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慶應義塾大学入学試験問題

環境情報学部

外国語

注意事項

1．　試験開始の合図があるまで、この問題冊子を開かないでください。

2．　この冊子は全部で24ページです。ドイツ語Ｉ（選択）は２ページから５ページ、フランス語Ｉ（選択）は６ページから９ページ、英語Ｉ（選択）は10ページから12ページ、英語Ⅱが14ページから16ページ、英語Ⅲは18ページから22ページです。試験開始の合図とともにすべてのページが揃っているか、確認してください。ページの欠落・重複があった場合には、直ちに監督者に申し出てください。

3．　ドイツ語Ｉ・フランス語Ｉ・英語Ｉのいずれかひとつの言語だけを選択し解答してください。選択した言語を解答用紙の選択問題マーク欄に必ずマークしてください。マークするのは、ひとつの言語だけです。英語Ⅱと英語Ⅲは全員が解答してください。

4．　問題冊子は、試験終了後必ず持ち帰ってください。

5．　受験番号と氏名は、解答用紙の所定の欄に必ず記入してください。

6．　解答用紙の「注意事項」を必ず読んでください。

英語Ⅰ（選択）

次の文章に関して、空欄補充問題と読解問題の二つがあります。まず、[31]から[40]の空所を埋めるのに、文脈的に最も適切な語を 1 から 3 の中から選び、その番号を解答欄（31）から（40）にマークしなさい。次に、内容に関する[41]から[45]の設問には、1 から 4 の選択肢が付されています。そのうち、文章の内容からみて最も適切なものを選び、その番号を解答欄（41）から（45）にマークしなさい。

1 When crossing the street one of the first things most pedestrians do when they see an oncoming vehicle is make eye contact with the driver. This is one way to ensure that the driver has seen you. Being seen by the driver is important to ensuring that you can cross the street safely. Now imagine doing the same scenario as a pedestrian, only when you attempt to make eye contact with the driver you discover that the vehicle has no [31](1. passenger 2. driver 3. observer). Do you cross the street? That situation is likely to become an everyday occurrence with the widespread [32](1. adaptation 2. regulation 3. hearsay) of automated vehicles (AVs). The answer to that question cannot be to wait and let the AV pass and then cross the street. To be fully integrated into our society, AVs need to be navigated in much the same way as other vehicles.

2 Research on pedestrians' interactions with manually driven vehicles has highlighted the important role of communication between pedestrians and vehicle drivers in ensuring safe interactions. This communication is often done through [33](1. timed 2. digital 3. verbal) exchanges, hand gestures, or eye contact between pedestrians and vehicle drivers. The removal of the driver presents new challenges to facilitating the communication needed to ensure pedestrian safety. The research on pedestrian-AV communication can be divided into those examining AV-to-pedestrian communication and those examining pedestrian-to-AV communication.

3 First, research on AV communication with pedestrians focuses on leveraging the use of devices on the AV to promote communication with the pedestrians. The most commonly studied devices are light-emitting diode (LED) message boards. These LED message boards are located on various parts of the AV (e.g., side panels, windshields, and overhead). Research is being conducted to determine the best locations for placing the LED boards on AVs. There is also ongoing research on what information these message boards should display. For example, should they display what the AV is currently doing (i.e., stopping) or what the pedestrian should be doing (i.e., cross now). One of the biggest limitations to the use of LED messages is related to scalability. An LED board might display a message intended for one pedestrian but be read by another pedestrian. For example, an AV's LED board might display a message that it is safe for pedestrian "A" to cross but also have the message read by pedestrian "B" whom the AV was [34](1. cautious 2. unaware 3. independent) of and to whom the AV did not intend to communicate that it was safe to cross. This could result in at least one pedestrian misreading the AV's intention. Another example of the scalability problem is the increase in the cognitive load

[35](1. balanced 2. imposed 3. transferred) on a pedestrian as the number of AVs with LED boards increases. As the number of AVs that the pedestrian [36](1. encounters 2. utilizes 3. maneuvers) increases, so does the number of potential LED messages to read. A pedestrian reading one message from one AV is certainly manageable but messages from two, three, or four become somewhat more difficult. This is especially true when you factor in the habits and behaviors associated with many pedestrians such as text messaging and email reading. In addition, when you [37](1. couple 2. double 3. compare) the first scalability problem with the second scalability problem it becomes easy to see how issues related to scalability can magnify. Scalability problems are not [38](1. irreplaceable 2. insurmountable 3. discouraging), but they do present ongoing challenges with the use of LED boards as a standalone solution.

4 Second, the removal of the driver presents another problem – the ability of the pedestrian to communicate with the AV. Common ground or a shared understanding helps to promote communication. One important source of common ground between pedestrians and drivers is based on their shared experiences. In many cases drivers have been pedestrians and pedestrians have at least ridden in a vehicle, [39](1. and yet 2. if not 3. let alone) driven a vehicle. This creates common ground between the driver and the pedestrian, which facilitates communication. However, AVs have not been pedestrians and AVs do not always [40](1. assist 2. challenge 3. mimic) human drivers in their behavior or decision-making. Both make it difficult for the AV and the pedestrian to establish common ground. Researchers are conducting studies to determine how pedestrians communicate their intention implicitly through their body language and behavior. Models employing machine learning are being developed to teach AVs how to interpret implicit communication from the pedestrians so that they can react to them correctly. However, the dynamic and emergent nature of these interactions makes modeling these interactions particularly challenging.

—Based on Robert, L.P. (2019). “The future of pedestrian-automated vehicle interactions,” *Crossroads*.

[41] According to the article, which of the following is the most appropriate description of the issue of scalability?

1. As the number of problems increases, the smaller each problem becomes.
2. The frequency of negative outcomes is predicted by the number of problems.
3. As the number of agents increases, the problem becomes more complex.
4. The scale of the problems is determined by the number of measured variables.

[42] What is the second scalability problem mentioned in the article?

1. Pedestrians have never driven AVs.
2. Each AV has to pay attention to multiple pedestrians.
3. AVs have never been pedestrians.
4. Each pedestrian has to pay attention to multiple AVs.

[43] According to the article, what would ***NOT*** count as "common ground" for human drivers and pedestrians?

1. They are both able to communicate orally.
2. They infer intentions through body language.
3. They have experienced each other's perspective.
4. They encounter each other on crowded streets.

[44] Which of the following is the central idea being presented by the author?

1. Increasing the number of AVs will pose a problem for city planning.
2. Pedestrians' walking habits must change in the AV age.
3. Refining communication between AVs and people is needed.
4. AVs should be designed in such a way that they can reproduce human behaviors.

[45] In the last paragraph, what makes "the dynamic and emergent nature" of human-AV interactions particularly challenging to model?

1. The number of AVs will keep increasing.
2. Pedestrians must read many types of signals from AVs.
3. AVs and pedestrians have distinct rules of behavior.
4. Pedestrian and AV behavior is largely unpredictable.

（下書き用）

英語II

次の文章に関して、空欄補充問題と読解問題の二つがあります。まず、[46]から[55]の空所を埋めるのに、文脈的に最も適切な語を 1 から 3 の中から選び、その番号を解答欄（46）から（55）にマークしなさい。次に、内容に関する[56]から[60]の設問には、1 から 4 の選択肢が付されています。そのうち、文章の内容からみて最も適切なものを選び、その番号を解答欄（56）から（60）にマークしなさい。

1 It's there, at the start of every conversation: the moment it takes your brain to adjust to an unfamiliar voice. It only lasts for a second or two, but in that brief time, your brain is thumbing its radio dial, tuning in to the unique pitch, rhythm, accent, and vowel sounds of a new voice. Once it is dialed in, the conversation can [46](1. make out 2. take off 3. get up).

2 This process is called rapid neural adaptation, and it happens constantly. New voices, sounds, sights, feelings, tastes, and smells all trigger this brain response. It is so [47](1. effortless 2. demanding 3. intrusive) that we are rarely even aware it's happening. But, according to new work from Tyler Perrachione and colleagues, problems with neural adaptation may be at the root of dyslexia, a reading impairment that affects millions of Americans, including [48](1. an estimated 2. as few as 3. precisely) one-in-five to one-in-twenty schoolchildren. Their experiments are the first to use brain imaging to compare neural adaptation in the brains of people with dyslexia and those who read normally.

3 In the team's first experiment, volunteers without dyslexia were asked to pair spoken words with images on a screen while the researchers used functional magnetic resonance imaging (fMRI) to [49](1. support 2. enhance 3. track) their brain activity. The subjects tried the test two different ways. In one version, they listened to words spoken by a variety of different voices. In the second version, they heard the words all spoken by the same voice. As the researchers expected, the fMRI revealed an [50](1. initial 2. urgent 3. inverted) spike of activity in the brain's language network at the start of both tests. But during the first test, the brain continued revving with each new word and voice. When the voice stayed the same in the second test, the brain did not have to work as hard. It adapted.

4 When subjects with dyslexia took the same tests, however, their brain activity never eased off. Like a radio that can't hold a frequency, the brain did not adapt to the consistent voice and had to process it fresh every time, as if it were new.

5 The results suggest that dyslexic brains have to work harder than "typical" brains to process incoming sights and sounds, [51](1. limiting 2. avoiding 3. requiring) additional mental overhead for even the simplest tasks. "What was surprising for me was the magnitude of the difference. These are not subtle differences," says Perrachione. This finding dovetails with his other work on the dyslexic brain, which has found that individuals with dyslexia also struggle with phonological working memory. The

extra brainwork might not be noticeable most of the time, but it seems to have a singularly prominent impact on reading.

6 The results could solve a paradox that has [52](1. stumped 2. enlightened 3. implicated) dyslexia researchers for decades. “People with dyslexia have a specific problem with reading, yet there is no ‘reading part’ of our brain,” says MIT neuroscientist John Gabrieli. Injuries to specific parts of the brain can cause people to lose particular skills, like the ability to speak, that sit in those brain regions. But because the brain doesn’t have a discrete reading center, it’s hard to understand how a disorder could [53](1. tackle 2. injure 3. handicap) reading and only reading.

7 This new work partially solves the paradox because rapid neural adaptation is a “low-level” function of the brain, which acts as a [54](1. chopping 2. mounting 3. building) block for “higher-level”, abstract functions. Yet that opens up another mystery, says Gabrieli: “Why are there other domains that are so well done by people with reading difficulty?”

8 The answer [55](1. has stuck 2. has to do 3. has problems) with the way we learn to read, the researchers think. There’s almost nothing we learn that’s as complicated as reading. That’s because learning to read is mentally cumbersome. The human brain did not evolve to read – literacy has been commonplace only in the last two centuries – so the brain must repurpose regions that evolved for very different ends. And the evolutionary newness of reading may leave the brain without a backup plan. “Reading is so demanding that there’s not a successful alternative pathway that works as well,” says Gabrieli. It’s like using a stapler to pound a nail – the stapler can get the job done, but it takes a lot of extra effort.

9 The fMRI results show which parts of the brain are straining but don’t tell researchers exactly why people with dyslexia have a different adaptation response. “Finding a basic thing that’s true in the whole brain gives us a better opportunity to start looking for connections between biological models and psychological models,” says Perrachione. Those connections may one day lead to better ways to identify and treat kids with dyslexia.

—Based on Becker, K. (2017). “The dyslexia paradox,” *The Brink.* Boston University.

[56] According to the author, what would be another example of rapid neural adaptation?

1. Reacting negatively to a strong smell
2. Getting used to the temperature of a hot bath
3. Being in constant pain from a severe injury
4. Memorizing new vocabulary in a second language

[57] In the 4th paragraph, what was the result of the study for those with dyslexia?

1. The participants' brain activity showed constant effort.
2. The subjects found the experiment easy to complete.
3. The participants found the volume difficult to hear.
4. The subjects recognized new words faster than old words.

[58] In the 5th paragraph, what does the author mean by "dovetails"?

1. To copy
2. To contradict
3. To prove
4. To align

[59] According to the article, reading can be considered an unnatural process because

1. it requires both high- and low-level brain functionality.
2. the reading center of the brain has not been located.
3. it takes minimal effort to accomplish successfully.
4. it is a concept and practice invented by people.

[60] What is the example of a stapler being used to exemplify?

1. The right tool for the job is not always the fastest.
2. The brain is highly adaptive, but not always efficient.
3. Evolution yields multiple tools for accomplishing the same tasks.
4. There is more than one way to learn to read.

（下書き用）

英語Ⅲ

次の文章に関して、空欄補充問題と読解問題の二つがあります。まず、[61]から[80]の空所を埋めるのに、文脈的に最も適切な語を 1 から 3 の中から選び、その番号を解答欄（61）から（80）にマークしなさい。次に、内容に関する[81]から[90]の設問には、1 から 4 の選択肢が付されています。そのうち、文章の内容からみて最も適切なものを選び、その番号を解答欄（81）から（90）にマークしなさい。

1 A few weeks ago a mother called me to report that her 5-year-old daughter had come home from school crying because her teacher had not allowed her to count on her fingers. This is not an isolated event – schools across the country regularly ban finger use in classrooms or communicate to students that they are babyish. This is [61](1. despite 2. in addition to 3. due to) a compelling and rather surprising branch of neuroscience that shows the importance of an area of our brain that "sees" fingers, well [62](1. over 2. approaching 3. beyond) the time and age that people use their fingers to count.

2 In a study published last year, the researchers Ilaria Berteletti and James R. Booth analyzed a specific region of our brain that is [63](1. supported by 2. controlled by 3. dedicated to) the perception and representation of fingers known as the somatosensory finger area. Remarkably, brain researchers know that we "see" a representation of our fingers in our brains, even when we do not use fingers in a calculation. The researchers found that when 8-to-13-year-olds were given complex subtraction problems, the somatosensory finger area lit up, even though the students did not use their fingers. This finger-representation area was, according to their study, also engaged to a greater extent with more complex problems that involved higher numbers and more manipulation. Other researchers have found that the better students' knowledge of their fingers was in the first grade, the higher they scored on number comparison and estimation in the second grade. Even university students' finger perception predicted their calculation scores.

3 Evidence from both behavioral and neuroscience studies shows that when people receive training on ways to perceive and represent their own fingers, they [64](1. get better at 2. miss out on 3. do away with) doing so, which leads to higher mathematics achievement. Researchers found that when 6-year-olds improved the quality of their finger representation, they improved in arithmetic knowledge, particularly skills such as counting and number ordering. [65](1. Unfortunately 2. However 3. In fact), the quality of the 6-year-old's finger representation was a better predictor of future performance on math tests than their scores on tests of cognitive processing.

4 Neuroscientists often [66](1. disregard how 2. debate why 3. concur that) finger knowledge predicts math achievement, but they clearly agree on one thing: that knowledge is critical. As Brian Butterworth, a leading researcher in this area, has written, if students aren't learning about numbers through thinking about their fingers, numbers "will never have a normal representation in the brain."

5 One of the recommendations of the neuroscientists [67](1. criticizing 2. conducting 3. facing) these important studies is that schools focus on finger discrimination – not only on number counting via their fingers but also on helping students distinguish between those fingers. Still, schools typically pay little [68](1. if 2. or 3. from) any attention to finger discrimination, and to our knowledge, no published curriculum encourages this kind of mathematical work. Instead, thanks largely to school districts and the media, many teachers have been led to believe that finger use is useless and something to be abandoned as quickly as possible. The after-school tutoring program Kumon, [69](1. for example 2. nevertheless 3. regardless), tells parents that finger-counting is a "no no" and that those who see their children doing so should report them to the instructor.

6 Stopping students from using their fingers when they count could, according to the new brain research, be akin to [70](1. halting 2. stimulating 3. advocating) their mathematical development. Fingers are probably one of our most useful visual aids, and the finger area of our brain is used well into adulthood. The need [71](1. for 2. of 3. with) and importance of finger perception could even be the reason that pianists, and other musicians, often display higher mathematical understanding than people who don't learn a musical instrument.

7 The finger research is part of a larger group of studies on cognition and the brain showing the importance of visual [72](1. effects on 2. independence from 3. engagement with) math. Our brains are made up of "distributed networks," and when we handle knowledge, different areas of the brain communicate with each other. When we work on math, in particular, brain activity is distributed among many different networks, which include areas within the ventral and dorsal pathways, both of which are visual. Neuroimaging has shown that even when people work on a number calculation, such as 12 x 25, with symbolic digits (12 and 25), our mathematical thinking is [73](1. prior to 2. separated from 3. grounded in) visual processing.

8 A striking example of the importance of visual mathematics comes from a study showing that after four 15-minute sessions of playing a game with a number line, differences in knowledge between students from low-income backgrounds and those from middle-income backgrounds were eliminated. Number-line representation of number quantity has been shown to be particularly important for the development of numerical knowledge, and students' learning of number lines is believed to be a [74](1. reflection of 2. precursor of 3. hindrance on) children's academic success.

9 Visual math is powerful for all learners. Years ago Howard Gardner proposed a theory of multiple intelligences, suggesting that people have different approaches to learning, such as those that are visual, kinesthetic, or logical. This idea helpfully expanded people's thinking about intelligence and competence, but was often used in unfortunate ways in schools, leading to the labeling of students as

particular type of learners who were then taught in different ways. But people who are not strong visual thinkers probably need visual thinking more than [75](1. no one 2. someone 3. anyone). Everyone uses visual pathways when we work on math. The problem is it has been presented, for decades, as a subject of numbers and symbols, ignoring the potential of visual math for transforming students' math experiences and developing important brain pathways.

10 It is [76](1. woefully 2. rather 3. hardly) surprising that students so often feel that math is inaccessible and uninteresting when they are plunged into a world of abstraction and numbers in classrooms. Students are made to memorize math facts, and plough [77](1. through 2. around 3. over) worksheets of numbers, with few visual or creative representations of math, often because of policy directives and faulty curriculum guides. To engage students in [78](1. productive 2. receptive 3. objective) visual thinking, they should be asked, at regular intervals, how they "see" mathematical ideas, and to draw what they see. They can be given activities with visual questions and they can be asked to provide visual solutions to questions. [79](1. If 2. Then 3. When) the YouCubed Team (a center at Stanford) created a free set of visual and open mathematics lessons for grades three through nine last summer, which invited students to appreciate the beauty in mathematics, they were downloaded 250,000 times by teachers and used in every state across the US. Ninety-eight percent of teachers said they would like more of the activities, and 89 percent of students reported that the visual activities enhanced their learning of mathematics. Meanwhile, 94 percent of students said they had learned to [80](1. take heed 2. give in 3. keep going) even when the work was hard and they made mistakes. Such activities not only offer deep engagement, new understandings, and visual-brain activity, but they show students that mathematics can be an open and beautiful subject, rather than a fixed, closed, and impenetrable subject.

11 Some scholars note that it will be those who have developed visual thinking who will be "at the top of the class" in the world's new high-tech workplace that increasingly draws upon visualization technologies and techniques, in business, technology, art, and science. Work on mathematics draws from different areas of the brain and students need to be strong with visuals, numbers, symbols, and words.

—Based on Boaler, J., & Chen, L. (2016). *The Atlantic.*

[81] According to the author, what is the problem with current math instruction?
1. It is often unreachable.
2. It is too creatively designed.
3. It is often visually intuitive.
4. It is too accessible.

[82] What might the author suggest as the best way to help students improve finger discrimination?
1. Have them type on a keyboard using one finger at a time.
2. Make them hide their fingers behind their back as they use them for counting.
3. Place colored dots on their fingers and touch corresponding colored piano keys.
4. Match numbers and colors on a touchscreen using only their fingers.

[83] Berteletti and Booth's study found that the somatosensory area
1. works harder with more complex mathematical problems.
2. disengages the visual image of fingers from brain function.
3. helps people use their fingers while solving mathematical calculations.
4. shows increased engagement as students get older.

[84] Why is training in finger discrimination important?
1. It is necessary in order for students to learn to use their fingers for math.
2. It is a prerequisite for learning to play a musical instrument.
3. It is needed for students to demonstrate creativity in mathematical thinking.
4. It is crucial for brain development of numerical skills.

[85] What does the author mean by "no no" in the 5th paragraph?
1. Not adequate
2. Not helpful
3. Not acceptable
4. Not necessary

[86] According to the article, what is the problem with Gardner's theory of multiple intelligences?
1. It is impossible to successfully implement in classroom learning.
2. It is limited to visual and mathematical intelligences.
3. It restricts the definition we have for competence and intelligence.
4. It overgeneralizes each student as a specific type of a learner.

[87] According to the article, the ability to perceive one's fingers does ***NOT*** have an effect on

1. mathematical ability.
2. visual thinking.
3. memorization techniques.
4. development of brain pathways.

[88] Why does the author mention "distributed networks" in the 7th paragraph?

1. To stress the importance of neuroimaging
2. To explain what is involved in doing math
3. To show the different functions of specific brain pathways
4. To illustrate the need for better control of brain activity

[89] What does the author mean by "at the top of the class" in the 11th paragraph?

1. Getting good grades
2. Making advantageous connections at work
3. Achieving the best results on exams
4. Leading one's field

[90] Which of the following would be the best title for this article?

1. Counting on math to be creative
2. Why kids should use their fingers in math class
3. Visualizing brain mechanisms for math
4. How teachers make finger counting discriminatory

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