

化	外国語	コミュニケーション英語Ⅰ・Ⅱ・Ⅲ	100点	
	数 学	共通：数学Ⅰ・Ⅱ・Ⅲ・A・B	100点	
	理 科	化学基礎・化学 「物理基礎・物理」, 「生物基礎・生物」から1科目選択	200点 100点	
生 物	外国語	コミュニケーション英語Ⅰ・Ⅱ・Ⅲ	100点	
	数 学	共通：数学Ⅰ・Ⅱ・Ⅲ・A・B	100点	
	理 科	生物基礎・生物 「物理基礎・物理」, 「化学基礎・化学」から1科目選択	200点 100点	
情 報 科	外国語	コミュニケーション英語Ⅰ・Ⅱ・Ⅲ	100点	
	数 学	共通：数学Ⅰ・Ⅱ・Ⅲ・A・B	200点	
	数学・理 科	「数学Ⅰ・Ⅱ・Ⅲ・A・B」, 「物理基礎・物理」, 「化学基礎・化学」, 「生物基礎・生物」から2科目選択	各100点	
生 活 科	食人間・栄養・環境科	外国語	コミュニケーション英語Ⅰ・Ⅱ・Ⅲ	200点
		数 学	数学Ⅰ・Ⅱ・A・B	200点
	理 科	「物理基礎・物理」, 「化学基礎・化学」, 「生物基礎・生物」から1科目選択	100点	
	人間生活・心理	外国語	コミュニケーション英語Ⅰ・Ⅱ・Ⅲ	250点
数学・国 語		「数学Ⅰ・Ⅱ・A・B」, 「国語総合, 現代文B, 古典B」から1科目選択	250点	

#### ▶ 備 考

• 理学部の数学・理科の試験は次のように2日間行う。

① 1日目：数学共通を解答（100分）。

② 2日目：数学科は数学専門と理科1科目，物理学科は数学と物理，化学科と生物学科は理科2科目（化学科は化学必須，生物学科は生物必須），情報科学科は数学・理科から2科目を合わせて解答（180分）。

• 「数学B」は「数列，ベクトル」から出題する。

\* 実技検査全科目（各科目100点満点）の平均点が60点未満もしくは50点未満の科目がある場合，不合格となる。

## 英語

(100分)

1 次の英文を読み，設問に答えなさい。

Suppose you're in a hurry to get somewhere and as you're walking down the street, you see someone struggling to pick up groceries from a bag that broke. Suddenly, you notice that the person gathering the lost goods is your uncle. Chances are, you stop to help. What if the person was a friend of yours? Would you stop then? How about a random stranger?

Most of you probably have the intuition that you would be most likely to help your family member, likely (but perhaps less likely) to help a friend, and least likely to help a stranger. There are even evolutionary theories that suggest that because you share more DNA with your relatives than with other people, perhaps we should be programmed to help our family more than people we don't know.

Is this tendency to help family more than friends and strangers programmed into us as humans? This question was explored in a paper in a 2022 issue of the *Journal of Experimental Psychology: General* by Julia Marshall and colleagues.

They did two developmental studies in which they had children between 5 and 9 years of age respond to a series of scenarios. They had adults address the same scenarios. One study looked just at children and adults from the United States, while the other looked at children and adults from several different countries.

In the first study, participants heard about scenarios in which a child needed help (in one scenario, a child was hungry, and in a second, a child fell

and was injured). They were told that someone (a parent, a friend, or someone they didn't know at all) saw the child. They were asked whether the person had to (that is, was obligated to) help.

The youngest children essentially felt that everyone should help. They felt slightly less strongly about strangers than about family and friends, but only slightly. As children got older, they increasingly differentiated between people, and they continued to believe that family should help but thought friends had less of an obligation, and strangers even less of an obligation. This pattern was strongest for the adults who were surveyed.

There are <sup>(1)</sup>two explanations for this pattern. One is that the youngest children just aren't that good at differentiating among people and that as they get better at it, they show a pattern that fits the adult intuition. The other possibility is that children gradually learn from the adults around them about what to expect related to helping behavior.

To explore this question, the second study looked at children and adults from a variety of countries (the US, Germany, India, Japan, and Uganda). In this study, the youngest children from all cultures felt that all people should be helpful. In the US, Germany, India, and Japan, there was a tendency for older children and adults to show a pattern like the one described earlier in which they differentiated between family, friends, and strangers. Interestingly, in Uganda, there was a strong tendency for adults to believe that everyone should be helpful. As a result, as children got older, they actually strengthened their belief that everyone should help.

This pattern of results suggests that young children have a general belief that people should be helpful and that they ultimately learn from the adults around them how to think about helping behavior. They eventually learn to adopt the mindset of the adults in their culture—even though different cultures have different approaches to helping behavior. These data also suggest that the pattern that fits the evolutionary prediction is not programmed into people's brains.

(Adapted from Art Markman, "Culture Shapes Who We Should Help", *Psychology Today*, 2022)

設問1 以下の(a)~(e)の文について、本文の内容に合致するものには○を、合致しないものには×を、それぞれ解答欄に書きなさい。

- (a) Some theories suggest that humans are programmed to help family members more than other people.
- (b) Julia Marshall and colleagues conducted research with participants from various countries.
- (c) Two studies were conducted, only one of which included children and adults.
- (d) Participants watched videos of two scenarios where children needed help.
- (e) Participants had to decide whether a family member, a friend, and a stranger should help a child in need.

設問2 下線部(1)の内容を、本文に即して日本語で説明しなさい。

設問3 以下の(ア)~(エ)の文の中で、本文の内容を最も適切に要約しているものを1つ選び、解答欄に記号で書きなさい。

- (ア) Young children are programmed to help family more than friends and strangers, but this changes according to culture.
- (イ) Young children cannot tell the difference between family, friends, and strangers, but they still believe everyone should help each other.
- (ウ) Young children believe everyone should help each other, but they learn to behave like the adults in their culture.
- (エ) Young children learn to tell the difference between family and

other people, but they are programmed to help family more.

2 次の英文を読み、設問に答えなさい。( \*, \*\*, \*\*\*を付した語には、注があります。)

4.05 pm. Exactly. The black and white dog rouses himself from his afternoon sleep and wanders lazily into the kitchen. He settles himself by the cupboard under the window, <sup>(1)</sup> sitting patiently and politely, as he fixes me with his earnest, brown eyes. The same spot. The same time. The same "look". Every day.

Eventually, I will stop what I am doing, and notice him. His tail beats a hopeful rhythm ( a ) the wall. He looks to the cupboard, then back at me, to the cupboard, then me. His intention is clear. "You must feed me now, human servant. The dog food is in the cupboard."

They say dogs are smart. Mine has trained me to feed him on cue, so I open the cupboard, crack open a can, and spoon out the dog food into his bowl.

Cans may seem mundane, but in their time, they were cutting edge. They changed the way that food could be stored, prolonging its life and making all sorts of foods accessible ( b ) people in faraway corners of the Earth. Indeed, it was the need to keep the military well-fed and healthy on their lengthy travels that drove the invention of the can in the first place.

Before canned goods, people either ate fresh, seasonal food, or they preserved their produce by methods such as drying, salting or fermenting\*. After the French Revolution, the French government was thinking of the future and looking for ways to strengthen their military power. Napoleon Bonaparte may or may not have said that an army marches on its stomach, but the French were clearly keen to see their men well-provisioned. So, in 1795, the government offered a prize of 12,000 francs to anyone who could invent an improved method of preserving food.

Ⓐ A few years later, the patent was sold to two Englishmen, Bryan Donkin

and John Hall, who refined the process further. Together, they created the world's first commercial canning factory in Bermondsey, London, just 5 miles away from the more aptly named Canning Town. A few years later, they were producing canned meats for the British Royal Navy, and shortly after that, tin cans were being used to store all sorts of necessities, from turpentine\*\* to gunpowder.

Ⓑ Realizing there was money to be made, Girard wanted to commercialize the tin can. The obvious move would have been to patent his invention in France, but Girard was put off by the time-consuming bureaucracy in his home country. England's financial system, in contrast, seemed inviting to entrepreneurs, but there was just one problem: the two countries were at war. Girard realized that if he were to patent his can in England, he would need to do so covertly. So he enlisted the help of an English merchant, who patented the idea for him. It was awarded in 1810.

Ⓒ The prize was awarded to a Parisian chef and brewer called Nicolas Appert. Appert found that if you placed cooked food in a glass jar, sealed it with cork and wax, and then plunged it into boiling water, the food didn't go off. Almost half a century before Louis Pasteur proved that heat kills bacteria, Appert was doing just that. He set up a business producing preserved foods, and wrote a book in 1811 with the does-what-it-says-on-the-tin title of *The Art of Preserving All Kinds of Animal and Vegetable Substances for Several Years*. It was the first book to describe the canning process in detail, and it went on to sell a respectable 6,000 copies.

Ⓓ Unfortunately for Appert, his method was as transparent as the glass jars he used, so it wasn't long before others were copying his tactics. Among them was a French engineer called Philippe de Girard, who adapted the process using tin cans instead of glass jars. The modern-day process of canning was born.

It seemed like the whole food preservation story was "in the can", but then the patent expired. The navy decided to save money by buying their

canned goods from a different supplier. Standards slipped. Sailors complained, and naval inspectors were called ( c ) to check the cans' contents. On one occasion, they tested 306 cans and found that only 42 were safe to eat.

The timing couldn't have been worse. Up to that point, canned foods had <sup>(2)</sup>predominantly been the preserve of the wealthy, who enjoyed luxury items such as tinned artichokes and turtle soup. The scandal hit the newspapers just as the 1851 Great Exhibition \*\*\* of London was introducing ordinary Londoners to the convenience of tinned goods. After that, it took years for canned food to become accepted.

Perhaps part of the battle was the physical struggle it took to open these cans. Some of the earliest were made from iron and tin, which made them heavy and thick. The lids were fixed on, meaning that people had to hammer their way in, or force the cans open with knives. It took more than 50 years after the invention of the can for someone to invent the can opener!

Now, the tin can has more than fulfilled its original purpose. Tinned food didn't just sustain the military on their expeditions, it broadened their diet and made them healthier. Tinned vegetables provided a much-needed source of vitamins and minerals, which helped to protect the men from disease.

Better provisions fuelled longer, bolder expeditions. In the 1820s, when William Edward Parry set ( d ) in search of the Northwest Passage, the sea route between the Atlantic and Pacific Oceans, he took canned provisions, including a 4-pound tin of roasted veal that was never used. Even then, the canning process was so good that when the tin was finally opened, over a hundred years later, the contents were still perfectly edible. It was fed to a cat, which lost none of its nine lives in the process.

(Adapted from Helen Pilcher, *Small Inventions That Made a Big Difference*, 2021)

<注> ferment\* : 発酵させる

turpentine\*\* : 油絵等に使うテレピン油

Great Exhibition\*\*\* : 万国大博覧会

設問1 下線部(1)を和訳しなさい。

設問2 ( a ) ~ ( d ) に入る最も適切な語を以下から選び、それぞれ解答欄に書き入れなさい。

against, in, off, to

設問3 枠線内の4つの段落④~⑩を最も適切な順序に並べ替え、解答欄に記号で書きなさい。

設問4 なぜ下線部(2)のように言えるのか、本文に即して日本語で述べなさい。

3 次の英文を読み、設問に答えなさい。( \*, \*\*を付した語には、注があります。)

[1] In the early part of the twentieth century, the American naturalist William Beebe came upon a strange sight in the Guyana jungle. A group of army ants was moving in a huge circle. The circle was 1,200 feet in circumference\*, and it took each ant two and a half hours to complete the loop. The ants went around and around the circle for two days until most of them dropped dead.

[2] What Beebe saw was what biologists call a "circular mill." The mill is created when <sup>④</sup>[army ants / find / from / separated / their colony / themselves]. Once they're lost, they obey a simple rule: Follow the ant in front of you. The result is the mill, which usually only breaks up when a few ants wander off by chance and the others follow them away.

[3] As Steven Johnson showed in his illuminating book *Emergence*, an ant colony normally works remarkably well. No one ant runs the colony. No one issues orders. Each individual ant knows, on its own, almost nothing. Yet the colony successfully finds food, gets all its work done, and reproduces itself. But

the simple tools that make ants so successful are also responsible for the death of the ants who get trapped in the circular mill. Every move an ant makes depends on what its fellow ants do, and an ant cannot act independently, which would help break the march to death.

[4] So far, I've assumed that human beings are not ants. In other words, I've assumed that human beings can be independent decision makers. Independence doesn't mean isolation, but it does mean relative freedom from the influence of others. If we are independent, our opinions are, in some sense, our own. We will not march to death in a circle just because the ants in front of us are.

[5] This is important because a group of people—unlike a colony of ants—is far more likely to come up with a good decision if the people in the group are independent of each other. Independence is always a relative term, but the story of Francis Galton and the ox illustrates the point. In the story, each person figured out his estimate of the weight of the ox on his own, relying on what economists call "private information." (Private information isn't just concrete data. It can also include interpretation, analysis, or even intuition.) And when you put all those independent estimates together, the combined guess was near perfect.

[6] Independence is important to intelligent decision making for two reasons. First, it keeps the mistakes that people make from becoming correlated. Errors in individual judgment won't wreck the group's collective judgment as long as those errors aren't systematically pointing in the same direction. One of the quickest ways to make people's judgments systematically biased is to make them dependent on each other for information. Second, independent individuals are more likely to have new information rather than the same old data everyone is already familiar with. The smartest groups, then, are made up of people with diverse perspectives who are able to stay independent of each other. Independence doesn't imply rationality or fairness, though. You can be biased and irrational, but as long as you're independent, you won't make the group any less intelligent.

[7] Now, the assumption of independence is a familiar one. It's intuitively appealing, since it takes the autonomy\*\* of the individual for granted. It's at the core of Western liberalism. And, in the form of what's usually called "methodological individualism," it is the basis of most of textbook economics. Economists usually take it as a given that people are self-interested. And they assume people arrive at their idea of self-interest on their own.

[8] For all this, though, independence is hard to come by. We are autonomous beings, but we are also social beings. We want to learn from each other, and learning is a social process. The neighborhoods where we live, the schools we attend, and the corporations where we work shape the way we think and feel. As Herbert J. Simon once wrote, "A man does not live for months or years in a particular position in an organization, exposed to some streams of communication, shielded from others, without the most profound effects upon what he knows, believes, attends to, hopes, wishes, emphasizes, fears, and proposes."

[9] Even while recognizing the social nature of existence, economists tend to emphasize people's autonomy and to de-emphasize the influence of others on our preferences and judgments. Sociologists, by contrast, describe people as embedded in particular social contexts, and see influence as inescapable. Sociologists generally don't view this as a problem. They suggest it's simply the way human life is organized. And it may not be a problem for everyday life.

[10] But what I want to argue here is that the more influence a group's members have on each other, and the more personal contact they have with each other, the less likely it is that the group's decisions will be wise ones. The more influence we have on each other, the more likely it is that we will believe the same things and make the same mistakes. That means it's possible that we could become individually smarter but collectively less so. The question we have to ask in thinking about collective wisdom, then, is: Can people make collectively intelligent decisions even when they are in constant, if unpredictable, interaction with each other?

(Adapted from James Surowiecki, *The Wisdom of Crowds: Why the Many Are Smarter Than the Few*, 2004)

<注> circumference\* : 円周  
autonomy\*\* : 自律性

設問1 ① [ ] 中の語句を最も適切な順序に並べ替え、解答欄に書きなさい。

設問2 下線部(1)を和訳しなさい。

設問3 段落 [6] の内容に合致しない文を以下の(ア)~(エ)から1つ選び、解答欄に記号で書きなさい。

- (ア) Being independent does not make people's judgment rational or fair.
- (イ) Errors in individual judgment can make the group's collective judgment worse if similar errors are made by others.
- (ウ) Independent individuals are likely to come up with new information as long as they are not biased.
- (エ) The smartest groups are made up of independent individuals who can make decisions on their own.

設問4 段落 [9] で示されている economists と sociologists の考え方の違いを本文に即して日本語で説明しなさい。

4 次の文章を読み、設問に英語で答えなさい。

観光地に行くと、写真を撮っている人がたくさんいる。自撮りの人もいるし、グループで通りかかった誰かにシャッターを押してもらうこともある。記念写真ではなく建物や風景ばかりを撮る人もいる(わたしはこのタイプ)。

たいていの場所は、行く前にすでにガイドブックやネット上の写真、テレビの映像で、そこを知っている。実際にその場に着くと、見た通りだと確認する。それから、自分が「本物」を見た証拠として自分が入った写真を撮り、SNSにアップする。

そのとき、意識しているのは、今実際に立っている場所、目の前の風景ではない。その写真を後で見る自分や、インターネットを見る誰かなのではないか。「証拠写真」を撮ることに懸命で、その場所で起きていること、空気、音なんかを、楽しむことをつい忘れてしまっている。

浅草で自撮り棒の先をひたすら見上げて歩く人の姿が気になったのは、あの人は今どこにいるのだろう、と思ったからだ。日本の観光地を歩く自分の画像を見る、旅行から帰って自宅にいる自分自身を、カメラを通して見ているだけのようない感じがしたのだった。

景勝地や花のきれいな公園に行くと、立ち入り禁止の柵を堂々と越え、踏まないでくださいという注意書きを無視して木の根を踏んで、高価そうな特大望遠レンズを構える人もちょくちょく見かける。

そのとき、撮影者にとっては、ファインダーやモニターに映るものこそがすべてになってしまい、現実の世界は写真に切り取られるための材料に過ぎなくなるのだろう。

入ってはいけないところには入らないが、わたし自身も、街なかで写真を撮るときに画面に意識を集中してしまって、電柱にぶつかったり車に接触しそうになったりして、あまりのうかつさに驚いたことが何度かある。ファインダーの中で注意を向けていたもの以外の周囲の現実、自分にとっては消えていたも同然だった。

写真もモニターに映る画像も、現実の世界のほんのわずかな部分をコピーした、

粒子や電気信号の集まりに過ぎないことを、撮影するときは忘れないでいたい。自分は豊かな世界の片隅にいる小さな存在で、だからこそ、写真を撮るのだ。

(柴崎友香「写真のマナー」、『惚れるマナー』, 2020 より)

設問 What is the author's conclusion and why does she think so? Explain in about 70 words.

## 数学

### ◀理学部(共通)▶

(100分)

- 1 3進法で表すと5桁となるような自然数全体の集合を  $X$  とする。また、 $X$  に含まれる自然数  $x$  に対して、 $x$  を3進法で  $abcde_{(3)}$  と表すときの各桁の総和  $a + b + c + d + e$  を  $S(x)$  とおく。例えば、10進数86は3進法で  $10012_{(3)}$  と表されるため、 $S(86) = 1 + 0 + 0 + 1 + 2 = 4$  である。
- (1) 10進数199を3進法で表し、 $S(199)$ を求めよ。
  - (2)  $X$ の要素の個数を求めよ。
  - (3)  $X$ から1つの要素を選び、さらに、各面に1, 2, 3, 4, 5, 6の数字の1つずつが重複なく書かれた1個のさいころを1回投げろ。ただし、 $X$ のどの要素が選ばれる確率も同じであるとする。選ばれた  $X$ の要素を  $x$ 、出たさいころの数字を  $r$  とおいたとき、次の確率を求めよ。
    - (i)  $x \geq 162$  かつ等式  $S(x) = r$  が成り立つ確率。
    - (ii)  $x$  が9の倍数であって  $r$  が奇数であったときに、等式  $S(x) = r$  が成り立つ確率。