



SAT Practice Test 3

Four modules, 98 questions, 2 hours 14 minutes plus a 10-minute break

Section	Questions	Time
Reading and Writing, Module 1	27 questions	32 minutes
Reading and Writing, Module 2	27 questions	32 minutes
Math, Module 1	22 questions	35 minutes
Math, Module 2	22 questions	35 minutes

1. Time each module on its own, and take the 10-minute break after Reading and Writing Module 2.
2. Mark answers on the answer sheet near the back. Work in the margins of the questions as much as you like.
3. Check your answers with the answer key, then read the explanations for every question you missed or guessed.
4. To take this test on screen or mark it up with a pen on a tablet, go to **marginsat.com**.

The questions in this section address a range of important reading and writing skills. Each question includes one or more passages, which may include a table or graph. Read each passage and question carefully, and then choose the best answer to the question based on the passage(s).

All questions in this section are multiple-choice with four answer choices. Each question has a single best answer.

- 1** Ecologists often treat a 1913 survey of the fish in Lake Washington as a baseline for measuring later change, but limnologist Mara Ostrowski cautions that the survey's species list is _____. its crews sampled only in shallow water near the shore and only in summer, so fish that live in the lake's depths or arrive in winter would likely have gone unrecorded.

Which choice completes the text with the most logical and precise word or phrase?

- (A) fabricated
- (B) incomplete
- (C) contradictory
- (D) obsolete

- 2** Printmaker Emiko Saito's woodcuts are strikingly _____. a single unbroken line may suggest both the curve of a wave and the shoulder of the figure watching it, and she seldom adds a mark that does not do at least two jobs.

Which choice completes the text with the most logical and precise word or phrase?

- (A) ornate
- (B) hesitant
- (C) spare
- (D) derivative

- 3** The following text is from a novel. Wen has taken over the running of her family's ferry dock.

Wen had expected the regulars to resist the new schedule, and for the first week they did, gathering at the rail each morning to tell her, in the tones of people reporting a death, which boat they used to catch. By the second week the complaints had grown shorter. By the third, Mr. Abernathy, who had complained loudest, was explaining the new times to a tourist with the air of a man who had drawn them up himself.

As used in the text, what does the word "air" most nearly mean?

- (A) manner
- (B) atmosphere
- (C) breeze
- (D) melody

- 4** The review board's endorsement of the harbor redevelopment plan was decidedly _____. its report praised the plan's goals at length but attached eleven conditions to its approval, several of which the developers had already said they could not meet.

Which choice completes the text with the most logical and precise word or phrase?

- (A) enthusiastic
- (B) qualified
- (C) unanimous
- (D) premature

5 For decades, biologists assumed that the bright colors of poison frogs served only to warn predators that the frogs are toxic. Working with captive frogs of one species, biologist Camila Ruiz noticed that females consistently chose brighter males as mates, even in enclosures that no predator had ever entered. Ruiz concluded that in this species, coloration likely also plays a role in mate choice, a finding that complicates the single-purpose explanation.

Which choice best describes the overall structure of the text?

- (A) It presents a long-held assumption, describes an observation that the assumption doesn't account for, and states a conclusion drawn from that observation.
- (B) It describes a debate between two groups of biologists, then explains why one group's position prevailed.
- (C) It introduces a hypothesis about poison frogs, outlines an experiment designed to test it, and reports that the experiment confirmed the hypothesis.
- (D) It presents an observation about poison frogs, then argues that the observation was based on flawed methods.

6 Many of the earliest sound recordings survive only on wax cylinders, which crack and warp with age. Playing a damaged cylinder with a stylus risks gouging the very grooves that hold the sound. In 2009, engineers at a national laboratory began scanning cylinders with a microscope that maps the grooves in three dimensions, then converting the maps into audio without anything touching the wax. Using this method, archivists have since recovered voices that had not been heard in over a century.

Which choice best describes the function of the underlined sentence in the text as a whole?

- (A) It explains why wax cylinders crack and warp as they age.
- (B) It challenges the claim that wax cylinders are too fragile to be played.
- (C) It describes the content of the recordings that archivists have recovered.
- (D) It introduces a technique that avoids the risk described earlier in the text.

7 Text 1

Economists who study congestion pricing (fees that drivers pay to enter crowded city centers) generally attribute its effect on traffic to price itself. When a trip costs more, they argue, drivers cancel or reschedule the trips they value least, such as errands that could be combined or made at off-peak hours.

Text 2

When transportation researcher Daniela Osei examined a city that introduced a downtown driving fee in 2018, she found that most of the drop in car trips came from commuters who switched to buses. Crucially, the city had used the fee's revenue to add bus routes and run buses more often that same year. Trips that were canceled outright, Osei found, accounted for only a small share of the decline.

Based on the texts, how would Osei (Text 2) most likely respond to the economists' explanation in Text 1?

- (A) She would argue that driving fees have little effect on the number of car trips made downtown.
- (B) She would agree that the explanation accounts for the decline she observed, since commuters' trips are the ones drivers value least.
- (C) She would argue that, at least in the city she studied, the explanation overlooks the role that improved bus service played in reducing car trips.
- (D) She would suggest that the economists have overstated how many drivers switched from cars to buses.

8

The following text is from a novel. Paulo has spent the summer repairing a sailboat that belonged to his late grandfather.

By August the hull was sound and the mast stood straight, and still Paulo found reasons not to put the boat in the water. A cleat needed polishing; the varnish on the tiller could use one more coat. His sister teased him that it would be the best-maintained boat never to leave a driveway. She was not wrong, and Paulo knew it. As long as there was work left to do, the boat was still his grandfather's, a project the two of them were finishing together. Once it sailed, it would simply be his.

Which choice best states the main idea of the text?

- (A) Paulo worries that his repairs have not made the boat safe to sail.
- (B) Paulo resents his sister's teasing about how long the repairs have taken.
- (C) Paulo wants to keep improving the boat so that it will be worth more if he sells it.
- (D) Paulo delays launching the boat because finishing the work would mean giving up a connection to his grandfather.

- 9** Each year, millions of red crabs on Christmas Island in the Indian Ocean leave the island's forests and walk to the coast to breed. To keep the crabs from being crushed on roads, island officials close some roads during the migration and have built underpasses beneath others. Park staff report that crabs readily use the underpasses where low fences guide them toward the entrances; where the fences are missing, many crabs simply walk onto the road.

According to the text, what has made the underpasses effective?

- (A) The roads above the underpasses are closed during the migration.
- (B) Low fences guide the crabs toward the underpass entrances.
- (C) The underpasses lead the crabs directly to the coast.
- (D) The crabs prefer the shade inside the underpasses to the open road.

- 10** Plant physiologist Tomasz Wrona hypothesizes that young sunflowers turn to face east each morning partly because a sun-warmed flower head attracts more bees, which pollinate the flower.

Which finding, if true, would most directly support Wrona's hypothesis?

- (A) Sunflowers that were prevented from turning grew smaller leaves than sunflowers that were allowed to turn.
- (B) Bees visited sunflowers more often in the afternoon than in the morning, regardless of which way the flowers faced.
- (C) Flower heads turned to face west received fewer bee visits than east-facing heads, but west-facing heads warmed with a small heater received about as many visits as east-facing heads.
- (D) Once sunflowers mature, they stop turning and remain facing east.

- 11** In the poem "Four A.M., the Bakery," the speaker conveys that the bakers' work is finished before the town has even started its day.

Which quotation from the poem most effectively illustrates the claim?

- (A) "Flour settles in the creases of my palms / like snow that has forgotten how to melt."
- (B) "The dough remembers every hand that pressed it, / rising slow in the warm dark by the oven."
- (C) "By six the racks are full and we are gone; / the first shop door along the street is still locked."
- (D) "At noon I pass the window where the loaves sit, / and strangers point at the ones they want."

Seabird foraging dives per hour

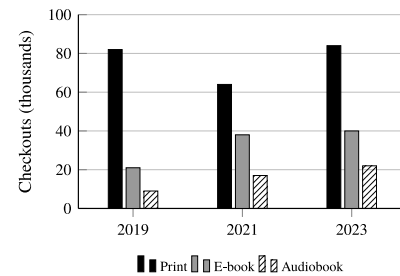
Species	Feeds mainly	Strong-current site	Weak-current site
Arctic tern	near surface	31	18
Bonaparte's gull	near surface	24	15
Common murre	deep water	9	10
Pigeon guillemot	deep water	12	12

Ornithologist Keiko Arai counted how often four seabird species dove for food at a site with strong tidal currents and at a site with weak currents. Arai concluded that strong currents increase foraging dives for species that feed near the surface but not for species that feed in deep water.

Which choice best describes data from the table that support Arai's conclusion?

- (A) Arctic terns and Bonaparte's gulls dove more often per hour at the strong-current site than at the weak-current site, while common murres and pigeon guillemots dove about as often at both sites.
- (B) Arctic terns dove more often per hour than any other species at both the strong-current site and the weak-current site.
- (C) Common murres dove less often per hour at the strong-current site than at the weak-current site.
- (D) At the strong-current site, the two species that feed near the surface dove a combined 55 times per hour.

Checkouts by format



A librarian argues that the rise of digital formats at her library has not come at the expense of print. As evidence, she points out that from 2019 to 2023, _____

Which choice most effectively uses data from the graph to complete the statement?

- (A) e-book checkouts rose from about 21,000 to about 40,000.
- (B) print checkouts fell from about 82,000 to about 64,000 as e-book checkouts rose from about 21,000 to about 38,000.
- (C) e-book and audiobook checkouts both increased while print checkouts rose slightly, from about 82,000 to about 84,000.
- (D) audiobook checkouts more than doubled, from about 9,000 to about 22,000.

14 Archaeologists have found that many millstones used in Roman Britain were cut from a coarse sandstone quarried in only one region of northern England. Millstones of this stone turn up at sites as far as 300 kilometers from the quarry, including several sites that lie much closer to other stone suitable for grinding grain. This suggests that _____

Which choice most logically completes the text?

- (A) most sites in Roman Britain lacked access to any stone suitable for millstones.
- (B) the quarry in northern England was the only source of millstones before the Roman period.
- (C) millstones made from the coarse sandstone wore out faster than millstones made from other stone.
- (D) the sandstone from northern England was valued enough that people transported it long distances even when nearer stone was available.

15 Some birds add aromatic plants such as yarrow to their nests, and researchers have long suspected that the plants keep parasites away. In a study of European starlings, however, nests with added yarrow held just as many mites as nests without it. Even so, chicks raised in the yarrow nests gained weight faster. The researchers concluded that if the plants do benefit chicks, _____

Which choice most logically completes the text?

- (A) starlings must add yarrow to their nests in order to raise chicks successfully.
- (B) the benefit probably does not come from reducing the number of parasites in the nest.
- (C) mites are unlikely to cause any harm to starling chicks.
- (D) yarrow probably attracts mites to nests rather than keeping them away.

16 The Chauvet Cave in southern France, which contains some of the oldest known figurative paintings in Europe, _____ in 1994 by three cave explorers who felt a faint draft of air coming from a pile of rocks.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) discovered
- (B) being discovered
- (C) was discovered
- (D) having been discovered

17 Glassblower Ines Moreau begins each piece by gathering molten glass on the end of a long hollow _____ she blows into the pipe while turning it, shaping the glass with wet wooden paddles.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) pipe, after that
- (B) pipe after that,
- (C) pipe, after that,
- (D) pipe; after that,

18 The collection of more than 300 hand-drawn maps that the cartographer produced during her four decades at the survey office _____ now housed at the state archive in Olympia.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) are
- (B) were
- (C) have been
- (D) is

- 19** Engineer Amara Diallo’s invention—a pair of gloves fitted with sensors that track finger _____ translates sign language into synthesized speech.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) movement—
- (B) movement,
- (C) movement;
- (D) movement

- 20** Entomologist Rui Matsuda recorded the temperature inside forty beehives every hour for an entire winter; _____ that colonies with more bees kept their cores warmer while eating less honey per bee.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) she found
- (B) finding
- (C) finds
- (D) found

- 21** For the harvest festival, volunteers spent six months sewing the twelve _____ costumes, each one embroidered with the name of a local farm.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) dancers’
- (B) dancer’s
- (C) dancers
- (D) dancers’s

- 22** The museum’s new exhibit on the Columbia River brings together three kinds of _____ woven fishing nets made by Indigenous fishers, survey instruments used to plan the river’s dams, and photographs of towns that the dams’ reservoirs later flooded.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) objects;
- (B) objects, such as:
- (C) objects, which
- (D) objects:

- 23** For much of the twentieth century, agronomists advised farmers in the region to plow their fields deeply every fall, burying weed seeds where they could not sprout. Deep plowing, _____, also exposes soil to wind and rain, and over decades the region’s fields lost much of their topsoil.

Which choice completes the text with the most logical transition?

- (A) however
- (B) therefore
- (C) for example
- (D) similarly

- 24** Most sharks must swim constantly to push water over their gills. The nurse shark, which spends much of its time on the seafloor, can instead pump water over its gills while lying still. _____ the nurse shark can rest in caves and crevices for hours at a time.

Which choice completes the text with the most logical transition?

- (A) Nevertheless,
- (B) Likewise,
- (C) As a result,
- (D) By contrast,

25

While researching a topic, a student has taken the following notes:

- The Bay of Fundy, between New Brunswick and Nova Scotia, has some of the largest tidal ranges in the world.
- At Burntcoat Head, the difference between high and low tide can reach 16 meters.
- In the Mediterranean Sea, tidal ranges are typically less than half a meter.
- The Mediterranean is nearly enclosed, connected to the Atlantic only by the narrow Strait of Gibraltar.

The student wants to contrast the tidal ranges of the two bodies of water. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- (A) While tidal ranges in the Bay of Fundy can reach 16 meters, those in the Mediterranean Sea are typically less than half a meter.
- (B) The Bay of Fundy, between New Brunswick and Nova Scotia, has some of the largest tidal ranges in the world.
- (C) The Mediterranean Sea is nearly enclosed, connected to the Atlantic only by the narrow Strait of Gibraltar.
- (D) Both the Bay of Fundy and the Mediterranean Sea have tides, although they are in different parts of the world.

26

While researching a topic, a student has taken the following notes:

- Weaver Talia Brenner and potter Joon Park both sold work at the 2024 Skagit Valley craft fair.
- Brenner dyes her wool with plants she grows herself.
- Park buys commercially prepared glazes.
- Both artists sold out on the fair's first day.

The student wants to emphasize a difference between the two artists' materials. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- (A) Although Brenner and Park work in different media, both artists sold out on the fair's first day.
- (B) Brenner dyes her wool with plants she grows herself, whereas Park buys commercially prepared glazes.
- (C) Brenner dyes her wool with plants she grows herself, and Park makes pottery.
- (D) Brenner and Park, a weaver and a potter, both sold work at the 2024 Skagit Valley craft fair.

While researching a topic, a student has taken the following notes:

- Octopuses have about 500 million neurons.
- Roughly two-thirds of those neurons are in the octopus's eight arms rather than in its central brain.
- Researchers have observed severed octopus arms continuing to reach for and grasp food.
- Neuroscientist Dana Ilunga studies how the arms coordinate with the central brain.

The student wants to explain why researchers think octopus arms may make some decisions on their own. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- (A) Octopuses have about 500 million neurons, and neuroscientist Dana Ilunga studies them.
- (B) Because about two-thirds of an octopus's neurons are in its arms, and severed arms can still reach for and grasp food, researchers suspect the arms make some decisions independently.
- (C) Neuroscientist Dana Ilunga studies how an octopus's eight arms coordinate with its central brain.
- (D) Severed octopus arms have been observed reaching for food, even though most of an octopus's neurons are in its central brain.

STOP. This is the end of Reading and Writing, Module 1.

The questions in this section address a range of important reading and writing skills. Each question includes one or more passages, which may include a table or graph. Read each passage and question carefully, and then choose the best answer to the question based on the passage(s).

All questions in this section are multiple-choice with four answer choices. Each question has a single best answer.

- 1** Historian Lucía Benavides argues that the reputation of the 1890s as an era of unchecked industrial expansion is somewhat _____.: although factory output did grow quickly over the decade, it did so in fits and starts, interrupted by two severe depressions that idled a fifth of the workforce.

Which choice completes the text with the most logical and precise word or phrase?

- (A) overstated
- (B) unfounded
- (C) obscure
- (D) irrefutable

- 2** The poet's late collections are often described as austere, but the description is _____ only if one reads them selectively: the poems critics like to quote are indeed spare, yet the books also contain long, digressive pieces crowded with names, recipes, and jokes.

Which choice completes the text with the most logical and precise word or phrase?

- (A) misleading
- (B) ambiguous
- (C) defensible
- (D) novel

- 3** The following text is from a novel. Halvard, a ship's carpenter, has come home to his village after many years at sea.

The village had not changed so much as _____. The same houses stood along the same lane, but each seemed to have drawn a little nearer to the ground, and the church spire, which he remembered as reaching nearly to the clouds, now barely cleared the elms.

Which choice completes the text with the most logical and precise word or phrase?

- (A) vanished
- (B) expanded
- (C) modernized
- (D) settled

- 4** Although the witness's account was, in its broad outlines, _____ the physical evidence, the attorney pointed to several small discrepancies in timing that the account could not explain.

Which choice completes the text with the most logical and precise word or phrase?

- (A) incompatible with
- (B) consistent with
- (C) unrelated to
- (D) identical to

5 Ecologists have long held that invasive species damage the ecosystems they enter, and in many cases the evidence is overwhelming. Yet a growing number of studies document invasive plants providing food or shelter for native animals, sometimes in places where native plants have already disappeared. Ecologist Maren Sjöberg argues that such findings should not be read as a defense of invasions; rather, they show that removing an invasive species can carry costs that management plans must account for.

Which choice best describes the function of the underlined sentence in the text as a whole?

- (A) It introduces evidence that complicates the view presented in the first sentence.
- (B) It provides an example that supports the claim that invasive species damage ecosystems.
- (C) It presents the conclusion that Sjöberg reaches about how invasive species should be managed.
- (D) It describes the evidence that Sjöberg uses to argue that invasions should be encouraged.

6 The following text is from a short story. Mrs. Okafor is teaching her grandson to drive.

“Both hands,” she said, though both of his hands were already on the wheel. Desmond nodded. “Mirror,” she said, and he checked it, and she watched him check it, and then she checked it herself. They had not yet left the driveway. In forty years of driving she had never once had an accident, a fact she had mentioned to him four times that morning, and it occurred to her now that perhaps the record was not entirely a matter of skill.

Which choice best describes the function of the final sentence in the text as a whole?

- (A) It reveals that Mrs. Okafor has misled Desmond about her driving record.
- (B) It shows that Mrs. Okafor has decided that Desmond is not yet ready to drive.
- (C) It explains why Mrs. Okafor has mentioned her driving record so often that morning.
- (D) It suggests that Mrs. Okafor is beginning to recognize that her extreme caution may account for her record as much as her skill does.

7 Text 1

City planners increasingly promote cool roofs, which are coated in white or reflective material. Studies show that such roofs can lower a building's roof surface temperature by as much as 30°C on a sunny day and reduce air-conditioning use in the rooms beneath, making them an inexpensive tool for coping with summer heat.

Text 2

Climate scientist Ji-ho Baek modeled what would happen if every building in a humid coastal city installed a cool roof. Individual buildings stayed cooler, as expected, but cooler land surfaces across the whole city weakened the afternoon sea breeze, and the model showed less summer rainfall in farmland inland. Baek does not dispute the benefits for single buildings; she argues that before cities mandate cool roofs, their effects at the scale of a whole region need study.

Based on the texts, how would Baek (Text 2) most likely respond to the planners' view in Text 1?

- (A) By questioning whether cool roofs actually lower surface temperatures as much as the planners claim
- (B) By accepting the building-level benefits the planners cite while cautioning that adopting cool roofs across a whole city may have effects those benefits don't capture
- (C) By arguing that cool roofs should be required in humid coastal cities in order to increase inland rainfall
- (D) By claiming that the reduction in air-conditioning use matters less than the increase in rainfall in nearby farmland

8

Economist Hyun-woo Lim studies why some small towns in the Midwest have kept their populations while neighboring towns have shrunk. Many observers credit local employers: a town with a large factory or hospital, they suggest, will hold on to its residents. Lim's data complicate that account. Among the towns he studied, those that kept their populations were no more likely than shrinking towns to have a large employer. They were, however, far more likely to lie within a 30-minute drive of a mid-sized city, which let residents keep their homes while commuting to jobs elsewhere.

Which choice best states the main idea of the text?

- (A) Lim argues that towns with large employers tend to lose population because residents would rather commute.
- (B) Lim found that most residents of small Midwestern towns commute to jobs in mid-sized cities.
- (C) Lim's findings suggest that being near a mid-sized city does more than having a large local employer to explain which towns kept their populations.
- (D) Lim's research shows that large local employers are the main reason some towns have kept their populations.

- 9** The following text is from a novel. Teodora has been asked to speak at her former teacher's retirement party.

Teodora had written the speech three times. The first version listed Mr. Aldana's accomplishments, which were many, and she abandoned it halfway through because it read like the back of a book jacket. The second told the story of the afternoon he kept her after class to say that her essay was the worst thing she had ever written and also the most interesting, and she abandoned that one too, because she could not decide whether the story flattered him. The third version was two sentences long. She suspected it was the best of the three, and she was fairly sure she would not have the nerve to read it.

According to the text, why did Teodora abandon the second version of the speech?

- (A) She was unsure whether the story it told would reflect well on Mr. Aldana.
- (B) She thought it read too much like a list of accomplishments.
- (C) She worried that it was too long to read at the party.
- (D) She realized that Mr. Aldana would probably not remember the afternoon it described.

- 10** Paleoclimatologist Ngozi Adeyemi hypothesizes that a prolonged drought around 1200 CE led the residents of a settlement in the American Southwest to abandon it.

Which finding, if true, would most directly weaken Adeyemi's hypothesis?

- (A) Tree-ring records from the region show unusually narrow rings, which indicate low rainfall, for the two decades before 1200 CE.
- (B) Excavations show that residents of the settlement built new grain-storage rooms during the drought years and continued living there for about forty years after the drought ended.
- (C) Several other settlements in the region were also abandoned around 1200 CE.
- (D) Pollen samples show that the area around the settlement had fewer drought-tolerant plants before 1200 CE than after it.

- 11** In a novel, the narrator portrays her brother Matteo as someone who is generous in ways he refuses to acknowledge.

Which quotation from the novel most effectively illustrates this portrayal?

- (A) "Matteo lent money to anyone who asked, and he kept a small notebook in which he recorded every loan to the penny."
- (B) "Matteo was always the first to arrive at family dinners and the last to leave, folding chairs long after everyone else had gone home."
- (C) "When our mother thanked him for driving her to the clinic each week, Matteo said only that he'd been going that way anyway, though the clinic was an hour in the opposite direction from his office."
- (D) "Matteo was not a talkative man, and he seemed to regard conversation as a tax he paid in exchange for being left alone."

12

Noon temperatures on summer days (°C)

City	Average noon air	Sidewalk in full sun	Sidewalk under tree canopy
Seattle	27	41	32
Denver	31	48	36
Phoenix	41	62	43

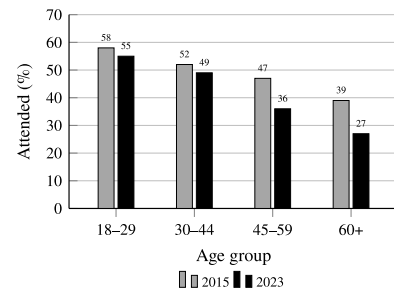
Researchers measured noon sidewalk temperatures in full sun and under tree canopies in three cities. Shade cooled sidewalks in every city, but the researchers cautioned that shade alone cannot make sidewalks in the hottest cities as cool as those in milder ones:

Which choice most effectively uses data from the table to support the researchers' caution?

- (A) in Phoenix, sidewalks under canopies were 19°C cooler than sidewalks in full sun, the largest difference of the three cities.
- (B) in Phoenix, sidewalks under canopies (43°C) were hotter than even the sidewalks in full sun in Seattle (41°C).
- (C) in Seattle, sidewalks in full sun (41°C) were 9°C hotter than sidewalks under canopies (32°C).
- (D) in Denver, sidewalks in full sun (48°C) were 17°C hotter than the average noon air temperature (31°C).

13

Adults who attended a live music performance



A music critic claims that the recent decline in live-music attendance has been concentrated among younger adults.

Which choice best describes data from the graph that weaken the critic's claim?

- (A) Adults aged 18–29 had the highest attendance rate of any age group in both 2015 and 2023.
- (B) Attendance fell in every age group between 2015 and 2023.
- (C) Attendance among adults aged 30–44 fell from 52% to 49% between 2015 and 2023.
- (D) Attendance among adults aged 18–29 fell from 58% to 55%, a much smaller drop than among adults 60 and older, whose attendance fell from 39% to 27%.

14 Many plant species that grow on serpentine soils (soils high in toxic metals and low in nutrients) are found nowhere else. One explanation is that these species thrive only in serpentine chemistry. But when botanist Elena Varga grew several such species in ordinary garden soil, most grew larger than they did on serpentine. When she grew them alongside common grasses in garden soil, however, the serpentine species were quickly crowded out. These results suggest that _____

Which choice most logically completes the text?

- (A) the serpentine species are restricted to serpentine soils not because they need its chemistry but because few competitors can survive there.
- (B) serpentine soils contain nutrients that the serpentine species need and that garden soil lacks.
- (C) common grasses would quickly crowd out the serpentine species on serpentine soils as well.
- (D) the serpentine species grow larger on serpentine soil when common grasses are present.

15 Historians of medieval Iceland rely heavily on the sagas, which were written down in the thirteenth century but describe events of the tenth and eleventh centuries. Because the sagas include vivid details about farms, feuds, and lawsuits, some historians have treated them as reliable records of the earlier period. Others note that saga writers often described buildings and legal procedures as they existed in the writers' own time, not in the time they were writing about. If the second group is correct, a historian who used the sagas to reconstruct tenth-century legal procedures would most likely _____

Which choice most logically completes the text?

- (A) find that tenth-century procedures were more complex than thirteenth-century ones.
- (B) be unable to find any descriptions of legal procedures in the sagas.
- (C) produce an account that partly reflects thirteenth-century procedures instead.
- (D) conclude that the sagas were written in the tenth century.

16 The Polynesian navigators who settled islands scattered across thousands of kilometers of open Pacific, reading ocean swells, stars, and the flight paths of seabirds to find land that lay far beyond the horizon, _____ some of the most remarkable voyages in human history.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) completing
- (B) to complete
- (C) having completed
- (D) completed

- 17** In 2021 the city restored a creek that had been buried in a concrete pipe beneath a parking lot since the 1950s, _____ about a kilometer of open water and wetland to the neighborhood.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) returned
- (B) returns
- (C) returning
- (D) and it returns

- 18** The festival's three headliners each represent a distinct tradition: Amira Haddad, an oud player from _____ Tomás Ribeiro, a fado singer from Portugal; and Keola Kahale, a slack-key guitarist from Hawaii.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) Lebanon,
- (B) Lebanon;
- (C) Lebanon:
- (D) Lebanon

- 19** Neither the architect nor the engineers who reviewed her plans _____ able to explain why the footbridge swayed when crowds crossed it in step.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) has been
- (B) is
- (C) have been
- (D) was

- 20** The plan's critics did not object to its _____ they objected to the speed at which the city intended to carry it out.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) cost; rather,
- (B) cost, rather
- (C) cost, rather,
- (D) cost rather,

- 21** By the time the excavation team reached the lowest layer of the site in 2019, the river _____ much of the surrounding terrace, carrying away artifacts that earlier surveys had recorded.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) had eroded
- (B) erodes
- (C) will have eroded
- (D) is eroding

- 22** Volcanologist Haruki _____ thousands of ash samples from the 2011 eruption, found that the ash particles were unusually sharp-edged.

Which choice completes the text so that it conforms to the conventions of Standard English?

- (A) Endo who has collected
- (B) Endo, who has collected
- (C) Endo; who has collected
- (D) Endo—who has collected

- 23** Linguists once assumed that whistled languages, in which speakers convey words by whistling, were simple codes that could carry only a handful of fixed messages. Recordings made in the Canary Islands and in northern Turkey, _____ show whistlers conveying complete sentences, including sentences their listeners had never heard before.

Which choice completes the text with the most logical transition?

- (A) for instance,
- (B) in other words,
- (C) similarly,
- (D) however,

- 24** The common cuckoo lays its eggs in the nests of other birds, which then raise the cuckoo chicks as their own. Some host species have evolved the ability to recognize and reject cuckoo eggs. Cuckoos, _____ have evolved eggs that closely mimic the color and pattern of their hosts' eggs.

Which choice completes the text with the most logical transition?

- (A) for example,
- (B) nevertheless,
- (C) in turn,
- (D) by contrast,

- 25** While researching a topic, a student has taken the following notes:

- In 1959, the Soviet probe Luna 3 photographed the far side of the Moon for the first time.
- Its images were blurry and showed few details.
- In 2019, China's Chang'e 4 became the first spacecraft to land on the Moon's far side.
- Because the far side never faces Earth, both missions had to work around the lack of a direct radio link: Luna 3 stored its photographs and transmitted them later, and Chang'e 4 relayed its signals through a separate satellite.

The student wants to emphasize a similarity between the two missions. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- (A) Whereas Luna 3 only photographed the Moon's far side in 1959, Chang'e 4 landed there in 2019.
- (B) Luna 3 stored its photographs to transmit them later, while Chang'e 4 relayed its signals through a separate satellite.
- (C) Like Luna 3, which photographed the Moon's far side for the first time, Chang'e 4 returned blurry images that showed few details.
- (D) Both Luna 3 and Chang'e 4 had to find a way to send information to Earth from the side of the Moon that never faces it.

26

While researching a topic, a student has taken the following notes:

- Ecologist Farida Haidari studied whether streetlights affect when oak trees leaf out in spring.
- She compared oaks near streetlights with oaks in dark parks in three cities.
- Oaks near streetlights leafed out up to a week earlier than oaks in dark parks.
- Leaves that open earlier are more likely to be damaged by late frosts.

The student wants to explain a possible consequence of Haidari's finding. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- (A) Haidari compared oaks near streetlights with oaks in dark parks in three cities to study the timing of leaf-out.
- (B) Oaks near streetlights leafed out up to a week earlier than oaks in dark parks, which may leave their new leaves more exposed to late frosts.
- (C) Oaks in dark parks leafed out up to a week earlier than oaks near streetlights, which may expose their new leaves to late frosts.
- (D) Haidari found that streetlights affect when oak trees leaf out in spring.

27

While researching a topic, a student has taken the following notes:

- Many violinists believe that old Italian violins, such as those made by Stradivari, sound better than new instruments.
- The wood of a violin changes as it ages.
- In a blind test, professional violinists could not reliably tell old Italian violins from high-quality new ones.
- In the same test, the players more often preferred the new violins.

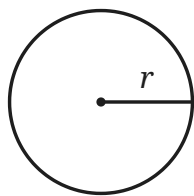
The student wants to present a finding that challenges a common belief. Which choice most effectively uses relevant information from the notes to accomplish this goal?

- (A) Many violinists believe that old Italian violins sound better than new ones, and the wood of a violin changes as it ages.
- (B) Because a violin's wood changes as it ages, old Italian violins sound better than new ones, a belief many violinists share.
- (C) Although many violinists believe that old Italian violins sound better than new ones, blind tests have compared old and new violins.
- (D) Despite a common belief that old Italian violins sound better than new ones, professional violinists in a blind test could not reliably tell them apart and more often preferred the new violins.

STOP. This is the end of Reading and Writing, Module 2.

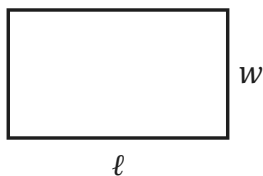
Math Reference Sheet

Use it during both Math modules

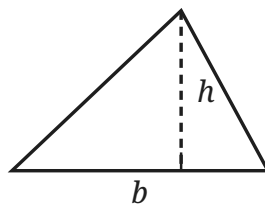


$$A = \pi r^2$$

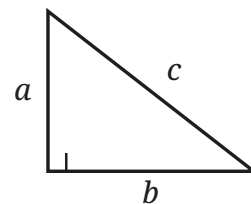
$$C = 2\pi r$$



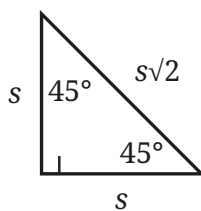
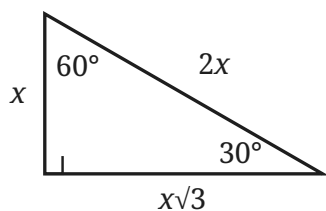
$$A = \ell w$$



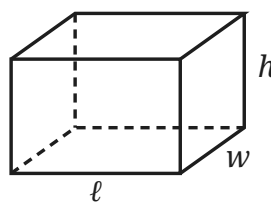
$$A = \frac{1}{2}bh$$



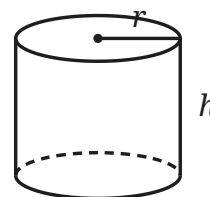
$$c^2 = a^2 + b^2$$



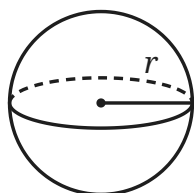
Special Right Triangles



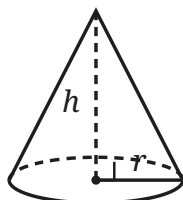
$$V = \ell wh$$



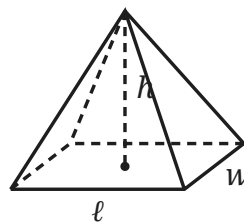
$$V = \pi r^2 h$$



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



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



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

- The number of degrees of arc in a circle is 360.
- The number of radians of arc in a circle is 2π .
- The sum of the measures in degrees of the angles of a triangle is 180.

The questions in this section address a number of important math skills.

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- If a fraction doesn't fit, enter its decimal equivalent instead.
- If a decimal doesn't fit, truncate or round it at the fourth digit.
- Enter a mixed number such as $3\frac{1}{2}$ as an improper fraction ($7/2$) or as a decimal (3.5).
- Leave out symbols such as a percent sign, comma, or dollar sign.

Examples

Answer	Acceptable ways to enter answer	Unacceptable: will NOT receive credit
3.5	3.5 3.50 7/2	31/2 3 1/2
$\frac{2}{3}$	2/3 .6666 .6667 0.666 0.667	0.66 .66 0.67 .67
$-\frac{1}{3}$	-1/3 -.3333 -0.333	-.33 -0.33

- 1** If $4(x - 3) + 7 = 23$, what is the value of $x - 3$?

- (A) 4
(B) 7
(C) 1
(D) 10

- 2** A jacket's price is reduced by 30%, and then the sale price is reduced by an additional 10%. The final price is what percent of the original price?

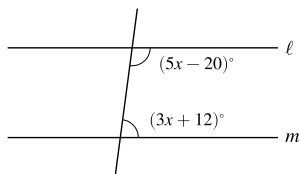
- (A) 60%
(B) 63%
(C) 67%
(D) 70%

- 3 The table shows three values of x and their corresponding values of $f(x)$ for the linear function f . Which equation defines f ?

x	$f(x)$
1	11
3	17
6	26

- (A) $f(x) = 8x + 3$
 (B) $f(x) = 3x + 11$
 (C) $f(x) = 6x + 5$
 (D) $f(x) = 3x + 8$

- 4 In the figure, line ℓ is parallel to line m , and a transversal crosses both lines. What is the measure, in degrees, of the larger of the two marked angles?



Your answer

- 5 A colony of bacteria has 1,500 bacteria at time $t = 0$, and its population increases by 8% every 30 minutes. Which function gives the number of bacteria $P(t)$ after t hours?

- (A) $P(t) = 1,500(1.08)^{t/2}$
 (B) $P(t) = 1,500(1.08)^{2t}$
 (C) $P(t) = 1,500(1.16)^t$
 (D) $P(t) = 1,500(0.08)^{2t}$

6

$$2x + 3y = 21$$

$$x - y = -2$$

If (x, y) is the solution to the system of equations, what is the value of $x + y$?

Your answer

- 7 A data set consists of the values 12, 15, 15, 18, 20, 23, and 40. If the value 40 is removed, which statement about the mean and median of the data set is true?

- (A) The mean decreases, and the median is unchanged.
 (B) Both the mean and the median are unchanged.
 (C) Both the mean and the median decrease.
 (D) The mean is unchanged, and the median decreases.

- 8 What is the positive difference between the two solutions of $x^2 - 10x + 21 = 0$?

Your answer

- 9 A delivery van can carry at most 1,200 pounds, including the driver. The driver weighs 180 pounds, and each box weighs 35 pounds. What is the greatest number of boxes the van can carry?

- (A) 29
 (B) 28
 (C) 30
 (D) 34

- 10 What is the radius of the circle in the xy -plane with equation $x^2 + y^2 - 6x + 8y = 0$?

- (A) 25
 (B) 10
 (C) $\sqrt{14}$
 (D) 5

- 11 A printer prints 18 pages per minute. At this rate, how many seconds does it take to print 45 pages?

Your answer

- 12** The functions f and g are defined by $f(x) = 2x^2 - 3x$ and $g(x) = x - 4$. What is the value of $f(g(-1))$?

(A) 1
(B) 14
(C) 65
(D) 21

- 13** At a museum, adult tickets cost \$12 and child tickets cost \$8. A group bought three times as many child tickets as adult tickets and spent a total of \$432. How many child tickets did the group buy?

(A) 36
(B) 12
(C) 24
(D) 48

- 14** Which expression is equivalent to $(3x - 2)^2 - (x + 4)(x - 4)$?

(A) $8x^2 - 12x - 12$
(B) $8x^2 - 12x + 20$
(C) $10x^2 - 12x + 20$
(D) $8x^2 + 20$

- 15** The table summarizes how 100 students at a school usually get to school. If a student who rides the bus is selected at random, what is the probability that the student is in grade 11?

	Bike	Bus	Car	Total
Grade 10	14	30	6	50
Grade 11	9	25	16	50
Total	23	55	22	100

(A) $\frac{1}{4}$
(B) $\frac{1}{2}$
(C) $\frac{5}{11}$
(D) $\frac{11}{20}$

- 16** For $x > 0$, which expression is equivalent to $\frac{x^{5/3} \cdot x^{-1/3}}{x^{2/3}}$?

(A) x^2
(B) $\sqrt[3]{x}$
(C) $x^{4/3}$
(D) $\sqrt[3]{x^2}$

- 17** In right triangle ABC , angle C is the right angle and $\sin A = \frac{5}{13}$. What is the value of $\tan B$?

(A) $\frac{12}{5}$
(B) $\frac{5}{12}$
(C) $\frac{12}{13}$
(D) $\frac{13}{5}$

- 18** What is the maximum value of the function $f(x) = -2x^2 + 12x + 5$?

(A) 3
(B) 5
(C) 23
(D) 41

- 19** A tank holds 240 liters of water and drains at a constant rate. After 8 minutes, it holds 176 liters. How many minutes after it began draining will the tank be empty?

(A) 22
(B) 27.5
(C) 32
(D) 30

- 20** Triangle ABC is similar to triangle DEF , and side AB corresponds to side DE . If $AB = 6$, $DE = 15$, and the area of triangle ABC is 24, what is the area of triangle DEF ?

Your answer

- 21 In the equation $x^2 + kx + 49 = 0$, k is a positive constant. If the equation has exactly one real solution, what is the value of k ?

Your answer

- 22 The function f is defined by $f(x) = a(x - 2)(x + 6)$, where a is a constant. In the xy -plane, the graph of $y = f(x)$ has a minimum value of -32 . What is the value of a ?

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

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$-\frac{1}{3}$	-1/3 -.3333 -0.333	-.33 -0.33

- 1**

$$7x - 3y = 11$$

$$3x + 5y = 1$$

If (x, y) satisfies the system of equations, what is the value of $10x + 2y$?

Your answer

2

Line ℓ passes through the points $(-3, 7)$ and $(5, -9)$. Line k is perpendicular to line ℓ and passes through the point $(4, 1)$. What is the y -coordinate of the y -intercept of line k ?

(A) -7

(B) -1

(C) 3

(D) 9

3 What is the sum of all solutions to $|2x - 5| = 3x + 10$?

- (A) -16
- (B) -15
- (C) -1
- (D) 1

4 A circle has a radius of 6. The length of minor arc AB is 4π . What is the area of the minor sector bounded by radii OA and OB , where O is the center of the circle?

- (A) 12π
- (B) 24π
- (C) 36π
- (D) 6π

5 A car travels 680 kilometers. The car's fuel efficiency is 34 miles per gallon, and gasoline costs \$3.40 per gallon. What is the cost, in dollars, of the gasoline used for the trip? (Use 1 mile = 1.6 kilometers.)

- (A) \$42.50
- (B) \$68.00
- (C) \$108.80
- (D) \$12.50

6 The polynomial $p(x) = 2x^3 - 5x^2 + kx - 6$, where k is a constant, leaves a remainder of 4 when divided by $x - 2$. What is the value of $p(-1)$?

- (A) 7
- (B) -6
- (C) -13
- (D) -20

7

$$3x - ky = 8$$

$$6x + 4y = 5$$

In the system of equations, k is a constant. If the system has no solution, what is the value of k ?

- (A) 2
- (B) -2
- (C) 8
- (D) -8

8

A caterer charges a flat fee plus a fixed amount per guest. The total charge is \$1,180 for 40 guests and \$1,705 for 65 guests. What is the caterer's flat fee, in dollars?

- (A) 21
- (B) 525
- (C) 340
- (D) 840

9

A cylindrical tank with radius 3 feet and height 10 feet is filled with water to 80% of its capacity. All of the water is poured into an empty rectangular tank whose base measures 6 feet by 4 feet. How deep, in feet, is the water in the rectangular tank?

- (A) π
- (B) 3.75π
- (C) 12π
- (D) 3π

10

The function $f(t) = 800(1.21)^t$ models a quantity t years after it was first measured. Which equivalent form of $f(t)$ shows, as a constant or coefficient, the percent increase in the quantity every half-year?

- (A) $f(t) = 800(1.105)^{2t}$
- (B) $f(t) = 800(1.1)^{2t}$
- (C) $f(t) = 800(1.21)^{t/2}$
- (D) $f(t) = 800(1.4641)^{t/2}$

- 11 In the equation $a(2x + 3) - 4x = 6x + b$, a and b are constants. If the equation has infinitely many solutions, what is the value of $a + b$?

Your answer

- 12 A random sample of 400 households was selected from a city with 52,000 households. In the sample, 38% of households had solar panels. Based on the sample, the margin of error for the percent of all households in the city with solar panels is 4.6 percentage points. Which of the following is the most plausible number of households in the city that have solar panels?

(A) 152
(B) 15,000
(C) 20,500
(D) 24,000

- 13 In the xy -plane, the graphs of $y = x^2 - 4x + c$ and $y = 2x - 3$, where c is a constant, intersect at exactly one point. What is the value of c ?

Your answer

- 14 In triangle XYZ , angle Y is a right angle and $\cos X = 0.6$. Point W lies on side XZ so that $\overline{YW}$ is perpendicular to $\overline{XZ}$. What is the value of $\cos(\angle XYW)$?

(A) 0.6
(B) 0.75
(C) 0.8
(D) 1.25

- 15 The graph of $y = f(x)$ in the xy -plane passes through the point $(2, 5)$. The function g is defined by $g(x) = 3f(x - 4) - 1$. Which point must lie on the graph of $y = g(x)$?

(A) $(6, 14)$
(B) $(-2, 14)$
(C) $(6, 12)$
(D) $(2, 14)$

16

$$y < 3x - 1$$

$$y > -x + 11$$

$$y \geq 2x - 9$$

For which of the following values of k does the point $(k, 5)$ satisfy all three inequalities?

(A) 2
(B) 6
(C) 7.5
(D) 6.5

- 17 The price of a stock increased by 25% on Monday and then decreased by $p\%$ on Tuesday. At the end of Tuesday, the price was 10% lower than it was at the start of Monday. What is the value of p ?

Your answer

18

$$\frac{x}{x-3} - \frac{2}{x+1} = \frac{12}{(x-3)(x+1)}$$

What is the solution set of the given equation?

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

- 19 In the xy -plane, the circle with equation $(x - 4)^2 + (y + 1)^2 = 25$ intersects the x -axis at two points. What is the distance between these two points?

(A) $2\sqrt{6}$
(B) $4\sqrt{6}$
(C) 8
(D) 10

- 20 For how many integer values of x is $(x - 2)(x + 1)^2(x - 5) \leq 0$?

Your answer

- 21** Pipe A alone can fill a tank in 6 hours. Pipes A and B working together can fill the tank in 4 hours. How many hours would it take pipe B alone to fill the tank?

(A) 2
(B) 2.4
(C) 10
(D) 12

- 22** The function f is defined by $f(x) = ax^2 + bx + c$. The graph of $y = f(x)$ in the xy -plane passes through the points $(0, 6)$ and $(2, 6)$, and the minimum value of f is -2 . What is the value of $f(5)$?

Your answer

STOP. This is the end of Math, Module 2.

Answer Sheet

Fill in one bubble per question. Write grid-in answers in the boxes.

Reading and Writing, Module 1

- | | |
|--------------------|--------------------|
| 1 (A) (B) (C) (D) | 2 (A) (B) (C) (D) |
| 3 (A) (B) (C) (D) | 4 (A) (B) (C) (D) |
| 5 (A) (B) (C) (D) | 6 (A) (B) (C) (D) |
| 7 (A) (B) (C) (D) | 8 (A) (B) (C) (D) |
| 9 (A) (B) (C) (D) | 10 (A) (B) (C) (D) |
| 11 (A) (B) (C) (D) | 12 (A) (B) (C) (D) |
| 13 (A) (B) (C) (D) | 14 (A) (B) (C) (D) |
| 15 (A) (B) (C) (D) | 16 (A) (B) (C) (D) |
| 17 (A) (B) (C) (D) | 18 (A) (B) (C) (D) |
| 19 (A) (B) (C) (D) | 20 (A) (B) (C) (D) |
| 21 (A) (B) (C) (D) | 22 (A) (B) (C) (D) |
| 23 (A) (B) (C) (D) | 24 (A) (B) (C) (D) |
| 25 (A) (B) (C) (D) | 26 (A) (B) (C) (D) |
| 27 (A) (B) (C) (D) | |

Math, Module 1

- | | |
|-------------------------|-------------------------|
| 1 (A) (B) (C) (D) | 2 (A) (B) (C) (D) |
| 3 (A) (B) (C) (D) | 4 <input type="text"/> |
| 5 (A) (B) (C) (D) | 6 <input type="text"/> |
| 7 (A) (B) (C) (D) | 8 <input type="text"/> |
| 9 (A) (B) (C) (D) | 10 (A) (B) (C) (D) |
| 11 <input type="text"/> | 12 (A) (B) (C) (D) |
| 13 (A) (B) (C) (D) | 14 (A) (B) (C) (D) |
| 15 (A) (B) (C) (D) | 16 (A) (B) (C) (D) |
| 17 (A) (B) (C) (D) | 18 (A) (B) (C) (D) |
| 19 (A) (B) (C) (D) | 20 <input type="text"/> |
| 21 <input type="text"/> | 22 (A) (B) (C) (D) |

Reading and Writing, Module 2

- | | |
|--------------------|--------------------|
| 1 (A) (B) (C) (D) | 2 (A) (B) (C) (D) |
| 3 (A) (B) (C) (D) | 4 (A) (B) (C) (D) |
| 5 (A) (B) (C) (D) | 6 (A) (B) (C) (D) |
| 7 (A) (B) (C) (D) | 8 (A) (B) (C) (D) |
| 9 (A) (B) (C) (D) | 10 (A) (B) (C) (D) |
| 11 (A) (B) (C) (D) | 12 (A) (B) (C) (D) |
| 13 (A) (B) (C) (D) | 14 (A) (B) (C) (D) |
| 15 (A) (B) (C) (D) | 16 (A) (B) (C) (D) |
| 17 (A) (B) (C) (D) | 18 (A) (B) (C) (D) |
| 19 (A) (B) (C) (D) | 20 (A) (B) (C) (D) |
| 21 (A) (B) (C) (D) | 22 (A) (B) (C) (D) |
| 23 (A) (B) (C) (D) | 24 (A) (B) (C) (D) |
| 25 (A) (B) (C) (D) | 26 (A) (B) (C) (D) |
| 27 (A) (B) (C) (D) | |

Math, Module 2

- | | |
|-------------------------|-------------------------|
| 1 <input type="text"/> | 2 (A) (B) (C) (D) |
| 3 (A) (B) (C) (D) | 4 (A) (B) (C) (D) |
| 5 (A) (B) (C) (D) | 6 (A) (B) (C) (D) |
| 7 (A) (B) (C) (D) | 8 (A) (B) (C) (D) |
| 9 (A) (B) (C) (D) | 10 (A) (B) (C) (D) |
| 11 <input type="text"/> | 12 (A) (B) (C) (D) |
| 13 <input type="text"/> | 14 (A) (B) (C) (D) |
| 15 (A) (B) (C) (D) | 16 (A) (B) (C) (D) |
| 17 <input type="text"/> | 18 (A) (B) (C) (D) |
| 19 (A) (B) (C) (D) | 20 <input type="text"/> |
| 21 (A) (B) (C) (D) | 22 <input type="text"/> |

Answer Key

Count your correct answers in each module

Reading and Writing, Module 1

1	B	Words in Context
2	C	Words in Context
3	A	Words in Context
4	B	Words in Context
5	A	Text Structure and Purpose
6	D	Text Structure and Purpose
7	C	Cross-Text Connections
8	D	Central Ideas and Details
9	B	Central Ideas and Details
10	C	Command of Evidence (Textual)
11	C	Command of Evidence (Textual)
12	A	Command of Evidence (Quantitative)
13	C	Command of Evidence (Quantitative)
14	D	Inferences
15	B	Inferences
16	C	Form, Structure, and Sense
17	D	Boundaries
18	D	Form, Structure, and Sense
19	A	Boundaries
20	B	Form, Structure, and Sense
21	A	Form, Structure, and Sense
22	D	Boundaries
23	A	Transitions
24	C	Transitions
25	A	Rhetorical Synthesis
26	B	Rhetorical Synthesis
27	B	Rhetorical Synthesis

Math, Module 1

1	A	Linear equations in one variable
2	B	Percentages
3	D	Linear functions
4	97.5 or 195/2	Lines, angles, and triangles
5	B	Nonlinear functions (exponential)
6	8	Systems of linear equations
7	C	One-variable data: center
8	4	Nonlinear equations (quadratic)

Reading and Writing, Module 2

1	A	Words in Context
2	C	Words in Context
3	D	Words in Context
4	B	Words in Context
5	A	Text Structure and Purpose
6	D	Text Structure and Purpose
7	B	Cross-Text Connections
8	C	Central Ideas and Details
9	A	Central Ideas and Details
10	B	Command of Evidence (Textual)
11	C	Command of Evidence (Textual)
12	B	Command of Evidence (Quantitative)
13	D	Command of Evidence (Quantitative)
14	A	Inferences
15	C	Inferences
16	D	Form, Structure, and Sense
17	C	Form, Structure, and Sense
18	B	Boundaries
19	C	Form, Structure, and Sense
20	A	Boundaries
21	A	Form, Structure, and Sense
22	B	Boundaries
23	D	Transitions
24	C	Transitions
25	D	Rhetorical Synthesis
26	B	Rhetorical Synthesis
27	D	Rhetorical Synthesis

Math, Module 2

1	12	Systems of linear equations
2	B	Linear functions (perpendicular lines)
3	C	Nonlinear equations (absolute value)
4	A	Circles (arcs and sectors)
5	A	Rates and units
6	D	Polynomials (remainder theorem)
7	B	Systems of linear equations (no solution)
8	C	Linear equations in two variables
9	D	Volume

9	A	Linear inequalities
10	D	Circles
11	150	Rates and units
12	C	Function notation (composition)
13	A	Linear equations in two variables
14	B	Equivalent expressions
15	C	Probability and conditional probability
16	D	Exponents and radicals
17	A	Right triangle trigonometry
18	C	Nonlinear functions (quadratic)
19	D	Linear functions
20	150	Similar triangles (area)
21	14	Nonlinear equations: discriminant
22	B	Nonlinear functions (quadratic)

10	B	Equivalent expressions (exponential)
11	20	Linear equations (infinitely many solutions)
12	C	Inference from sample statistics
13	6	Nonlinear systems: discriminant
14	C	Right triangle trigonometry
15	A	Function transformations
16	D	Systems of linear inequalities
17	28	Percentages
18	A	Nonlinear equations (rational)
19	B	Circles
20	5	Polynomials (sign analysis)
21	D	Rates (work)
22	126	Nonlinear functions (quadratic)

Estimate your Reading and Writing score

Add your correct answers from both Reading and Writing modules (out of 54).

Raw	Score	Raw	Score
0	200	28	520
1	220	29	520
2	240	30	530
3	250	31	540
4	270	32	550
5	290	33	560
6	300	34	570
7	320	35	580
8	340	36	580
9	350	37	590
10	360	38	600
11	370	39	610
12	380	40	620
13	390	41	630
14	400	42	640
15	410	43	650
16	420	44	660
17	420	45	680
18	430	46	690
19	440	47	700
20	450	48	710
21	460	49	730
22	470	50	740
23	480	51	760
24	480	52	770
25	490	53	780
26	500	54	800
27	510		

Estimate your Math score

Add your correct answers from both Math modules (out of 44). Add the two section scores for your total.

Raw	Score	Raw	Score
0	200	23	540
1	220	24	550
2	240	25	560
3	260	26	570
4	280	27	580
5	310	28	590
6	330	29	600
7	350	30	610
8	370	31	620
9	390	32	640
10	400	33	650
11	410	34	660
12	430	35	680
13	440	36	690
14	450	37	700
15	460	38	710
16	470	39	730
17	480	40	740
18	490	41	760
19	500	42	770
20	510	43	790
21	520	44	800
22	530		

Reading and Writing, Module 1

1. B. The colon introduces the reason for the caution: the crews sampled only some depths and one season, so fish were probably *missed*. A list that leaves things out is *incomplete*. *Obsolete* is tempting because the survey is old, but the text faults its sampling, not its age. Nothing suggests invented data (*fabricated*) or internal conflict (*contradictory*).

2. C. Every line does double duty and extra marks are rare, so the prints use very little: they are *sparse*. *Ornate* is the opposite (heavily decorated). Nothing suggests timidity (*hesitant*) or copying (*derivative*).

3. A. Mr. Abernathy explains the schedule as if he had written it: *air* describes the way he carries himself, his *manner*. *Atmosphere* and *breeze* are other senses of “air” that don’t fit a person’s bearing, and *melody* (as in “an air”) is a musical sense.

4. B. Praise plus eleven conditions, some unmeetable, is approval with reservations: *qualified*. *Enthusiastic* grabs only the first half of the colon’s evidence (“praised the plan’s goals at length”) and ignores the “but.” Nothing in the text concerns the vote count (*unanimous*) or timing (*premature*).

5. A. Sentence 1 gives the assumption (color only warns predators), sentence 2 an observation it can’t explain (mate choice with no predators around), sentence 3 Ruiz’s conclusion. Choice C is the trap: Ruiz *noticed* something; she wasn’t testing a prior hypothesis, and her result undercuts the old view rather than confirming it. There is no two-sided debate (B), and nothing calls her methods flawed (D).

6. D. The second sentence names the risk (a stylus damages the grooves); the underlined sentence describes a method in which “nothing touch[es] the wax.” That is a way around the risk. It doesn’t explain the cracking (A) or dispute fragility (B); in fact it accepts it. The recordings’ content (C) comes up only in the last sentence, and only vaguely.

7. C. The economists credit price alone and describe drivers canceling low-value trips. Osei finds that most of the drop came from switching to buses that the fee’s revenue improved, and that cancellations were a small share. So the price-only account misses the transit piece. A contradicts Osei’s own finding that car trips dropped. D gets the direction backward: the economists never mention switching to buses; Osei is the one who emphasizes it.

8. D. The last two sentences explain the delay: while work remains, the boat is a shared project with his grandfather; once it sails, that ends. A is contradicted by “the hull was sound and the mast stood straight.” B misses that Paulo agrees with his sister (“She was not wrong”). Nothing mentions selling (C).

9. B. The last sentence ties success to the fences: crabs use the underpasses where fences guide them and walk onto the road where fences are missing. A mixes up the two measures: road closures are a separate strategy for *other* roads. C and D are never stated.

10. C. The hypothesis links two things: facing east → warmer head → more bees. C isolates warmth: west-facing heads lose visits, but adding heat restores them, which points to warmth as the cause. A concerns leaf growth, not bees. B, if anything, works against a morning-warmth effect. D describes behavior but says nothing about bees.

11. C. The claim has two parts: the work is *done*, and the town hasn’t *started*. C gives both: the racks are full and the bakers have left while the first shop is still locked. A and B describe the work in progress, with nothing about the town. D shows the town active at noon, after the fact, so it doesn’t show the timing contrast.

12. A. Arai’s conclusion is a comparison *between sites*, split by feeding type. A gives both halves: surface feeders up (31 vs 18, 24 vs 15), deep feeders roughly flat (9 vs 10, 12 vs 12). B compares species, not sites. C is accurate but covers one deep-water species and says nothing about surface feeders. D gives a total for one site with nothing to compare it to.

13. C. The claim is about print *not* suffering while digital grew, so the evidence has to show both: digital up and print holding steady or rising. C does. B is the trap: its numbers are real but come from 2019 to 2021, not 2023, and print falling would undercut the librarian. A and D show digital growth only and say nothing about print.

14. D. People hauled this stone up to 300 km to places that had usable stone nearby. The likeliest reason is that they preferred it. A is contradicted: several sites had suitable stone closer by. B is about an earlier period the text never covers. C would make the long haul *less* sensible, not more.

15. B. Mite numbers were the same with or without yarrow, yet chicks still did better, so whatever helps them isn’t fewer parasites. A overreaches (“must”); chicks in plain nests survived. C draws a conclusion about mites the study didn’t test. D is contradicted by the equal mite counts.

16. C. Strip the clause between commas and the sentence reads “The Chauvet Cave ... _____ in 1994.” It has no main verb yet, so the blank needs a finite one. Only *was discovered* is finite and fits “by three cave explorers.” B and D are nonfinite. A is finite only as an active verb (the cave discovered something), which clashes with “by ... explorers.”

17. D. Both halves are complete sentences, so they need a semicolon (or a period) between them, and the introductory “after that” takes a comma. A and C join two sentences with only a comma (a comma splice). B has no boundary punctuation at all.

18. D. The subject is *collection* (singular); “of more than 300 hand-drawn maps that ...” is a long modifier. “Now” calls for present tense: *is*. A, B, and C are plural verbs that agree with *maps*, the nearest noun, which is the trap.

19. A. The phrase about the gloves interrupts the sentence and opens with a dash, so it must close with a dash. A comma (B) or semicolon (C) can’t close a dash-opened interruption, and D leaves it unclosed, making “movement translates” read as the main clause.

20. B. The sentence already has its subject and main verb (*Matsuda recorded*). After the comma, the blank begins a modifier that describes what the recording showed, so it needs the nonfinite *finding*. A makes a second complete sentence after a comma (a comma splice). C and D are finite verbs with no subject or conjunction to attach them.

21. A. Twelve costumes belong to twelve dancers, so you need a plural possessive: *dancers’*. B is singular possessive (one dancer). C is a plain plural with no possession. D isn’t a standard form for a plural ending in *s*.

22. D. A complete clause (“The exhibit brings together three kinds of objects”) introduces a list, which is the colon’s job. A semicolon (A) must join two complete clauses. “Such as” followed by a colon (B) is redundant and incorrect. “Which” (C) starts a clause that never gets its verb.

23. A. The first sentence gives the benefit of deep plowing; the second gives a cost that cuts against it. That’s a contrast: *however*. “Therefore” wrongly makes erosion the purpose or result of the advice; “for example” and “similarly” don’t fit a downside.

24. C. The contrast with other sharks is already made in the second sentence. The blank’s sentence states a *consequence* of that ability: because it can breathe while still, it can rest for hours. “By contrast” repeats a contrast that’s already been drawn, and there is nothing in the last sentence to contrast with the one before it. “Nevertheless” implies the resting happens despite the gill pumping.

25. A. The goal names two things (both bodies of water) and one relationship (contrast in tidal range). A gives both ranges side by side. B covers only Fundy, C only the Mediterranean’s shape, and D gives a similarity (both have tides) wrapped in a contrast word.

26. B. Only B contrasts their *materials*: homegrown plant dyes vs store-bought glazes. A opens with a contrast word but its actual content is a similarity (both sold out). C names Park’s medium, not her materials. D is a similarity.

27. B. The goal asks for an explanation (a reason), so the answer needs the two supporting facts: neurons are mostly in the arms, and severed arms still act. B gives both. D flips the second note (two-thirds are in the arms, not the brain). A and C describe the research without giving a reason.

Reading and Writing, Module 2

1. A. Benavides grants the growth (“did grow quickly”) but says it wasn’t “unchecked.” The reputation exaggerates: it is *somewhat overstated*. *Unfounded* is too strong; it would mean there was no basis at all, yet she concedes the growth happened. *Irrefutable* reverses her point.

2. C. The sentence says the label “austere” holds up *only if* you read selectively, since the quoted poems are spare but much of the rest isn’t. A label that holds up only under that condition is *defensible* only that way. *Misleading* flips the logic: the description isn’t misleading *only* when read selectively; selective reading is what makes it work.

3. D. The houses are the same but seem to have “drawn ... nearer to the ground,” and the spire seems lower: the village appears to have sunk or *settled*. *Expanded* and *modernized* contradict “the same houses ... the same lane.” *Vanished* contradicts the houses still standing.

4. B. “Although” sets up a contrast with the discrepancies, so in broad outline the account must have agreed with the evidence: *consistent with*. *Identical to* is too strong for something that has discrepancies. *Incompatible with* removes the contrast that “although” requires.

5. A. “Yet” signals a turn: after the long-held view (invasives cause harm), the sentence brings in studies showing invasives sometimes help native animals, which complicates that view. Sjöberg’s conclusion (C) comes in the *next* sentence. D reverses her position: she says the findings are *not* a defense of invasions. B gets the direction of the evidence backward.

6. D. The passage piles up her caution (instructions he's already following, checking the mirror after he does, not yet out of the driveway). The last sentence has her realize the spotless record may owe something to that caution rather than "entirely" to skill. Nothing suggests the record is false (A) or that she has made a decision about Desmond (B). The sentence doesn't explain her repetition (C); it reflects on the record itself.

7. B. Baek "does not dispute the benefits for single buildings" but warns that citywide use can weaken sea breezes and reduce inland rain. That is B. A contradicts her acceptance of the building-level effect. C reverses both her stance (she urges caution before mandates) and the model's result (less rain). D also gets the rainfall direction wrong.

8. C. Lim's data show that large employers didn't distinguish growing from shrinking towns, while proximity to a mid-sized city did. D restates the view Lim's data *complicate*. A invents a causal claim (employers cause loss). B overgeneralizes from "more likely to lie within a 30-minute drive" to "most residents commute."

9. A. The second version was dropped "because she could not decide whether the story flattered him," meaning she couldn't tell whether it reflected well on him. B is the reason for abandoning the *first* version. Length (C) is mentioned only for the third, and memory (D) never comes up.

10. B. If people stayed through the drought, even expanding food storage, and remained for decades after it ended, the drought can't explain their leaving. That weakens the hypothesis. A and D are evidence that the drought happened, which *supports* the hypothesis, as does C (a regional pattern fits a regional drought).

11. C. The portrayal has two parts: generosity, and refusing to acknowledge it. C has both: a weekly two-hour detour for his mother, brushed off with "going that way anyway." A shows generosity but a careful accounting of it, not a refusal to acknowledge it. B shows helpfulness with no deflection. D shows reserve with no generosity.

12. B. The caution compares shaded sidewalks in the hottest city with sidewalks in a mild one. B does exactly that: shade in Phoenix (43°C) still beats *unshaded* Seattle (41°C). A is true but shows how well shade works, which is the opposite emphasis. C and D stay within one city and don't compare hot with mild.

13. D. To weaken "concentrated among younger adults," show that older adults dropped more. D does: 3 points for 18–29 vs 12 points for 60+. A compares levels, not declines. B says every group fell but not where the drop was concentrated. C shows a younger group declining, which leans toward *supporting* the critic.

14. A. Alone in garden soil the species do fine, even better; with competitors they lose. So the soil chemistry isn't what they need; serpentine is where competitors can't follow. B is contradicted by the better growth in garden soil. C ignores the setup: grasses mostly can't grow on serpentine. D has no support.

15. C. If writers projected their own era's procedures backward, a tenth-century reconstruction built from the sagas would carry thirteenth-century practice in it. A makes a comparison the text gives no basis for. B contradicts the vivid lawsuit details. D contradicts the stated dates.

16. D. Subject: *The Polynesian navigators*. Then comes a "who" clause and a long "reading ..." phrase, and the sentence still has no main verb. The blank must supply a finite verb: *completed*. A, B, and C are all nonfinite and would leave the sentence a fragment.

17. C. "The city restored a creek" is complete. The phrase after the comma describes the result of the restoration, so it takes a nonfinite participle: *returning*. A and B are finite verbs left with no subject after a comma. D is grammatical in form but shifts to present tense for a 2021 event.

18. B. Each list item contains its own comma (name, description), so the items are separated by semicolons, as the rest of the list shows ("Portugal; and"). A comma (A) would blur the items together; a colon (C) doesn't separate list items; no punctuation (D) runs two items together.

19. C. With "neither ... nor," the verb agrees with the nearer subject, *the engineers*, which is plural: *have been*. A, B, and D are singular and agree with *architect* instead.

20. A. Two complete clauses need a semicolon (or period) between them, and the adverb *rather* that opens the second clause takes a comma after it. B and C are comma splices, and D has no boundary punctuation at all.

21. A. "By the time" plus a past event (2019) calls for the past perfect: the erosion was complete before the team arrived. B and D are present tense for a past situation. C projects into the future.

22. B. The clause "who has collected ... eruption" is nonessential (the name already identifies him), and it closes with a comma before "found," so it must open with a comma too. A leaves it unopened. C uses a semicolon, which can't introduce a dependent clause. D opens with a dash but closes with a comma, which is a mismatch.

23. D. The recordings show full, novel sentences, which contradicts the old assumption of a few fixed messages. The relationship is contrast: *however*. "For instance" would make the recordings an example of the old assumption. "In other words" would make them a restatement of it.

24. C. Hosts adapted to cuckoos; cuckoos adapted back. That's a reciprocal response: *in turn*. "By contrast" sounds right because the subject switches from hosts to cuckoos, but the two adaptations aren't opposed; one answers the other. "Nevertheless" wrongly suggests mimicry happened despite host rejection rather than because of it.

25. D. D states a shared challenge, which is the similarity the last note describes. C opens with "Like," a similarity word, but its content is wrong: only Luna 3's images are described as blurry. A and B give differences, B even though it draws on the right note.

Math, Module 1

1. A. Treat $x - 3$ as one unit: $4(x - 3) = 16$, so $x - 3 = 4$. Choice B is x itself, which you get by solving all the way down.

2. B. Multiply the multipliers: $0.70 \times 0.90 = 0.63$, so 63%. Adding the discounts (40% off, giving 60%) is the trap: the second discount applies to a smaller price.

3. D. Slope: $\frac{17 - 11}{3 - 1} = 3$. Then $11 = 3(1) + b$ gives $b = 8$. Check $x = 6$: $3(6) + 8 = 26$. Choice B uses $f(1) = 11$ as the y -intercept, but the intercept is $f(0)$.

4. 97.5 or 195/2. The marked angles are same-side interior angles between parallel lines, so they add to 180° : $(3x + 12) + (5x - 20) = 180$, so $8x = 188$ and $x = 23.5$. The angles are $3(23.5) + 12 = 82.5^\circ$ and $5(23.5) - 20 = 97.5^\circ$. The question asks for the larger *angle*, not x . Accept 97.5 or 195/2.

5. B. There are two 30-minute periods per hour, so after t hours the 8% growth has applied $2t$ times: $1,500(1.08)^{2t}$. Choice A applies it only once every 2 hours. Choice C adds the rates instead of compounding them ($1.08^2 = 1.1664$, not 1.16).

6. 8. From the second equation, $x = y - 2$. Substituting: $2(y - 2) + 3y = 21$, so $5y = 25$ and $y = 5$; then $x = 3$. The question asks for $x + y = 8$.

7. C. Mean: $143/7 \approx 20.4$ becomes $103/6 \approx 17.2$. Median: the middle of 7 values is 18; the middle of the remaining 6 is $(15 + 18)/2 = 16.5$. Both drop. The common trap (A) assumes removing an outlier never moves the median, but removing any value from one end shifts the middle position.

8. 4. $x^2 - 10x + 21 = (x - 3)(x - 7)$, so the solutions are 3 and 7, which differ by 4.

9. A. $180 + 35b \leq 1,200$ gives $b \leq \frac{1,020}{35} \approx 29.1$, so the most whole boxes is 29. Rounding up to 30 breaks the limit. Choice D ignores the driver ($1,200/35 \approx 34.3$).

26. B. A consequence needs the finding plus what follows from it. B links earlier leaf-out near streetlights to frost risk. C reverses which trees leafed out first. A gives the method, and D gives the finding with no consequence.

27. D. D states the belief and then the finding that contradicts it. C has the right contrast word but no finding: "blind tests have compared" says a test happened, not what it showed. B presents the belief as fact and supports it. A just restates the belief.

10. D. Complete the square: $(x^2 - 6x + 9) + (y^2 + 8y + 16) = 25$, so $(x - 3)^2 + (y + 4)^2 = 25$. The radius is $\sqrt{25} = 5$. Choice A is r^2 ; choice B is the diameter.

11. 150. $45 \div 18 = 2.5$ minutes, and $2.5 \times 60 = 150$ seconds. Stopping at 2.5 answers in the wrong unit.

12. C. Work from the inside out: $g(-1) = -5$, then $f(-5) = 2(25) - 3(-5) = 50 + 15 = 65$. Choice A is $g(f(-1)) = g(5) = 1$, which applies the functions in the wrong order.

13. A. Let a be the number of adult tickets. Then $12a + 8(3a) = 36a = 432$, so $a = 12$, and there are $3(12) = 36$ child tickets. Choice B is the number of adult tickets.

14. B. $(3x - 2)^2 = 9x^2 - 12x + 4$ and $(x + 4)(x - 4) = x^2 - 16$. Subtracting: $9x^2 - 12x + 4 - x^2 + 16 = 8x^2 - 12x + 20$. Choice A forgets to distribute the minus sign to -16 .

15. C. The condition ("a student who rides the bus") sets the denominator: 55 bus riders. Of those, 25 are in grade 11: $\frac{25}{55} = \frac{5}{11}$. Choice A uses all 100 students, and B uses all grade 11 students.

16. D. Add exponents in the numerator and subtract the denominator's: $\frac{5}{3} - \frac{1}{3} - \frac{2}{3} = \frac{2}{3}$. And $x^{2/3} = \sqrt[3]{x^2}$. Choice C stops after the numerator; choice A adds the denominator's exponent instead of subtracting.

17. A. $\sin A = \frac{BC}{AB} = \frac{5}{13}$, so take $BC = 5$ and $AB = 13$; then $AC = 12$. For angle B , the opposite side is AC and the adjacent side is BC : $\tan B = \frac{12}{5}$. Choice B is $\tan A$.

18. C. The vertex is at $x = -\frac{12}{2(-2)} = 3$, and $f(3) = -18 + 36 + 5 = 23$. Choice A is where the maximum occurs, not its value.

19. D. Rate: $(240 - 176) \div 8 = 8$ liters per minute. From full, $240 \div 8 = 30$ minutes. Choice A is the time remaining *after* the first 8 minutes, which answers a different question.

20. 150. The scale factor is $15/6 = 2.5$, and areas scale by the square: $24 \times 2.5^2 = 24 \times 6.25 = 150$. Multiplying by 2.5 gives 60, which scales the area like a length.

Math, Module 2

1. 12. Add the equations: $(7x + 3x) + (-3y + 5y) = 11 + 1$, so $10x + 2y = 12$. Solving for x and y separately works too but takes longer.

2. B. Slope of ℓ : $\frac{-9 - 7}{5 - (-3)} = -2$, so line k has slope $\frac{1}{2}$. Then $y - 1 = \frac{1}{2}(x - 4)$ gives $y = \frac{1}{2}x - 1$; the intercept is -1 . Choice A uses slope 2 (sign flipped but not reciprocated), C uses $-\frac{1}{2}$, and D uses ℓ 's own slope.

3. C. Case 1: $2x - 5 = 3x + 10$ gives $x = -15$, but then the right side is $3(-15) + 10 = -35 < 0$, which an absolute value can't equal. Reject it. Case 2: $-(2x - 5) = 3x + 10$ gives $x = -1$, and the right side is $7 \geq 0$. Only -1 works. Choice A keeps the extraneous solution.

4. A. Central angle: $\theta = \frac{4\pi}{6} = \frac{2\pi}{3}$. Sector area: $\frac{1}{2}r^2\theta = \frac{1}{2}(36)\left(\frac{2\pi}{3}\right) = 12\pi$. Equivalently, the arc is $\frac{4\pi}{12\pi} = \frac{1}{3}$ of the circumference, so the sector is $\frac{1}{3}$ of 36π .

5. A. $680 \div 1.6 = 425$ miles; $425 \div 34 = 12.5$ gallons; $12.5 \times 3.40 = \$42.50$. Choice D is the number of gallons, not dollars. B skips the unit conversion, and C converts in the wrong direction.

6. D. Remainder theorem: $p(2) = 4$. That gives $16 - 20 + 2k - 6 = 4$, so $2k = 14$ and $k = 7$. Then $p(-1) = -2 - 5 - 7 - 6 = -20$. Choice A is k ; choice B comes from using $k = -7$.

7. B. No solution means parallel lines: the x - and y -coefficients are proportional but the constants aren't. Since $6 = 2 \cdot 3$, we need $4 = 2(-k)$, so $k = -2$. Check the constants: $5 \neq 2 \cdot 8$, so the lines are distinct. Choice A drops the minus sign in front of k .

8. C. Per-guest charge: $\frac{1,705 - 1,180}{65 - 40} = \frac{525}{25} = 21$. Flat fee: $1,180 - 40(21) = 340$. Choice A is the per-guest rate, the first thing you find.

9. D. Water volume: $0.8 \cdot \pi(3^2)(10) = 72\pi$ cubic feet. Depth: $72\pi \div (6 \cdot 4) = 3\pi$ feet. B forgets the 80%; A forgets to square the radius; C divides by only one side of the base.

21. 14. Exactly one real solution means the discriminant is zero: $k^2 - 4(1)(49) = 0$, so $k^2 = 196$ and $k = 14$ (positive).

22. B. The zeros are 2 and -6 , so the vertex is midway at $x = -2$. Then $f(-2) = a(-4)(4) = -16a = -32$, so $a = 2$. A positive a matches the graph having a minimum. Choice A gets the sign wrong (a negative a would give a maximum).

10. B. $1.21 = 1.1^2$, so $1.21^t = (1.1^2)^t = 1.1^{2t}$. With $2t$ half-years in t years, the base 1.1 is the half-year growth factor: 10% per half-year. Choice D is also equivalent ($1.4641^{t/2} = 1.21^t$), but it shows the two-year factor. Choice A halves the rate instead of taking a square root, and C isn't equivalent.

11. 20. Expand: $(2a - 4)x + 3a = 6x + b$. Infinitely many solutions requires matching coefficients and constants: $2a - 4 = 6$ gives $a = 5$, and $b = 3a = 15$. So $a + b = 20$.

12. C. The plausible range is $38\% \pm 4.6\%$, or 33.4% to 42.6% of 52,000: about 17,370 to 22,150 households. Only 20,500 is in that range. Choice A is 38% of the *sample*; B and D fall outside the margin.

13. 6. Set equal: $x^2 - 4x + c = 2x - 3$, so $x^2 - 6x + (c + 3) = 0$. One intersection means a zero discriminant: $36 - 4(c + 3) = 0$, so $c + 3 = 9$ and $c = 6$.

14. C. Triangle XYW has its right angle at W , so $\angle XYW = 90^\circ - \angle X$. Then $\cos(\angle XYW) = \sin X = \sqrt{1 - 0.6^2} = 0.8$. Choice A is $\cos X$, which you'd get by assuming the angles are equal.

15. A. We need $x - 4 = 2$, so $x = 6$. Then $g(6) = 3f(2) - 1 = 3(5) - 1 = 14$. Choice B shifts left instead of right; choice C subtracts the 1 before multiplying.

16. D. Substitute $y = 5$. First: $5 < 3k - 1$ gives $k > 2$. Second: $5 > -k + 11$ gives $k > 6$. Third: $5 \geq 2k - 9$ gives $k \leq 7$. So $6 < k \leq 7$, and only 6.5 fits. Choice B fails the strict inequality, and C breaks $k \leq 7$.

17. 28. $1.25 \left(1 - \frac{p}{100}\right) = 0.90$, so $1 - \frac{p}{100} = 0.72$ and $p = 28$. The tempting 35 (that is, $25 + 10$) treats percents as if they added.

18. A. Multiply by $(x - 3)(x + 1)$: $x(x + 1) - 2(x - 3) = 12$, so $x^2 - x - 6 = 0$, or $(x - 3)(x + 2) = 0$. But $x = 3$ makes a denominator zero, so it's extraneous. Only -2 remains. Choice C keeps the extraneous root.

19. B. On the x -axis, $y = 0$: $(x - 4)^2 + 1 = 25$, so $x - 4 = \pm\sqrt{24}$. The distance is $2\sqrt{24} = 4\sqrt{6} \approx 9.8$. Choice A is $\sqrt{24}$, half the distance; choice D is the diameter, which would be right only if the chord passed through the center (it doesn't, since the center is at $y = -1$).

20. 5. Since $(x + 1)^2 \geq 0$, the sign depends on $(x - 2)(x - 5)$, which is ≤ 0 for $2 \leq x \leq 5$: the integers 2, 3, 4, 5. The squared factor adds one more: at $x = -1$ the product equals 0, which satisfies $\leq$. Total: 5.

21. D. Rates add: $\frac{1}{6} + \frac{1}{B} = \frac{1}{4}$, so $\frac{1}{B} = \frac{1}{4} - \frac{1}{6} = \frac{1}{12}$, and $B = 12$ hours. Choice A subtracts times instead of rates. Choice B is the time if two pipes with rates $\frac{1}{6}$ and $\frac{1}{4}$ worked together.

22. 126. Points with equal y -values at $x = 0$ and $x = 2$ put the axis of symmetry at $x = 1$, so $f(x) = a(x - 1)^2 - 2$. From $f(0) = a - 2 = 6$, $a = 8$. Then $f(5) = 8(16) - 2 = 126$.