前

平成17年度入学試験問題

外国語

英語

150点満点

≪配点は，学生募集要項に記載のとおり。≫

（注　意）

1. 問題冊子および解答冊子は係員の指示があるまで開かないこと。
2. 問題冊子は表紙のほかに5ページ，解答冊子は表紙のほかに12ページある。
3. 問題は全部で3題ある（1～5ページ）。
4. 筆答開始後，解答冊子の表紙所定欄に学部名・受験番号・氏名をはっきり記入すること。表紙には，これら以外のことを書いてはならない。
5. 解答は，すべて解答冊子の指定された箇所に記入すること。
6. 解答に関係のないことを書いた答案は無効にすることがある。
7. 解答冊子は，どのページも切り離してはならない。
8. 問題冊子は持ち帰ってもよいが，解答冊子は持ち帰ってはならない。

I　次の文章を読んで，下の問いに答えなさい。　(50 点)

The famous British physicist Lord Kelvin (1824–1907), after whom the degrees in the absolute temperature scale are named, once said in a lecture: "When you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind." He was referring, of course, to the knowledge required for the advancement of science. But numbers and mathematics have the curious tendency of contributing even to the understanding of things that are, or at least appear to be, extremely remote from science. In a famous story by Edgar Allan Poe, Detective Dupin says: "We make chance a matter of absolute calculation. We subject the unlooked for and unimagined to the mathematical formulae of the schools." At an even simpler level, consider the following problem you may have encountered when preparing for a party: You have a chocolate bar composed of twelve pieces; how many snaps will be required to separate all the pieces? The answer is actually much simpler than you might have thought. Every time you make a snap, you have one more piece than you had before. Therefore, if you need to end up with twelve pieces, you will have to snap eleven times. More generally, irrespective of the number of pieces the chocolate bar is composed of, the number of snaps is always one less than the number of pieces you need.

Even if you are not a chocolate lover yourself, you realize that this example demonstrates a simple mathematical rule that can be applied to many other circumstances. But in addition to mathematical properties, formulae, and rules (many of which we forget anyhow), there also exist a few special numbers that are so ubiquitous that they never cease to amaze us. The most famous of these is the number pi (π), which is the ratio of the circumference of any circle to its diameter. The value of pi, 3.14159..., has fascinated many generations of mathematicians. Even though it was defined originally in geometry, pi appears very frequently and unexpectedly in the calculation of probabilities. A famous example is known as Buffon's Needle, after the French mathematician Comte de Buffon (1707–1788), who posed and solved this probability problem in 1777. He asked: Suppose you have a large sheet of paper on the floor, ruled with parallel straight lines spaced by a fixed distance. A needle of length equal precisely to the spacing between the lines is thrown completely at random onto the paper. What is the probability that the needle will land in such a way that it will intersect one of the lines, as in Figure 1? Surprisingly, the answer turns out to be the number $2/\pi$. Therefore, in principle, you could even evaluate π by repeating this experiment many times and observing in what fraction of the total number of throws you obtain an intersection. Pi has by now become such a household word that film director Darren Aronofsky was even inspired to make a 1998 intellectual thriller with that title.

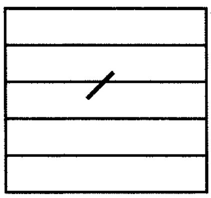

Figure 1

(1) 物理学者 Kelvin の講演から引用したセンテンスが 1 つある。それを和訳しなさい。

(2) 探偵 Dupin の言葉を引用したセンテンスが 2 つある。それらを和訳しなさい。

(3) You have a chocolate bar composed of twelve pieces; how many snaps will be required to separate all the pieces? という問いに対して，「より一般的」な答えとなっているセンテンスが 1 つある。それを和訳しなさい。

(4) Buffon's Needle の問いを構成しているセンテンスが 3 つある。それらを和訳しなさい。

(5) Buffon's Needle の問いに対する答えとなっているセンテンスが 1 つある。それを和訳しなさい。

Ⅱ 次の文章を読んで，下の問いに答えなさい。 (50 点)

For 300 years, Western travelers to Southeast Asia had been returning with tales of enormous groups of fireflies blinking on and off in harmony, in displays that supposedly stretched for miles along the riverbanks. These reports, often written in the romantic style favored by authors of travel books, gave rise to (1)widespread disbelief. How could thousands of fireflies orchestrate their flashings so precisely and on such a vast scale?

In the years between 1915 and 1935, *Science* published 21 articles on this mysterious form of light show. Some dismissed the phenomenon as a fleeting coincidence. Others ascribed it to peculiar atmospheric conditions of exceptional humidity, calm, or darkness. A few believed there must be a conductor, a firefly that leads all the rest. The naturalist Hugh Smith wrote in exasperation that "some of the published explanations are more remarkable than the phenomenon itself." But he confessed that he too was unable to offer any explanation.

(2)For decades, no one could come up with a good theory. By the late 1960s, however, the pieces of the puzzle began to fall into place. One clue was so obvious that nearly everyone missed it. Fireflies not only flash in harmony — they flash in rhythm, at a constant tempo. Even when isolated from one another, they still keep to a steady beat. That implies that each insect must have its own means of keeping time, some sort of internal clock. This hypothetical clock is still unknown but is presumed to be a group of neurons somewhere in the firefly's tiny brain.

The second clue came from the work of the biologist John Buck, who did more than anyone else to make the study of fireflies scientifically respectable. He suggested that the fireflies must somehow be adjusting their rhythms in response to the flashes of others. To test that hypothesis directly, Buck and his co-workers conducted laboratory studies where they flashed an artificial light at a firefly (to imitate the flash of another) and measured its response. They found that an individual firefly will shift the timing of its flashes in a consistent, predictable manner, and that the size and direction of the shift depend on when in the cycle the stimulus was received. (3) For some species, the stimulus always advanced the firefly's rhythm, as if setting its clock ahead; for other species, the clock could be either delayed or advanced, depending on whether the firefly was just about to flash, whether it was halfway between flashes, and so on.

Taken together, the two clues suggested that the flash rhythm was regulated by an internal, resettable clock. And that immediately suggested (4) a possible synchronization mechanism: In a mass of flashing fireflies, every one is continually sending and receiving signals, shifting the rhythms of others and being shifted by them in turn. Out of the mass of flashing lights, synchronization somehow emerges naturally.

Thus we are led to entertain an explanation that seemed unthinkable just a few decades ago — the fireflies organize themselves. No conductor is required, and it doesn't matter what the weather is like. Synchronization occurs through mutual cuing, in the same way that an orchestra can keep perfect time without a conductor. What's odd here is that the insects don't need to be intelligent. They have all the ingredients they need: Each firefly contains something like a little metronome whose timing adjusts automatically in response to the flashes of others. That's it.

(1) 下線部(1) widespread disbelief の内容を具体的に表すセンテンスが１つある。それを和訳しなさい。

(2) 下線部(2)を和訳しなさい。

(3) 下線部(3)を和訳しなさい。

(4) 下線部(4) a possible synchronization mechanism の内容を音楽器具に言及して説明しているセンテンスが１つある。それを和訳しなさい。

III 次の文章(1)，(2)を英訳しなさい。(　　　)内は英訳する必要はない。(50点)

(1) 女性が従来学問の世界で十分活躍できなかったのは，男性中心で作られてきた社会に原因があったことは疑う余地はありません。とくにわが国は従来年功序列の社会でありましたので，出産，育児のため女性が休むことは昇進の面で著しく不利でありました。今後は休んだ後の復職を容易にするとともに，復職後業績を上げれば速やかに昇進できる体制を作り上げて行かねばなりません。

(井村裕夫『時計台の朝』)

(2) わたしたちの健康にとって歯は大切な役割を果たしています。歯の健康は治療だけでは守れません。その場限りの治療から，さらに前進して，病気を予防し，健康を管理していくように心がけましょう。そのためには毎食後の歯磨きの励行にとどまらず，野菜を含めバランスのとれた食事をとることや，さらには，過度のストレスに陥って病気に負けることのないよう精神的な安定を保つことも大切です。

問題は，このページで終わりである。