Question 1-11 are based on the following passage.

This passage is adapted from David Z. Hambrick, "Winning SCRABBLE and the Nature of Expertise," © 2015 Scientific American.

SCRABBLE has been one of the most popular board games in the world for decades. And, now, as an increasingly popular domain for scientific research on expertise, it is giving psychologists a better understanding of the underpinnings of complex skill and a clearer picture of the origins of greatness. The overarching goal of this research is to better understand the interplay between "software" and "hardware" aspects of the cognitive system. Software factors include knowledge and skills that are acquired through experience, whereas hardware factors include genetically-influenced abilities and capacities. SCRABBLE is ideal for research on how these factors interact not only because it is relatively easy to find research participants from a wide range of skill, but because it can be imported into the lab.

The basic goal of SCRABBLE is to create intersecting words by placing lettered tiles on a board containing a 15 x 15 grid. Knowledge is, of course, critical for success in this task. If you want to become a great SCRABBLE player, first and foremost, you have to know a lot of words. You also need to be adept at identifying potential plays. Finally, you have to know SCRABBLE strategy—or what aficionados call "rack management"—such as how to keep a good mix of consonants and vowels.

People aren't born with this type of specialized knowledge. Research indicates that we may come into the world equipped with the building blocks for complex skills such as math, but certainly nothing as specific as knowledge of words in a particular language. Thus, experience is necessary to become an expert in SCRABBLE. And, in fact, SCRABBLE skill has been found to correlate positively with the amount of time people spend engaging in SCRABBLE-related activities. In one study, using official SCRABBLE rating as an objective measure of skill, researchers found that groups of "elite" and "average" SCRABBLE players differed in the amount of time they had devoted to things like studying word lists, analyzing previous SCRABBLE games, and anagramming—and not by a little. Overall, the elite group had spent an average of over 5,000 hours on SCRABBLE study, compared to only about 1,300 hours for the average group.

Clearly, expert SCRABBLE players are to some degree "made". But there is evidence that basic cognitive abilities play a role, too. In a study recently published in Applied Cognitive Psychology, Michael Toma and his colleagues found that elite SCRABBLE players outperformed college students from a highly selective university on tests of two cognitive abilities: working memory and visuospatial reasoning. Working memory is the ability to hold in mind information while using it to solve a problem, as when iterating through possible moves in a SCRABBLE game. Visuospatial reasoning is the ability to visualize things and to detect patterns, as when imagining how tiles on a SCRABBLE board would intersect after a certain play. Both abilities are influenced by genetic factors.

Further evidence pointing to a role of these abilities in SCRABBLE expertise comes from a recent brain imaging study by Andrea Protzner and her colleagues at the University of Calgary. Using functional magnetic resonance imaging (fMRI), these researchers recorded the brain activity of SCRABBLE players and control subjects as they performed a task in which they were shown groups of letters and judged whether they formed words. (fMRI measures brain activity by detecting changes in blood flow within different regions of the brain.) The major finding of this study was that competitive SCRABBLE players recruited brain regions associated with working memory and visual perception to perform this task to a greater degree than the control subjects did.

What might explain SCRABBLE experts' superiority in working memory and visuospatial reasoning? For the same basic reason that basketball players tend to be tall, a likely explanation is that people high in working memory and visuospatial reasoning abilities are people who tend to get into, and persist at, playing SCRABBLE: because it gives them an advantage in the game. This explanation fits with what behavioral geneticists call gene-environment correlation, which is the idea that our genetic makeup influences our experiences.

These findings add to an emerging understanding of complex skill that may ultimately bring expertise within reach of a larger number of people than is currently the case.

CONTINUE

Survey results of members with National Scrabble Association Ratings versus college students at a liberal arts college who have played Scrabble at some point but have never competed.

Variables	Scrabble experts	College students
Number of people	114	147
Ave. days per year spent playing scrabble	221.37	8.1

Questions	Scrabble experts answering yes	College students answering yes
Have you ever studied words from the *Official Scrabble Player's Dictionary* or a similar source?	99%	5%
Are there words that you know are legal in Scrabble, but you do not know what the word means?	89%	26%
When you play Scrabble do you **always** keep track of the letters that have been played, so you know if you are likely to get a rare letter that you might need?	80%	4.8%
When your opponent has the Scrabble board facing him or her, do you sometimes mentally rotate the board to imagine what it would look like if it were facing you?	17%	38%
When you think about the layout of Scrabble boards, do you know the point value for every square on the board (e.g. double or triple word/letter score tiles?)	70%	3%

1

The passage makes the most extensive use of which kind of evidence?

A) expert testimony.
B) scientific studies.
C) secondary sources.
D) statistical analysis.

2

The main effect of the term "hardware" line 8 is to suggest that the human brain

A) is more like a computer than people realize.
B) has particular characteristics that cannot be changed.
C) can be essentially reprogrammed through people's actions.
D) can be improved through the use of computers.

3

Evidence from the passage suggests that elite SCRABBLE players would be most likely to outperform non-elite SCRABBLE players in which of the following?

A) Gaining admission to a selective university.
B) Playing a board game like chess.
C) Solving a mathematical equation.
D) Learning a foreign language.

4

Which choice provides the best evidence for the claim that two people performing the same activity may be using different areas of the brain?

A) lines 17–19 ("Knowledge . . . words")
B) lines 32–37 ("In one . . . little")
C) lines 62–64 ("fMRI . . . brain")
D) lines 64–68 ("The major . . . did")

5

The author implies that people who experience great success in a given activity are often born with

A) advantages uniquely suited to that activity.
B) a drive to succeed in any activity.
C) parents who value success in that activity.
D) a desire to participate in many activities.

6

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

A) lines 28–32 ("Thus . . . activities")
B) lines 37–40 ("Overall . . . group")
C) lines 51–53 ("Visuospatial . . . play")
D) lines 70–75 ("For . . . game")

7

As used in line 33, "objective" most nearly means

A) perceptible.
B) sensory.
C) intentional.
D) unbiased.

8

The main purpose of paragraph 3 is to

A) trace the non-cognitive factors associated with SCRABBLE expertise.
B) show that average SCRABBLE players lack the genetic advantages of elite players.
C) examine the value of childhood training in predicting SCRABBLE success.
D) demonstrate that hard work is all it takes to become an elite SCRABBLE player.

CONTINUE

9

According to the chart, the question to which the smallest percentage of college students answered "yes" mainly tested the students'

A) vocabulary knowledge.
B) critical thinking.
C) working memory.
D) visuospatial reasoning.

10

Based on the passage and the chart, college students playing SCRABBLE are more likely than elite players to

A) make an effort to visualize the board from a different perspective, because they are less able to rely on visuospatial reasoning.
B) have difficulty remembering which letters have been played, because they use their working memory less.
C) forget to study, because they are less invested in winning any particular game.
D) spend time learning words, because they have less inherent talent than elite players.

11

According to the chart, elite SCRABBLE players are most likely to do which of the following?

A) Study the definitions of words.
B) Keep track of letters played.
C) Memorize point values.
D) Memorize words.

CONTINUE