves that the deep ocean is far quieter than most researchers had assumed.

D was developed primarily to measure the speed of sound through cold seawater.

29 The passage describes how researchers locate a calling whale through acoustic triangulation. Which choice lists the steps of that method in the correct order?

A Record when a call reaches each sensor in a grid, turn the differences in arrival time into distances, and then find where those distances intersect.

B Find where the sensors' readings intersect, record when a call reaches each sensor, and then turn those arrival times into distances.

C Measure how loud a call is at each sensor in a grid, turn the differences in loudness into distances, and then find where those distances intersect.

D Record when a call reaches a single anchored sensor, turn that arrival time into a distance, and then send a boat to confirm the location.

30 As it is used in the fifth paragraph, the word *masking* most nearly means:

- **A** the physical injury of a whale's hearing by loud sound.
- **B** the disguising of a ship's engine to imitate a whale call.
- **C** the process by which background noise reduces the distance over which a call can be heard.
- **D** the deliberate silencing of whales by researchers during an experiment.

31 The passage most strongly suggests that visual surveys of whale populations are limited because they:

- **A** cannot distinguish one whale species from another.
- **B** depend on conditions such as daylight and calm weather that acoustic sensors do not require.
- **C** are more expensive to conduct than deploying grids of hydrophones.
- **D** tend to overestimate the number of animals passing through a strait.

32 According to Table 1, compared with hours when a ship passed at 18 knots, hours when a ship passed at 10 knots had:

- **A** higher background noise and a shorter detection range.
- **B** higher background noise and a longer detection range.
- **C** lower background noise and a shorter detection range.
- **D** lower background noise and a longer detection range.

33 In the fourth paragraph, the author contrasts the recordings' contents with "the silent world of popular imagination" mainly to:

- **A** argue that earlier scientists had deliberately concealed how noisy the ocean was.
- **B** emphasize how surprising the abundance of human-made noise was to researchers.
- **C** suggest that whale calls are quieter than most people assume.
- **D** explain why hydrophones must be anchored to the seafloor.

34 A reader examines Table 1 and concludes that whales called less often during hours when a ship passed at 18 knots than during hours with no ship within 30 miles. Based on the passage and Table 1, which of the following is the best reason to be cautious about that conclusion?

- **A** Background noise was lower during hours when a ship passed at 18 knots than during hours with no ship nearby.
- **B** The study included three kinds of hours with a ship present but only one kind of hour without a ship.
- **C** The passage indicates that a single hydrophone cannot register a whale's call, so the station's counts are unreliable.
- **D** The detection range was also far shorter in those hours, so the station may have missed calls that whales made.

35 The author's discussion of whales falling silent after a ship passes primarily serves to:

- **A** prove conclusively that ship noise causes whales lasting physical harm.
- **B** show that whales measurably respond to noise even though the reason is still uncertain.
- **C** demonstrate that whales prefer to migrate at night to avoid vessels.
- **D** cast doubt on whether acoustic monitoring can detect changes in behavior.

36 Which statement, if true, would most strengthen the author's claim that acoustic monitoring can help test whether noise-reduction measures work?

- **A** A new species of deep-sea fish was discovered using seafloor hydrophones.
- **B** After a shipping lane imposed a speed limit, sensor arrays recorded a clear drop in background noise within weeks.
- **C** Satellite tags showed that some fin whales travel farther in winter than previously believed.
- **D** Container ships have continued to grow larger and more numerous over the past decade.

End of Section 3. If you finish before time is called, check your work on this section only.

SECTION 4 OF 4 · OPTIONAL

Science

40 questions | 40 minutes

Directions. Each passage gives data, experiments or viewpoints, followed by questions. Read the passage, then answer the questions. You may look back at the passage as often as you like. You may not use a calculator on this section. Mark each answer on the answer sheet.

PASSAGE I Solubility of Three Salts in Water

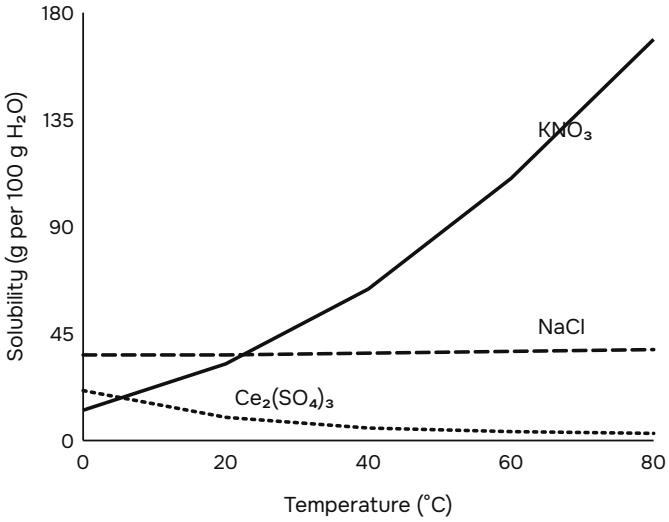
The *solubility* of a salt is the maximum mass of that salt that can dissolve in a given mass of water at a given temperature. A solution holding this maximum mass of dissolved salt is *saturated*. If a saturated solution is brought to a temperature at which the solubility is lower, the excess salt crystallizes, that is, it comes out of solution as a solid.

Students measured the solubility of 3 salts, potassium nitrate (KNO_3), sodium chloride (NaCl), and cerium(III) sulfate [$Ce_2(SO_4)_3$], in water at 5 temperatures. In each trial, one salt was added to 100 g of water held at a constant temperature, and the mixture was stirred until no more of the salt would dissolve. The mass of dissolved salt was then determined. The results are shown in Table 1 and plotted in Figure 1.

Table 1

Temperature (°C)	Solubility (g of salt per 100 g of H_2O)		
	KNO_3	NaCl	$Ce_2(SO_4)_3$
0	13.0	35.7	21.4
20	32.0	36.0	9.9
40	64.0	36.6	5.6
60	110.0	37.3	3.9
80	169.0	38.4	3.2

Figure 1



QUESTIONS 1 TO 6

1 According to Table 1, the solubility of KNO_3 in water at 40°C is:

- **A** 5.6 g per 100 g of H_2O.
- **B** 36.6 g per 100 g of H_2O.
- **C** 64.0 g per 100 g of H_2O.
- **D** 110.0 g per 100 g of H_2O.

2 Two students proposed models for how the temperature of water affects the solubility of a salt in that water.

Student 1: As the temperature increases, the solubility of every salt increases.

Student 2: As the temperature increases, the solubility of a salt may increase, decrease, or change very little, depending on the salt.

Which student's model is consistent with the data in Table 1?

- **A** Student 1's model, because the solubility of KNO_3 increased by more than 150 g per 100 g of H_2O from 0°C to 80°C
- **B** Student 1's model, because each of the 3 salts was more soluble at 80°C than at 0°C
- **C** Student 2's model, because the solubility of NaCl was exactly the same at every temperature tested
- **D** Student 2's model, because the solubility of $Ce_2(SO_4)_3$ decreased as temperature increased while the solubility of KNO_3 increased

3 Based on Table 1, the solubility of KNO_3 in water at 50°C would most likely be closest to which of the following?

- **A** 58 g per 100 g of H_2O
- **B** 72 g per 100 g of H_2O
- **C** 87 g per 100 g of H_2O
- **D** 116 g per 100 g of H_2O

4 According to Figure 1, the solubility curves for KNO_3 and NaCl intersect at a temperature:

- **A** between 0°C and 20°C.
- **B** between 20°C and 40°C.
- **C** between 40°C and 60°C.
- **D** The curves do not intersect between 0°C and 80°C.

5 A student completely dissolved 50.0 g of KNO_3 in 100 g of water at 60°C and then cooled the solution to 20°C. Based on Table 1, approximately what mass of KNO_3 most likely crystallized out of the solution?

- **A** 0 g
- **B** 18.0 g
- **C** 32.0 g
- **D** 50.0 g

6 A mixture containing 30.0 g of KNO_3 and 30.0 g of NaCl was completely dissolved in 100 g of water at 80°C. Based on Table 1, if the solution were then cooled to 0°C, which of the following would most likely result?

- **A** About 17 g of KNO_3 would crystallize, and all of the NaCl would remain dissolved.
- **B** About 17 g of NaCl would crystallize, and all of the KNO_3 would remain dissolved.
- **C** All of both salts would remain dissolved.
- **D** About 13 g of KNO_3 and about 5.7 g of NaCl would crystallize.

PASSAGE II Water Quality Along Bell Creek

Dissolved oxygen (DO) is the amount of oxygen gas dissolved in water, measured in milligrams per liter (mg/L). Turbidity is a measure of how cloudy water is because of suspended particles, measured in nephelometric turbidity units (NTU). Students monitored water quality in Bell Creek at 4 sites. Site 1 was farthest upstream; Sites 2, 3, and 4 were located 5 km, 10 km, and 15 km downstream of Site 1, respectively.

Study 1

At noon on June 15, the students measured the water temperature and the DO of the creek at each of the 4 sites (see Table 1).

Site	Distance downstream of Site 1 (km)	Water temperature (°C)	DO (mg/L)
1	0	14.0	9.8
2	5	16.5	8.6
3	10	19.0	7.2
4	15	21.5	6.0

Table 1

Study 2

At the same time that each Study 1 measurement was made, the students also measured the pH and the turbidity of the creek water at each site (see Table 2).

Site	pH	Turbidity (NTU)
1	7.9	4
2	7.4	18
3	7.0	35
4	6.7	52

Table 2

Study 3

Also on June 15, the students measured the DO at Site 4 at 4 different times of day (see Table 3).

Time of day	DO at Site 4 (mg/L)
6 a.m.	4.8
10 a.m.	5.5
2 p.m.	6.4
6 p.m.	5.9

Table 3

QUESTIONS 7 TO 12

7 According to Table 1, as the distance downstream of Site 1 increased from Site 1 to Site 4, the water temperature and the DO, respectively:

- **A** increased; increased
- **B** increased; decreased
- **C** decreased; increased
- **D** decreased; decreased

8 In Study 1, which of the following was the same for all 4 sites?

- **A** The distance downstream of Site 1
- **B** The water temperature
- **C** The DO
- **D** The time of day at which the measurements were made

9 Based on Table 1, if the students had measured the DO at noon at a site located 7.5 km downstream of Site 1, the DO would most likely have been:

- **A** less than 6.0 mg/L.
- **B** between 6.0 mg/L and 7.2 mg/L.
- **C** between 7.2 mg/L and 8.6 mg/L.
- **D** greater than 8.6 mg/L.

10 A student claimed that in Bell Creek on June 15, sites with higher turbidity tended to have lower DO. Do the results of Studies 1 and 2 support this claim?

- **A** Yes; from Site 1 to Site 4, turbidity increased and DO decreased.
- **B** Yes; from Site 1 to Site 4, both turbidity and DO increased.
- **C** No; from Site 1 to Site 4, turbidity increased and DO decreased.
- **D** No; from Site 1 to Site 4, both turbidity and DO decreased.

11 A student proposed that the changes in DO at Site 4 in Study 3 resulted from 2 processes: algae release oxygen into the water by photosynthesis, which occurs only while light is available, and organisms in the creek use up oxygen by respiration at all times. Which of the following results, if observed, would most weaken this explanation?

- **A** On a cloudy day, the DO at Site 4 rose less between 6 a.m. and 2 p.m. than it did on June 15.
- **B** The DO at Site 4 at 4 a.m. was lower than the DO at Site 4 at 10 p.m. the night before.
- **C** Site 4 creek water sealed in clear bottles, filled so that no air was inside, gained DO while the bottles sat in sunlight.
- **D** Site 4 creek water sealed in bottles, filled so that no air was inside, gained DO while the bottles sat in complete darkness.

12 The Study 1 measurements were made at noon. Is the DO value for Site 4 in Table 1 consistent with the results of Study 3?

- **A** Yes; 6.0 mg/L is between the DO values measured at Site 4 at 10 a.m. and at 2 p.m.
- **B** Yes; 6.0 mg/L is greater than every DO value listed in Table 3.
- **C** No; 6.0 mg/L is less than every DO value listed in Table 3.
- **D** No; according to Table 3, the DO at Site 4 stayed constant throughout the day.

PASSAGE III Acceleration of a Cart on a Ramp

Students investigated factors that affect the acceleration of a cart rolling down a straight ramp. In each trial, a low-friction cart was placed at the top of a 1.2 m aluminum track and released from rest. A motion sensor mounted at the top of the track recorded the cart's acceleration, in m/s^2, and the time, in seconds, the cart took to travel the full 1.2 m. The incline angle of the ramp could be adjusted, and metal blocks could be clamped to the cart to change its total mass.

Experiment 1

The students kept the total cart mass at 0.50 kg and varied the incline angle of the ramp. Five trials were performed, one at each of five angles from 5° to 25°. The results are shown in Table 1.

Trial	Incline angle (°)	Acceleration (m/s^2)	Time to travel 1.2 m (s)
1	5	0.71	1.84
2	10	1.55	1.24
3	15	2.37	1.01
4	20	3.17	0.87
5	25	3.94	0.78

Experiment 2

The students set the incline angle at 15° and varied the total cart mass from 0.50 kg to 1.50 kg by adding metal blocks to the same cart. All other conditions were identical to those in Experiment 1. The results are shown in Table 2.

Trial	Total cart mass (kg)	Acceleration (m/s^2)	Time to travel 1.2 m (s)
6	0.50	2.37	1.01
7	0.75	2.39	1.00
8	1.00	2.38	1.00
9	1.25	2.40	1.00
10	1.50	2.38	1.00

QUESTIONS 13 TO 19

13 According to the results of Experiment 1, as the incline angle increased from 5° to 25°, the acceleration of the cart:

- **A** increased only.
- **B** decreased only.
- **C** increased, then decreased.
- **D** remained the same.

14 Based on Table 1, when the incline angle was 10°, the acceleration of the cart was:

- **A** 0.71 m/s^2.
- **B** 1.55 m/s^2.
- **C** 2.37 m/s^2.
- **D** 3.17 m/s^2.

15 Suppose Experiment 1 had included a trial with the incline angle set at 12.5°. The acceleration of the cart in that trial would most likely have been:

A less than 1.55 m/s^2.
B between 1.55 m/s^2 and 2.37 m/s^2.
C between 2.37 m/s^2 and 3.17 m/s^2.
D greater than 3.17 m/s^2.

16 Which of the following factors was varied in Experiment 2 but held constant in Experiment 1?

A The incline angle of the ramp
B The distance the cart traveled along the track
C The total mass of the cart
D The initial speed of the cart

17 Which of the following statements about the acceleration of the cart is best supported by the results of Experiment 2?

A It increased in direct proportion to the total cart mass.
B It decreased by about half each time the total cart mass increased.
C It remained approximately the same regardless of the total cart mass.
D It varied by more than 1 m/s^2 between successive trials.

18 Suppose the students repeated Experiment 1 with the incline angle set at 30°. Based on the trend in Table 1, the acceleration of the cart would most likely have been closest to:

A 2.4 m/s^2.
B 3.2 m/s^2.
C 3.9 m/s^2.
D 4.7 m/s^2.

19 A cart with a total mass of 1.00 kg is released from rest on the same track with the incline angle set at 20°. Based on the results of both experiments, the time for this cart to travel 1.2 m would most likely be closest to:

A 0.78 s.
B 0.87 s.
C 1.00 s.
D 1.24 s.

PASSAGE IV Light Wavelength and Photosynthesis in Elodea

Elodea is an aquatic plant that releases oxygen gas as a byproduct of photosynthesis. When a sprig of elodea is submerged and illuminated, gas bubbles rise from the cut end of the stem. The number of bubbles produced per minute can be used as a measure of the rate of photosynthesis. Students performed three experiments using identical 6 cm elodea sprigs placed in beakers of pond water. Unless noted, each trial used a water temperature of 25°C and a lamp placed 20 cm from the sprig.

Experiment 1

Colored filters were placed between a white lamp and the beaker so that only one range of wavelengths reached the elodea. A trial using no filter (white light, the full spectrum) was included for comparison. The lamp brightness, distance (20 cm), and water temperature (25°C) were kept the same in every trial. Bubbles were counted for 3 minutes and the average number per minute was recorded (Table 1).

Light color	Wavelength (nm)	Bubbles per min
Violet	410	20
Blue	460	33
Green	530	8
Yellow	580	14
Red	660	30
White (full spectrum)	all	40

Experiment 2

Using white light at 25°C, the students changed the distance between the lamp and the elodea. All other conditions matched Experiment 1. Bubbles per minute were recorded at each distance (Table 2).

Distance from lamp (cm)	Bubbles per min
10	52
20	40
30	27
40	17
50	10

Experiment 3

Using white light with the lamp fixed at 20 cm, the students varied the temperature of the pond water. All other conditions matched Experiment 1. Bubbles per minute were recorded at each temperature (Table 3).

Water temperature (°C)	Bubbles per min
15	24
20	32
25	40
30	45
35	33
40	15

QUESTIONS 20 TO 26

20 According to Table 1 (Experiment 1), which color of light resulted in the lowest number of bubbles per minute?

- **A** Violet
- **B** Green
- **C** Yellow
- **D** Red

21 Which of the following was the same in every trial of all three experiments?

- **A** The color of the light reaching the elodea
- **B** How far the lamp was placed from the sprig
- **C** The temperature of the pond water
- **D** The length of the elodea sprig

22 Based on Experiment 2, if the lamp had been placed 25 cm from the elodea, the number of bubbles per minute would most likely have been closest to:

- **A** 15
- **B** 27
- **C** 34
- **D** 48

23 Which statement best describes how the number of bubbles per minute changed in Experiment 3 as water temperature rose from 15°C to 40°C?

- **A** It decreased continuously.
- **B** It increased continuously.
- **C** It increased to a maximum near 30°C and then decreased.
- **D** It remained about constant.

24 Why did the students include a white light (full spectrum) trial in Experiment 1?

- **A** To serve as a comparison showing the rate under the full spectrum of light
- **B** Because white light contains only a single wavelength
- **C** To test the effect of water temperature on the elodea
- **D** To guarantee that fewer bubbles would form in the colored trials

25 A student pointed out that in Experiment 2, the lamp may have warmed the pond water more when it was placed closer to the beaker. Which of the following changes to Experiment 2 would best ensure that differences in bubbles per minute were caused only by the distance from the lamp?

- **A** Keeping each beaker in a water bath held at 25°C throughout every trial
- **B** Placing a red filter between the lamp and the beaker in every trial
- **C** Measuring the water temperature only at the start of each trial
- **D** Counting bubbles for 6 minutes instead of 3 minutes in each trial

26 Chlorophyll, the main pigment in elodea, absorbs blue and red light strongly but reflects most green light. Which result from Experiment 1 is best explained by this fact?

- **A** White light produced more bubbles than any single color of light.
- **B** Green light produced far fewer bubbles than blue or red light.
- **C** Violet light produced more bubbles than yellow light.
- **D** Red light and blue light produced identical bubble counts.

PASSAGE V Antibacterial Soap Concentration and Zone of Inhibition

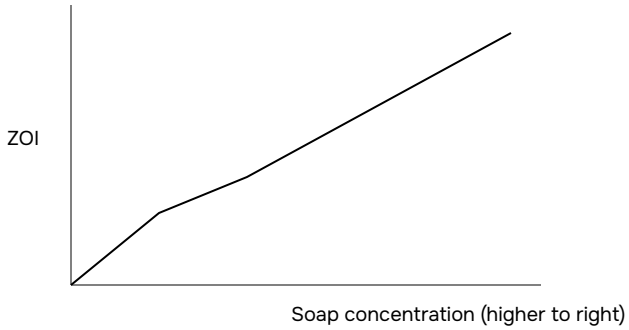
Antibacterial soaps contain a chemical agent that slows or stops bacterial growth. When a small paper disc soaked in soap solution is placed on a lawn of bacteria growing on a nutrient plate, a clear region called the *zone of inhibition* (ZOI) forms where bacteria fail to grow. A larger ZOI, measured in millimeters (mm) as the diameter of the clear region, indicates stronger inhibition. Students ran three studies using discs of equal size and plates incubated for 24 hours (h) unless noted.

Study 1

Discs soaked in antibacterial soap of varying concentration (percent by volume, % v/v) were placed on plates of *Escherichia coli* (*E. coli*) and incubated at 37 °C. A 0% disc (water only) served as the control. Each ZOI was recorded (see Table 1 and Figure 1).

Soap concentration (% v/v)	Zone of inhibition (mm)
0	0
1	6
2	9
4	13
8	17
16	21

Figure 1



Study 2

Discs soaked in a fixed 4% v/v soap solution were placed on plates of four different bacterial species and incubated at 37 °C (see Table 2).

Bacterial species	Zone of inhibition (mm)
E. coli	13
Staphylococcus aureus	18
Pseudomonas aeruginosa	8
Bacillus subtilis	15

Study 3

Discs soaked in a fixed 8% v/v soap solution were placed on plates of *E. coli* and incubated at four different temperatures (see Table 3).

Incubation temperature (°C)	Zone of inhibition (mm)
25	12
30	15
37	17
42	14

QUESTIONS 27 TO 33

27 According to Table 1, the zone of inhibition produced by a 2% v/v soap solution on *E. coli* was closest to which of the following?

- **A** 6 mm
- **B** 9 mm
- **C** 13 mm
- **D** 17 mm

28 Based on the results of Study 1, as the soap concentration increased from 0% to 16% v/v, the zone of inhibition:

- **A** increased only.
- **B** decreased only.
- **C** stayed the same.
- **D** increased, then decreased.

29 Based on Study 2, a student concluded that at *every* soap concentration, the soap would produce a larger zone of inhibition on *S. aureus* than on *E. coli*. Is this conclusion justified by the results of Studies 1 and 2?

- **A** Yes; at 4% v/v, the zone of inhibition was 18 mm for *S. aureus* and 13 mm for *E. coli*.
- **B** Yes; in Study 1, the zone of inhibition for *E. coli* increased at every step as the soap concentration increased.
- **C** No; at 4% v/v, the zone of inhibition for *S. aureus* was smaller than the zone for *E. coli*.
- **D** No; *S. aureus* was tested at only one soap concentration, so the results cannot show how the 2 species compare at other concentrations.

30 Based on Study 2, which bacterial species was most resistant to the antibacterial soap at 4% v/v?

- **A** *E. coli*
- **B** *Staphylococcus aureus*
- **C** *Pseudomonas aeruginosa*
- **D** *Bacillus subtilis*

31 In Study 2, which of the following was the independent variable (the factor the students deliberately changed from trial to trial)?

- **A** Soap concentration
- **B** Incubation temperature
- **C** Type of bacterial species
- **D** Zone of inhibition

32 The students prepare an *agent-free soap* that is identical to the soap used in the studies except that it contains no antibacterial agent. They want to determine whether the 17 mm zone of inhibition produced by the 8% v/v disc in Study 1 was caused by the antibacterial agent or by the soap's other ingredients. Which of the following discs should the students test to answer this question?

- **A** A disc soaked in 8% v/v agent-free soap, on *E. coli* at 37 °C
- **B** A disc soaked in 8% v/v agent-free soap, on *S. aureus* at 37 °C
- **C** A disc soaked in water only, on *E. coli* at 37 °C
- **D** A disc soaked in 8% v/v antibacterial soap, on *E. coli* at 25 °C

33 Suppose *P. aeruginosa* were tested with an 8% v/v soap solution at 37 °C for 24 h. Based on the combined results of Studies 1 and 2, its zone of inhibition would most likely be closest to:

A 8 mm
B 12 mm
C 17 mm
D 21 mm

PASSAGE VI The End-Triassic Mass Extinction

About 201 million years ago, at the Triassic-Jurassic boundary (TJB), roughly half of all known genera vanished in one of Earth's five largest mass extinctions. The event coincided with the eruption of the Central Atlantic Magmatic Province (CAMP), one of the largest volcanic episodes in Earth's history. Table 1 lists estimated conditions at five times, given in thousands of years (kyr) before or after the boundary. Table 2 lists extinction intensity for five groups of marine invertebrates, ranked by how heavily each group builds a calcium carbonate skeleton. Three scientists interpret the same data differently.

Table 1. Estimated conditions across the Triassic-Jurassic boundary

Time relative to boundary	Atmospheric CO_2 (ppm)	Global temp. anomaly (°C)	Surface ocean pH
100 kyr before	1,000	0.0	8.20
50 kyr before	1,200	+0.5	8.15
Boundary (0)	2,400	+2.5	7.90
50 kyr after	3,000	+4.0	7.75
100 kyr after	2,600	+3.5	7.85

Table 2. Extinction intensity of marine invertebrate groups at the TJB

Group	Calcification	Genera before	Genera lost	% lost
Scleractinian corals	High	40	36	90%
Bivalves	High	80	56	70%
Brachiopods	Moderate	50	25	50%
Gastropods	Moderate	60	24	40%
Organic-walled plankton	Low	40	6	15%

Scientist 1 CAMP eruptions released enormous volumes of sulfur dioxide and carbon dioxide over roughly 600,000 years. Sulfate aerosols first triggered brief, severe cooling, and the accumulating CO_2 then drove rapid greenhouse warming. These swift temperature swings, together with toxic gases and acid rain, killed organisms on both land and sea. Because land plants and vertebrates went extinct at the same time as marine species, and acidification cannot act on land, the primary cause was direct climatic disruption from volcanism, not seawater chemistry.

Scientist 2 The CO_2 released by CAMP dissolved into the oceans, forming carbonic acid and lowering surface pH by about 0.45 units (Table 1). The resulting drop in carbonate saturation made it difficult for organisms to build calcium carbonate skeletons. This explains the pattern in Table 2: heavily calcified corals and bivalves lost the most genera, while lightly calcified plankton were barely affected. Warming alone would not selectively spare the least calcified groups, so the primary killing mechanism was ocean acidification.

Scientist 3 Volcanism was the ultimate trigger, but no single mechanism explains the whole event. In the oceans, falling pH devastated calcifying organisms, exactly as the selectivity in Table 2 shows. On land, where acidification could not act, rapid warming and habitat loss (Table 1) drove the extinctions. The two mechanisms operated in different environments but shared one underlying cause: volcanic CO_2. Removing either mechanism would leave part of the extinction pattern unexplained.

QUESTIONS 34 TO 40

34 According to Table 1, as atmospheric CO_2 increased across the Triassic-Jurassic boundary, surface ocean pH generally:

- **A** increased.
- **B** decreased.
- **C** remained constant.
- **D** increased, then decreased.

35 According to Table 2, which group of marine invertebrates lost the greatest percentage of its genera?

- **A** Scleractinian corals
- **B** Bivalves
- **C** Brachiopods
- **D** Organic-walled plankton

36 Which observation would Scientist 2 most likely use to support the ocean acidification hypothesis?

- **A** Land plant genera declined sharply at the boundary.
- **B** Heavily calcified corals and bivalves lost far more genera than lightly calcified plankton.
- **C** Sulfate aerosols caused a brief cooling before warming began.
- **D** Global temperature rose about 4°C after the boundary.

37 Scientists 1 and 2 would most likely disagree about which of the following statements?

- **A** CAMP volcanism released large amounts of carbon dioxide.
- **B** The main mechanism that killed marine calcifying organisms was a drop in ocean pH.
- **C** A mass extinction occurred at the Triassic-Jurassic boundary.
- **D** Atmospheric CO_2 rose across the boundary.

38 Suppose new fossil data show that land plant genera declined by about 60% at the Triassic-Jurassic boundary. This finding would most directly support the view(s) of:

- **A** Scientist 2 only.
- **B** Scientist 1 only.
- **C** Scientists 1 and 3.
- **D** Scientists 2 and 3.

39 Based on Table 1, a rock layer with a reconstructed surface ocean pH of 7.80 most likely formed when atmospheric CO_2 was between:

- **A** 1,200 and 2,400 ppm.
- **B** 2,400 and 2,600 ppm.
- **C** 2,600 and 3,000 ppm.
- **D** greater than 3,000 ppm.

40 Scientist 3's combined model differs from the models of Scientists 1 and 2 mainly because Scientist 3 proposes that:

- **A** neither warming nor acidification contributed to the extinction.
- **B** volcanism was unrelated to the rise in atmospheric CO_2.
- **C** marine and terrestrial extinctions resulted from two different mechanisms that shared a single underlying cause.
- **D** only marine calcifying organisms were affected by the event.

End of Section 4. If you finish before time is called, check your work on this section only.

Answer key

Tick the box next to each answer you got right, then count the ticks in each section: that is your raw score. A skipped question counts as wrong. Every question also has a worked explanation in the app: take Form A online at prep36.com/#/tests, then open the review.

Section 1 · English

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

Number right: _____ of 50

QUESTIONS BY REPORTING CATEGORY

Conventions of Standard English 2, 5, 6, 8, 11, 12, 16, 18, 21, 25, 26, 27, 31, 32, 34, 35, 40, 41, 45, 46, 49
Production of Writing 1, 3, 7, 10, 14, 15, 19, 20, 22, 23, 28, 30, 33, 37, 39, 42, 44, 48, 50
Knowledge of Language 4, 9, 13, 17, 24, 29, 36, 38, 43, 47

Section 2 · Math

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

Number right: _____ of 45

QUESTIONS BY REPORTING CATEGORY

Algebra 9, 13, 16, 18, 20, 24, 29, 41
Functions 17, 21, 23, 26, 27, 30, 39, 40
Geometry 19, 25, 33, 34, 35, 42, 43, 44
Number & Quantity 2, 5, 7, 8, 28
Statistics & Probability 15, 32, 37, 38, 45
Integrating Essential Skills 1, 3, 4, 6, 10, 11, 12, 14, 22, 31, 36

Section 3 · Reading

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

Number right: _____ of 36

QUESTIONS BY REPORTING CATEGORY

Key Ideas & Details 1, 2, 3, 4, 8, 9, 10, 11, 12, 16, 19, 20, 21, 22, 28, 29, 31
Craft & Structure 5, 6, 7, 13, 14, 15, 23, 24, 25, 30, 33, 35
Integration of Knowledge & Ideas 17, 18, 26, 27, 32, 34, 36

Section 4 · Science

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

Number right: _____ of 40

QUESTIONS BY REPORTING CATEGORY

Interpretation of Data 1, 3, 4, 5, 6, 7, 9, 13, 14, 15, 17, 18, 20, 22, 23, 27, 28, 30, 34, 35, 39
Scientific Investigation 8, 16, 19, 21, 24, 25, 31, 32, 33
Evaluation of Models 2, 10, 11, 12, 26, 29, 36, 37, 38, 40

Score your test

1. **Count your raw score.** For each section, count the questions you got right. There is no penalty for a wrong answer.
2. **Convert it.** Find your raw score in that section's column of the table, then read the scale score (1 to 36) on the same row.
3. **Work out the Composite.** Add your English, Math and Reading scale scores, divide by 3 and round to the nearest whole number (a half rounds up). Science does not count toward the Composite.
4. **Science and STEM.** Science is reported on its own. Your STEM score is the average of your Math and Science scale scores, rounded the same way.

SECTION	RAW SCORE	SCALE SCORE
English	_____ of 50	_____
Math	_____ of 45	_____
Reading	_____ of 36	_____
Science	_____ of 40	_____
Composite	**(E + M + R) ÷ 3**	_____
STEM	**(M + S) ÷ 2**	_____

Prep36's approximate practice scale

This is the table the Prep36 app uses to score its practice tests. Each ACT test form is scaled on its own, so a score from this table is an estimate for practice, not a prediction of an ACT score. A dot means no raw score lands on that scale score.

Scale score	**English** raw, of 50	**Math** raw, of 45	**Reading** raw, of 36	**Science** raw, of 40	**Scale** score
36	50	44-45	36	40	**36**
35	47-49	43	34-35	39	**35**
34	·	41-42	33	38	**34**
33	46	39-40	·	36-37	**33**
32	·	38	32	35	**32**
31	45	37	·	34	**31**
30	·	36	31	33	**30**
29	44	34-35	·	32	**29**
28	42-43	33	29-30	30-31	**28**
27	41	31-32	·	29	**27**
26	40	30	28	28	**26**
25	39	28-29	26-27	26-27	**25**
24	37-38	27	25	25	**24**
23	36	26	24	22-24	**23**
22	34-35	25	23	21	**22**
21	32-33	24	21-22	20	**21**
20	30-31	23	20	19	**20**
19	29	21-22	·	18	**19**
18	27-28	20	18-19	15-17	**18**
17	26	16-19	17	14	**17**
16	25	14-15	16	13	**16**
15	22-24	11-13	15	12	**15**
14	21	9-10	13-14	11	**14**
13	19-20	7-8	12	·	**13**
12	17-18	5-6	9-11	8-10	**12**
11	15-16	4	8	7	**11**
10	11-14	·	7	6	**10**
9	10	3	5-6	5	**9**
8	9	·	·	·	**8**
7	6-8	2	4	3-4	**7**
6	5	·	·	2	**6**
5	4	1	2-3	·	**5**
4	·	·	·	·	**4**
3	2-3	·	1	1	**3**
2	1	·	·	·	**2**
1	0	0	0	0	**1**

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