

1. 次の英文を読み、設問に答えなさい。なお、段落[A]から[D]は順番が原文とは入れ替えてある。

Newton showed that the book of nature is written in the language of mathematics. Some chapters ① boil down to a clear-cut equation; but scholars who attempted to reduce biology, (い) economics and psychology to neat Newtonian equations have discovered that these fields have a level of complexity that makes such an aspiration ② futile. This did not mean, however, that they gave up on mathematics. A new branch of mathematics was developed over the last 200 years to deal with the more complex aspects of reality: statistics.

[A] Their work was founded on several recent breakthroughs in the fields of statistics and probability. One of these was Jacob Bernoulli's Law of Large Numbers. Bernoulli had ③ codified the principle that while it might be difficult to predict (1) certainty a single (ろ) event, such as the death of a particular person, it was possible to predict (1) great accuracy the average outcome of many similar events. (2), while Maclaurin could not use maths to predict whether Webster and Wallace would die next year, he could, given enough data, tell Webster and Wallace how many †Presbyterian ministers in Scotland would almost certainly die next year. Fortunately, they had ready-made data that they could use. Actuary tables published fifty years previously by Edmond Halley proved particularly useful. Halley had analysed records of 1,238 births and 1,174 deaths that he obtained from the city of Breslau, Germany. Halley's tables made it possible to see that, for example, a twenty-year-old person has a 1:100 chance of dying in a given year, but a fifty-year-old person has a 1:39 chance.

[B] In 1744, two Presbyterian clergymen in Scotland, Alexander Webster and Robert Wallace, decided to set up a life-insurance fund that would provide pensions for the widows and orphans of dead clergymen. They proposed that each of their church's ministers would pay a small portion of his income into the fund, which would invest the money. If a minister died, his widow would receive dividends on the fund's profits. This would allow her to live (3) for the rest of her life. But to determine how much the ministers had to pay in so that the fund would have enough money to live up (4) its obligations, Webster and Wallace had to be able to predict how many ministers would die each year, how many widows and orphans they would leave behind, and by how many years the widows would outlive their husbands.

[C] Processing these numbers, Webster and Wallace concluded that, on average, there would be 930 living Scottish Presbyterian ministers at any given moment, and an average of twenty-seven ministers would die each year, eighteen of whom would be survived by widows. Five of those who did not leave widows would leave orphaned children, and two of those survived by widows would also be outlived by children from previous marriages who had not yet reached the age of sixteen. They further computed how much time was likely to go by before the widows' death or remarriage (in both these eventualities, payment of the pension would ④ cease). These figures enabled Webster and Wallace to determine how much money the ministers who joined their fund had to pay in order to provide for their loved ones. By contributing about £2 a year, a minister could guarantee that his widowed wife would receive at least £10 a year – a hefty sum in those days. If he thought that was not enough he could choose to pay in more, up to a level of about £6 a year – which would guarantee his widow the even more ⑤ handsome sum of £25 a year.

[D] Take note of what the two churchmen did not do. They did not pray to God to reveal the answer. Nor did they search for an answer in the Holy Scriptures or among the works of ancient theologians. Nor did they enter into an abstract philosophical disputation. Being Scots, they were (5) types. So they contacted a professor of mathematics from the University of Edinburgh, Colin Maclaurin. The three of them (X) and used these to (は) calculate how many ministers were likely to pass away in any given year.

According to their calculations, by the year 1765 the Fund for a Provision for the Widows and Children of the Ministers of the Church of Scotland would have capital totalling £58,348. Their calculations proved amazingly (6). When that year arrived, the fund's capital stood at £58,347 – just £1 less than the prediction! This was even better than the prophecies of Habakkuk, Jeremiah or St John. Today, Webster and Wallace's fund, known simply as Scottish Widows, is one of the largest pension

and insurance companies in the world. With assets worth £100 billion, it insures not only Scottish widows, but anyone willing to buy its ^(に) policies.

†Presbyterian: キリスト教長老派教会

(Adapted from Yuval N. Harari, *Sapiens: A Brief History of Humankind*, 2011)

[1] 段落[A]から[D]を最も適切な順に並び替えたものを選択肢(1)～(5)の中から選び、マークシートの解答欄(1)にマークしなさい。

(1) A D C B (2) B D A C (3) C A B D (4) C B D A (5) D C B A

[2] 下線部①～⑤の意味の説明として最も適切なものを選択肢1～5の中から選び、マークシートの解答欄(2)から(6)にマークしなさい。

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|------------------|-----------------|---------------|----------------|---------------|
| ① 1. amount to | 2. aspire to | 3. belong to | 4. respond to | 5. subject to |
| ② 1. annoying | 2. fruitless | 3. helpless | 4. indifferent | 5. subtle |
| ③ 1. decided | 2. estimated | 3. formulated | 4. predicted | 5. suggested |
| ④ 1. clarify | 2. decrease | 3. justify | 4. succeed | 5. terminate |
| ⑤ 1. alternative | 2. good-looking | 3. rational | 4. substantial | 5. ultimate |

[3] 空所(1)～(6)に入る最も適切な語句を選択肢1～5の中から選び、マークシートの解答欄(7)から(12)にマークしなさい。

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|--------------------|----------------|-----------------|------------------|--------------------|
| (1) 1. above | 2. by | 3. in | 4. over | 5. with |
| (2) 1. By contrast | 2. In addition | 3. Regardless | 4. That is | 5. To the contrary |
| (3) 1. anxiously | 2. comfortably | 3. dramatically | 4. energetically | 5. precisely |
| (4) 1. at | 2. by | 3. on | 4. to | 5. with |
| (5) 1. beneficial | 2. generous | 3. lazy | 4. practical | 5. religious |
| (6) 1. accurate | 2. clear | 3. concrete | 4. economic | 5. significant |

[4] 下線部(い)～(に)の語と第1アクセント(第1強勢)の位置が同じ単語を選択肢1～4の中から選び、マークシートの解答欄(13)から(16)にマークしなさい。

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|------------------|-----------------|------------------|-----------------|-----------------|
| (い) ec-o-nom-ics | 1. ac-ces-so-ry | 2. ben-e-fi-cial | 3. pa-ram-e-ter | 4. vol-un-tar-y |
| (ろ) e-vent | 1. bal-ance | 2. im-age | 3. pat-tern | 4. tech-nique |
| (は) cal-cu-late | 1. al-ler-gy | 2. en-gi-neer | 3. in-ter-fere | 4. suf-fi-cient |
| (に) pol-i-cies | 1. ex-per-tise | 2. in-ter-pret | 3. rep-re-sent | 4. sym-me-try |

[5] 次の語句を文法的・内容的に最も適切な順に並びかえて(X)を完成させたとき、3番目にくるものの番号を解答欄(17)に、7番目にくるものの番号を解答欄(18)にマークしなさい。

1. at which 2. collected 3. data 4. died 5. on 6. people 7. the ages

[6] 英文の内容に最もよく一致するものを選択肢1～8の中から3つ選び、マークシートの解答欄(19)から(21)にマークしなさい。ただし、解答の順序は問いません。

1. Biologists succeeded in describing the life of animals in mathematical terms.
2. Newtonian equations are complex enough to capture phenomena observed in economics and psychology.
3. Roughly two thirds of Scottish Presbyterian ministers were estimated to be outlived by their wives.
4. Statistics and probability are useful in calculating the likelihood of an event's occurrence on a large scale.
5. The development of statistics contributed to establishing the insurance industry in the world today.
6. Webster and Wallace closely examined the Bible as they set up their life-insurance fund.
7. Webster and Wallace started a life-insurance fund because they thought it would be profitable.
8. Webster and Wallace were good at predicting when their family members were likely to die.

2. 次の英文を読み、設問に答えなさい。

Yesterday in a restaurant in Tokyo, someone at the table next to us lit a cigarette. I asked my Japanese host if no one ever asked smokers to go outside. His answer took me by surprise; one is not allowed to smoke on the street. Inside is fine, outside is wrong. It's the opposite of what we are used to in the West. The point is not so much the reason for the Japanese rule, but the fact that cultural differences often ① baffle us. This is because we assume our own perspective to be the only one that matters or makes sense. The same applies very much to my field of ¹primateology, which owes much to Japanese pioneers.

Today I met in Kyoto with my old friend Toshisada Nishida, who is a student of the late Jun'ichiro Itani, who in turn was the most prominent student of Kinji Imanishi, the founder of Japanese primatology. Imanishi was interested in the connection between primate behavior and human evolution well before his counterparts in the West. In 1952, Imanishi wrote a little book that criticized (ア), and raised the possibility that animals other than ourselves might have culture. The proposed definition of culture was simple: if individuals learn from one another, their behavior may, over time, become different from that of other groups, thus creating a characteristic culture. Soon thereafter, his students demonstrated how potato-washing behavior that was started by a juvenile female monkey on Koshima Island, cumulatively spread to other members of her troop. The troop had developed a potato-washing culture, which still remains today, half a century later.

Imanishi was also the first to insist that observers give their animals names and follow them for years so that they understand their kinship relations. His concepts are now all around us: every self-respecting field worker conducts long-term studies based on individual identification, and the idea of cultural transmission in animals is one of the hottest topics of today. But that is now: when Imanishi and his students toured American universities to report their findings in 1958, all they got was ridicule. The act of humanizing animals by giving them names and seeing them as social beings was seen as problematic; scientists were trained to keep a distance from their research subjects. Only the greatest American primatologist of the day, Ray Carpenter, saw the point and became a strong supporter of Japanese primatology. He visited Japan three times, and within a decade, the practice of identifying primates individually had been widely adopted at Western primatological field sites.

To further understand how this transmission of ideas from Japan to the West could have taken place ② under our noses, we need to look at Eastern culture, and also appreciate how linguistic monopoly affects science. Plato's "great chain of being," which places humans above all other animals, is absent from Eastern philosophy. In most traditional Eastern belief systems, the human soul can reincarnate in many shapes and forms, so all living things are spiritually connected. A man can become a fish and a fish can become God. The fact that primates, our closest animal relatives, are native to many Eastern countries, has only helped to strengthen this belief in (イ). It's hardly surprising that evolution was minimally controversial in the East: if we believe that the soul can move from monkey to human and back, evolution becomes a logical thought. As Itani put it, "Japanese culture does not emphasize the difference between people and animals and so is relatively free from the spell of ¹anti-anthropomorphism."

The lack of credit for the Japanese approach (most treatments of animal culture either forget to mention Imanishi, or worse, claim that the studies of potato-washing were naive and ill-conceived) can be partly attributed to the language barrier. It is hard for non-English speakers to make themselves heard in an English-speaking world. Since English is not my native tongue, I am familiar with the effort involved in writing and speaking another language—even though my native Dutch is probably the closest another language can come to English. Scientists from other places have to make ten times the effort. English itself is of course not the problem: it is not better or worse than any other language. The problem is (ウ).

Good ideas formulated in bad English either die or get repackaged. It is a bit like a Hollywood remake of a French play such as *La Cage aux Folles*: its origins are immediately erased once it's called *The Birdcage*. One reason Eastern thinking could ③ creep into the study of animal behavior unnoticed, is that it filtered into the literature through awkward formulations and translations that native English speakers could then improve upon.

In a way, it is delightful to see how views that were clearly ④ at odds with the traditional Western dualism could gradually enter our thinking. It helped us ⑤ chuck out some of our cultural baggage.

At the same time, however, the way it happened hints at the difficulties other cultural and linguistic groups experience when they seek a voice in science and gain proper acknowledgement. Each culture is too ㊦ wrapped up in its own relation with nature to step back and see it as it is. To gain a full picture requires all kinds of scientists, who together take on a task equivalent to comparing the images in a range of fun-house mirrors. Somewhere in that heavily distorted information resides the truth.
 †primatology: 霊長類学, †anti-anthropomorphism: 動物を人間と見なすことに反対する考え方
 (Adapted from Frans de Waal, "Rousseau Meets Japanese Primatology," *3 Quarks Daily*, March 2010)

- [1] 下線部 ㊦ ～ ㊦ の意味に最も近いものを選択肢 1 ～ 5 の中から選び、マークシートの解答欄 (22) から (27) にマークしなさい。

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|------------------------|---------------------|-------------------|------------------|--------------------|
| ㊦ 1. entice | 2. misunderstand | 3. perplex | 4. question | 5. ridicule |
| ㊦ 1. decently | 2. disastrously | 3. unethically | 4. unnoticed | 5. unplanned |
| ㊦ 1. care | 2. peep | 3. probe | 4. slip | 5. slope |
| ㊦ 1. in agreement with | 2. incongruent with | 3. indifferent to | 4. on a par with | 5. with respect to |
| ㊦ 1. commemorate | 2. discard | 3. fight | 4. organize | 5. remember |
| ㊦ 1. distracted | 2. driven | 3. immersed | 4. suited | 5. undertaken |

- [2] 空所 (ア) ～ (ウ) に入る最も適切な文を選択し、マークシートの解答欄 (28) から (30) にマークしなさい。

- (ア) 1. the Eastern view of nature being imbued with spirit
 2. the view of Darwinian evolutionary theory
 3. the view of animals as mindless automatons
 4. the view of humans as mindless automatons
- (イ) 1. anti-anthropomorphism 2. the afterlife
 3. the interconnectedness of life 4. the superiority of Western thinking
- (ウ) 1. the attitude of native English speakers
 2. the difficulty of French plays
 3. the philosophical differences between East and West
 4. the poor English of Dutch scientists

- [3] 次の文は英文全体の要旨を述べたものである。下記の空所 (ア) ～ (ケ) に入る単語として最も適切なものを選択肢 1 ～ 9 の中から選び、マークシートの解答欄 (31) から (39) にマークしなさい。同じ選択肢を 2 度選んではいけません。

In this blog post, Frans de Waal describes how and why in his field of primatology, Japanese pioneers, most notably Kinji Imanishi, have left an important yet often unnoticed influence. In the 1950s, Imanishi suggested that animals other than humans might have (ア), a view that contradicted the Western belief that humans and animals are fundamentally different. Imanishi was also (イ) in his method; he gave names to the animals he studied and spent extended time with them. Today, this method of long-term fieldwork is the norm in primatology, but at the time, it (ウ) the belief that animals should not be anthropomorphized, and that a distance should be kept between the researcher and the animal subject. The American primatologist, Ray Carpenter, became interested in this Japanese approach, and (エ) the role of introducing it to the West. Today, Imanishi's approach is accepted as the norm around the world. Frans de Waal points out how cultural background (オ) scientific discovery, such as the Eastern belief that assumes all creatures to be spiritually and interdependently connected. He also points out that the reason why the Japanese contribution to primatology is relatively hidden is the language barrier. Western science (カ) in the English language, and those who are from non-Anglophone countries are in a less favorable position for (キ) their research globally. Moreover, once ideas enter the English language, their origins are often forgotten. De Waal ends with the suggestion of (ク) one's own cultural views and beliefs, and of comparing them with those of others for a 'truer' (ケ) of reality.

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|---------------|---------------|-----------------|------------|---------------|
| 1. challenged | 2. circulates | 3. culture | 4. glimpse | 5. influences |
| 6. played | 7. radical | 8. relativizing | 9. voicing | |

3. 次の対話文を読み、設問に答えなさい。

(A quiet restaurant. At a back table two people, a man and a woman, are talking. The woman appears nervous. She keeps putting her glass of water to her mouth but not taking a sip.)

Ms. Yagami: So how are the marriage preparations going? Is everything on track?

Mr. Hiyoshi: ① More or less. The invitations go out next week. You're invited of course.

Ms. Yagami: (*trying to smile*). That's terrific. I think you two are going to make a great couple.

Mr. Hiyoshi: And how about your plans? Is everything still on for April?

(*Ms. Yagami looks like she is holding back tears. She doesn't say anything.*)

Mr. Hiyoshi: Don't tell me I've ② put my foot in it. Are things still on between you two?

Ms. Yagami: (*trying to regain her composure*). We've ③ called the wedding off. It just wasn't feeling right.

Mr. Hiyoshi: I had no idea. I'm so sorry. Is there anything I can do?

Ms. Yagami: (*becoming a little emotional again*). It may be better if we don't see each other again. Like this I mean. As friends.

Mr. Hiyoshi: But why? We've always ④ been there for each other, haven't we? As friends I mean.

Ms. Yagami: (*gathering her things and getting ready to leave*). I'm sorry to do this to you, but would you be able to ⑤ foot the bill tonight? I can't stay here any longer.

Mr. Hiyoshi: (*calling after Ms. Yagami*). Please sit down. Can't we just talk?

(*Ms. Yagami steps out into the rainy night. In her mind she is wondering when her life became such a soap opera and why men can be so slow at times. She quickly hails a taxi and leaves.*)

[1] 下線部①～⑤に関する以下の質問において最も適切なものを選択肢1～4の中から選び、マークシートの解答欄 (40) から (44) にマークしなさい。

- ① Which expression does **not** share the same meaning as More or less in the dialogue?
1. Against all odds 2. By and large 3. For the most part 4. On the whole
- ② What does it mean to put one's foot in it?
1. dirty oneself 2. rush things
3. say something tactless 4. stamp your authority on something
- ③ What does it mean to call something off?
1. advertise it 2. cancel it 3. postpone it 4. reschedule it
- ④ What does it mean to be there for someone?
1. give someone space 2. provide support
3. tolerate someone 4. travel somewhere for someone
- ⑤ What does it mean to foot the bill?
1. ignore the bill 2. pay the bill 3. send the bill to someone else 4. split the bill

[2] 以下の問いに答えなさい。解答はマークシートの解答欄 (45) にマークしなさい。

What would be the most appropriate title for this dialogue?

1. He Just Doesn't Get It 2. Restaurant Rivals
3. Singing in the Rain 4. Undercover Lovers

[3] 対話文の内容に一致するものを選択肢1～8の中から3つ選び、マークシートの解答欄 (46) から (48) にマークしなさい。ただし、解答の順序は問いません。

1. Mr. Hiyoshi's wedding plans are going fairly smoothly.
2. Ms. Yagami is still optimistic about getting back with her fiancé.
3. Mr. Hiyoshi agrees that it is impossible for him and Ms. Yagami to remain friends.
4. Ms. Yagami believes her life has become overly dramatic.
5. Mr. Hiyoshi was caught off guard to hear that Ms. Yagami has called off her wedding.
6. Ms. Yagami called her wedding off for financial reasons.
7. Ms. Yagami was disappointed by the service at the restaurant.
8. Ms. Yagami has expressed her disapproval of Mr. Hiyoshi's fiancé in the past.

[4] 対話文に関する以下の問題に答えなさい。解答は解答用紙（記述式）に英語で記入しなさい。

- (1) What word starting with the letter "f" could complete the following sentence?
One possible reason for why Ms. Yagami believes she can no longer be friends with Mr. Hiyoshi is that she has f_____ for him.
- (2) Complete the following sentence.
To regain one's composure means to _____.

4. 和文の内容とほぼ同じ意味になるように、指定された文字から始まる適切な1語を空所①～⑧に入れて、英文を完成させなさい。解答は解答用紙（記述式）に記入しなさい。

Want to design a new material for solar energy, a drug to fight cancer or a compound that stops a virus from attacking a crop? First, you must tackle two ①(c): finding the right chemical structure for the substance and determining which chemical reactions will link up the right atoms into the ②(d) molecules or combinations of molecules. Now, ③(a) intelligence is starting to increase the ④(e) of both design and synthesis, making the enterprise faster, easier and cheaper while ⑤(r) chemical waste. In AI, machine-learning algorithms analyze all known past experiments that have attempted to discover and synthesize the substances of interest – those that worked and, importantly, those that failed. Based on the patterns they discern, the algorithms predict the structures of ⑥(p) useful new molecules and ways of manufacturing them. The technologies may provide such benefits as improved health care and agriculture, greater conservation of resources, and ⑦(e) production and storage of ⑧(r) energy.

(Adapted from Jeff Carbeck, "AI for Molecular Design," *Scientific American*, December 2018)

太陽エネルギーのための新たな物質、がん治療薬、あるいは農作物へのウィルス感染を防ぐ化合物をデザインしてみませんか？ そのためにはまず、2つの課題に取り組まねばなりません。すなわち、その物質の正しい化学構造を見いだすことと、どの化学反応が適切な原子を所望の分子や分子化合物に連結するのかを決定することです。現在、人工知能はデザインと合成の効率を高めつつあり、それによってその事業を迅速に、簡単に、安価に実現させ、同時に化学廃棄物を減らしつつあります。人工知能では、機械学習アルゴリズムが目的の物質の発見と合成を試みた過去の既知の実験—機能したものだけでなく、重要なのは、失敗したものも含め—全てを分析します。アルゴリズムは、それが見分けたパターンを基に、潜在的に有用な新しい分子の構造とそれらの製造方法を予測します。その技術は医療や農業の改善、さらなる資源保護、そして再生可能エネルギーの産生と貯蔵の増強など、様々な分野に恩恵を与えるでしょう。