

**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 January is prime time for returns in the retail industry, the month where shoppers show up in droves to trade in an ill-fitting sweater from grandma or to unload the second and third *Frozen* dolls that showed up under the Christmas tree. This post-Christmas [31](1. ceremony 2. ritual 3. lineage) has always been costly for retailers, comprising a large share of the \$284 billion in goods that were returned in 2014. But now it is [32](1. suitably 2. arguably 3. publicly) becoming more urgent for the industry to think carefully about return policies, as analysts say the rise of online shopping is bringing with it a [33](1. crest 2. plunge 3. surge) in returns.
- 2 The return rate for the industry overall is about 8 percent, but analysts say that it is likely significantly higher than that online, since shoppers are purchasing goods without seeing them in person or trying them on. Against that [34](1. backdrop 2. backtrack 3. backlash), researchers at the University of Texas-Dallas sought to get a better handle on how return policies affect shopper behavior and, in [35](1. spirit 2. vain 3. turn), whether lenient policies such as offering a lengthy period for returns actually helps or hurts a retailer's business.
- 3 Overall, a lenient return policy did indeed correlate with more returns. But, crucially, it was even more strongly correlated with an increase in purchases. In other words, retailers are generally getting a clear sales benefit from giving customers the [36](1. impression 2. imposition 3. assurance) of a return. But of course, not all return policies are created equal, and that's where the findings get interesting. The team examined several potential characteristics of a return policy: time (such as whether you must return within 14 days or 90 days); money (whether or not you get a full [37](1. reinstatement 2. reimbursement 3. reassessment)); effort (whether you must provide a receipt or other forms); scope (whether even sale merchandise is eligible for return); and exchange (whether you're limited to getting store credit for your return).
- 4 One surprising finding: More leniency on time limits is associated with a reduction—not an increase—in returns. This may seem [38](1. inconvenient 2. self-evident 3. counterintuitive), but researchers say it could have varying explanations. Ryan Freling, who conducted the research alongside Narayan Janakiraman and Holly Syrdal, said that this is perhaps a result of what's known as “endowment effect.”

5 “That would say that the longer a customer has a product in their hands, the more attached they feel to it,” Freling said. Plus, the long timeframe creates less urgency around the decision over whether or not to take it back. “Since they don’t feel pressure to take it right back to the store, they kind of sit with it and live with it and say, ‘Well it’s not that bad,’” Freling said.

6 The researchers found that leniency around the time you have and the amount of money you can get back are most effective in increasing overall sales. [39](1. Making 2. Getting 3. Taking) it easier to return, with no questions asked, for instance, also increases purchases, though not quite as much.

7 So why does any of this matter? Retailers are desperate to figure out how to curb costly returns in the era of online shopping. This is why you see them rolling out website features such as apparel fit predictors, and it’s why they’re hounding you via e-mail to write a review of your latest purchase. They’re trying to create an environment in which their customers buy the right thing on the first try. But re-evaluating return policies could be another [40](1. curtain 2. string 3. lever) to pull as they aim to get this balance right. The UT-Dallas research suggests that it is complex to pinpoint an optimal return policy. Limits on scope, or what items are eligible for return, were found to be powerful in cutting down the number of returns, even if they weren’t especially effective in raising overall sales. So, a retailer might have to choose what’s more important to the business: boosting overall sales or cutting the number of returns.

8 The researchers, who conducted a meta-analysis of 21 research studies that together include 11,662 subjects, suggest that retailers might also want to consider creating more complex return policies that have different rules for different products. “Depending on whether it’s a durable good or a consumable good, whether it’s high-fashion or fast-fashion, those different segments of the market have different reasons for buying and they have different concerns for risk and quality,” Freling said.

—Based on Halzack S. (2016). “The surprising psychology of shoppers and return policies,” *The Washington Post*.

[41] In the 3<sup>rd</sup> paragraph, the main results of the researchers' findings can be best summarized as

1. allowing customers to return items means less profit for non-online stores.
2. online retailers are required to have return policies.
3. return policies can influence how much a company sells.
4. the characteristics of return policies are generally all the same.

[42] In the 4<sup>th</sup> paragraph, what was the surprising result?

1. Stricter time limits on return policies led to fewer returns.
2. Less strict time limits on return policies led to fewer returns.
3. Stricter time limits on return policies led to no change in returns.
4. Less strict time limits on return policies led to no change in returns.

[43] What is the “endowment effect” as mentioned in the article?

1. Touching and seeing products in person makes them harder to return.
2. Receiving things for free makes it harder to give them up.
3. Returning items online is more stressful than returning them in stores.
4. Keeping a purchase is more likely the longer you have it in your possession.

[44] According to the article, which of the following was mentioned as having an effect on returns but not sales?

1. Money
2. Effort
3. Scope
4. Exchange

[45] According to the 7<sup>th</sup> paragraph, what is the benefit of writing a review of a product?

1. Reviews help customers make informed choices about their purchases ahead of time.
2. Reviews allow customers to explain why they returned an item.
3. Reviews provide retailers with information about who is buying and returning their products.
4. Reviews assist retailers in selling only high-quality goods and services.

## 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           When we think of commercial initiatives in space, the question of legal rights for them is very important. Anyone who invests major sums of money in an activity wants to make sure that they will not lose their investments because it turns out afterwards that they did not have the right to the resources they extract. It is also important to have laws in place that regulate the relations between different companies from different countries, [46](1. borne 2. baffled 3. bound) by different laws in their home countries, but trying to coexist in space.
- 2           There are also questions of coexisting with other players with other agendas, such as the scientific community. It can be expected that space research and commercial space projects will prove to be very useful for each other. There will, [47](1. therefore 2. however 3. furthermore), also be points of conflict. One of them will be planetary protection, i.e. measures aimed at avoiding biological [48](1. adjustment 2. diversity 3. contamination) resulting from human space activities. We have not yet discovered any life on Mars or any other extraterrestrial body, but it is not a very controversial assumption that the time will come for us to exploit the resources on a potentially inhabited world in space, or to establish it as a tourist destination. When this happens, we will see conflicts between those who think that we have looked for life long enough on the world in question and that it is now time to give the [49](1. yellow card 2. silver spoon 3. green light) for development, and those who think that there is still a chance there might be life that we should not endanger.
- 3           It all depends on the values at [50](1. stake 2. length 3. large), of course. If we assume that extraterrestrial life only has value as a study object, it might be very difficult to resist exploitation even if it potentially puts [51](1. inner 2. indigenous 3. intelligent) life at risk. Economic value is privileged by our society, and when the value of knowledge as such is set against economic value, the former usually loses.
- 4           An alternative possibility is that extraterrestrial life, in [52](1. service 2. addition 3. debt) to its value as a study object, also has economic value. Just like with the value as a study object, this is also a form of instrumental value: Something has economic value because it can generate money. Can extraterrestrial life have instrumental value in this way, and what does it mean for the relations between astrobiology, commercial interests, and planetary protection if it does?

5 Charles Cockell mentions bioengineering as an example. He [53](1. alternates 2. distinguishes 3. wavers) between the economic value of extraterrestrial life that is related to us compared to if it is not related to us. This makes good sense. It is easy to imagine that a microbe that is genetically well adapted to life on another world might contain adaptations that we will want to insert into earth bacteria and use for different purposes. In such cases, it clearly makes things easier if they are genetically related. If they are, we will be able to transfer the properties in question to earth life by transferring the relevant genes from extraterrestrial microbes to earth microbes. Interesting properties [54](1. should 2. must 3. could) include the ability to survive high doses of radiation, which might be useful if we want to engineer microbes to do work inside a nuclear reactor, disaster area, or aboard a spaceship travelling from Earth to Mars. An ability to extract energy from the Sun in a very efficient way is another example of a useful property that might be found in microbial life on worlds further from the Sun.

6 If we find extraterrestrial life that has value as a resource for bioengineering, the aims of science and business will actually converge [55](1. when 2. since 3. until) it comes to planetary protection. But in the long run the value of extraterrestrial life as study objects and as resources for bioengineering may make different demands on the timespan during which they have to be protected. Which type of value will be more demanding is not possible to say before we have actually found them.

—Based on Persson, E. (2018). “A philosophical outlook on potential conflicts between planetary protection, astrobiology and commercial use of space,” *Our Common Cosmos: Exploring the Future of Theology, Human Culture and Space Sciences*.

[56] What is the main question about space exploration addressed in this article?

1. How will humanity agree upon universal space laws and regulations?
2. How should resource rights on other planets be fairly divided?
3. How should we develop planets that already support life?
4. How will scientific interests hinder corporate profitability in space?

[57] Based on the 3<sup>rd</sup> paragraph, what is the likely outcome when scientific and economic goals conflict?

1. Science is given precedence over economic factors.
2. Economic considerations are favored over science.
3. Scientific and economic interests are treated equally.
4. It is impossible to say as every situation is different.

[58] What does the author mean by extraterrestrial life being “related to us” in the 5<sup>th</sup> paragraph?

1. It is an ancestor of the organisms from which we evolved.
2. It descends directly from Earth's microbial lifeforms.
3. It shares DNA that is compatible with that of life on Earth.
4. It exists on one of the other planets in our solar system.

[59] What does the author think will happen if scientific and financial goals coincide?

1. Conflicts between science and business may occur anyway due to their differing methods.
2. Science and business will have to coordinate their agendas to increase profitability.
3. There will be fierce competition between science and business for bioengineering resources.
4. The protection of extraterrestrial life is unlikely to be a goal for both science and business.

[60] According to the author, which of these is **NOT** mentioned as a potential problem with the commercial exploitation of space?

1. Microbes or viruses from space could cause future pandemics if they are brought back to Earth.
2. It is unclear whether companies are legally allowed to profit from resources on other planets.
3. Some people will object to the commercial use of other planets, even if they seem to be lifeless.
4. Rules and regulations governing commercial space activities for all countries are still needed.

注意事項 2

問題冊子に数字の入った  $\square$  があります。それらの数字は解答用紙の解答欄の番号を表しています。対応する番号の解答欄の 0 から 9 までの数字または - (マイナスの符号) をマークしてください。

$\square$  が 2 個以上つながったとき、数は右詰めで入れ、左の余った空欄には 0 を入れてください。負の数の場合には、マイナスの符号を先頭の  $\square$  に入れてください。また、小数点以下がある場合には、左詰めで入れ、右の余った空欄には 0 を入れてください。

$$\begin{array}{l}
 \text{(例)} \quad 12 \longrightarrow \begin{array}{|c|c|c|} \hline 0 & 1 & 2 \\ \hline \end{array} \qquad -3 \longrightarrow \begin{array}{|c|c|c|} \hline - & 0 & 3 \\ \hline \end{array} \\
 1.4 \longrightarrow \begin{array}{|c|c|c|} \hline 0 & 0 & 1 \\ \hline \end{array} . \begin{array}{|c|c|} \hline 4 & 0 \\ \hline \end{array} \qquad -5 \longrightarrow \begin{array}{|c|c|c|} \hline - & 0 & 5 \\ \hline \end{array} . \begin{array}{|c|c|} \hline 0 & 0 \\ \hline \end{array}
 \end{array}$$

分数は約分した形で解答してください。マイナスの符号は分母には使えません。

$$\text{(例)} \quad \frac{4}{8} \longrightarrow \frac{1}{2} \longrightarrow \frac{\begin{array}{|c|c|} \hline 0 & 1 \\ \hline \end{array}}{\begin{array}{|c|c|} \hline 0 & 2 \\ \hline \end{array}} \qquad -\frac{6}{9} \longrightarrow -\frac{2}{3} \longrightarrow \frac{\begin{array}{|c|c|} \hline - & 2 \\ \hline \end{array}}{\begin{array}{|c|c|} \hline 0 & 3 \\ \hline \end{array}}$$

ルート記号の中は平方因子を含まない形で解答してください。

$$\begin{array}{l}
 \text{(例)} \quad \sqrt{50} \longrightarrow \begin{array}{|c|c|} \hline 0 & 5 \\ \hline \end{array} \sqrt{\begin{array}{|c|c|} \hline 0 & 2 \\ \hline \end{array}} \qquad -\sqrt{24} \longrightarrow \begin{array}{|c|c|} \hline - & 2 \\ \hline \end{array} \sqrt{\begin{array}{|c|c|} \hline 0 & 6 \\ \hline \end{array}} \\
 \sqrt{13} \longrightarrow \begin{array}{|c|c|} \hline 0 & 1 \\ \hline \end{array} \sqrt{\begin{array}{|c|c|} \hline 1 & 3 \\ \hline \end{array}} \qquad -\frac{\sqrt{18}}{6} \longrightarrow \frac{\begin{array}{|c|c|} \hline - & 1 \\ \hline \end{array} \sqrt{\begin{array}{|c|c|} \hline 0 & 2 \\ \hline \end{array}}}{\begin{array}{|c|c|} \hline 0 & 2 \\ \hline \end{array}}
 \end{array}$$

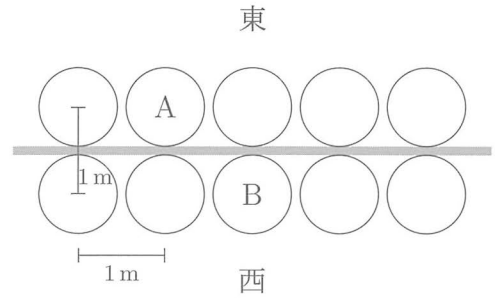
数式については、つぎの例のようにしてください。分数式は約分した形で解答してください。

$$\begin{array}{l}
 \text{(例)} \quad \sqrt{12a} \longrightarrow \begin{array}{|c|c|} \hline 0 & 2 \\ \hline \end{array} \sqrt{\begin{array}{|c|c|} \hline 0 & 3 \\ \hline \end{array}} a \\
 -a^2 - 5 \longrightarrow \begin{array}{|c|c|} \hline - & 1 \\ \hline \end{array} a^2 + \begin{array}{|c|c|} \hline 0 & 0 \\ \hline \end{array} a + \begin{array}{|c|c|} \hline - & 5 \\ \hline \end{array} \\
 \frac{4a}{2a-2} \longrightarrow \frac{-2a}{1-a} \longrightarrow \frac{\begin{array}{|c|c|} \hline 0 & 0 \\ \hline \end{array} + \begin{array}{|c|c|} \hline - & 2 \\ \hline \end{array} a}{1 - \begin{array}{|c|c|} \hline 0 & 1 \\ \hline \end{array} a}
 \end{array}$$

また、選択肢の番号を選ぶ問題では、最も適切な選択肢を 1 つだけ選びなさい。同じ選択肢を複数回選んでもかまいません。

数学Ⅲ

(1) ある公園に、図のように 10 個の丸い椅子が、東側に 5 個横一列に、西側に 5 個横一列に、それぞれ 1 m 間隔で置かれている。また、東側の椅子と西側の椅子は 2 つずつ背中合わせに置かれていて、その間隔は 1 m となっている。

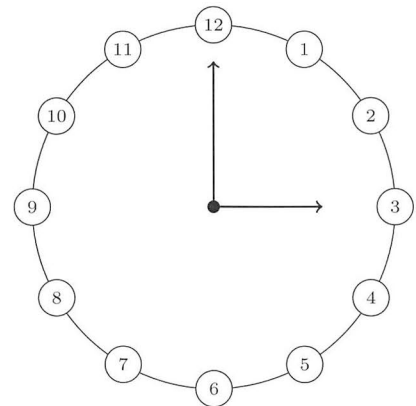


A さんはいつも東側の椅子のいずれかに、B さんは西側の椅子のいずれかに、同じ確率で座る。このとき、A さんと B さん

の座る位置がソーシャルディスタンスの 2 m 以上である確率は  $\frac{\begin{matrix} (61) & (62) \\ (63) & (64) \end{matrix}}{\begin{matrix} (61) & (62) \\ (63) & (64) \end{matrix}}$  である。

なお、A さんも B さんも椅子の中心に座り、ソーシャルディスタンスは座っている椅子の中心間の距離で測るものとする。

(2) 別の公園には、半径 2 m の円周上の地面に時計の文字盤が刻んであり、1 時間ごと、すなわち 30 度ごとに丸い椅子が置いてある。



この円形に配置された 12 脚の椅子に、来場者 3 人がやってきて任意の位置に座るとき、お互いがソーシャルディスタンスの 2 m 以上

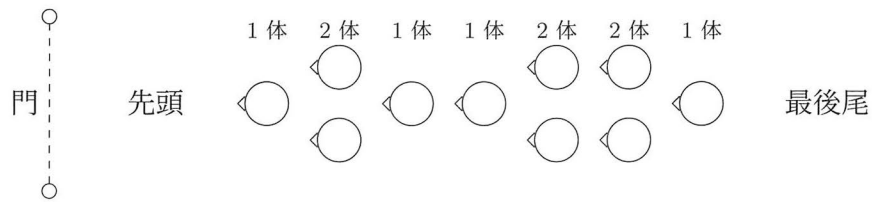
である確率は  $\frac{\begin{matrix} (65) & (66) & (67) \\ (68) & (69) & (70) \end{matrix}}{\begin{matrix} (65) & (66) & (67) \\ (68) & (69) & (70) \end{matrix}}$  である。

なお、同じ椅子に複数の人が座ることはなく、人は椅子の中心に座り、ソーシャルディスタンスは座っている椅子の中心間の距離で測るものとする。



数学IV

(1) 同じ人形  $n$  体 ( $n$  は正の整数) を, 1 体または 2 体ずつ前方を向かせて列に並べる. 例えば  $n = 10$  のとき, 下図のように先頭から 1 体, 2 体, 1 体, 1 体, 2 体, 2 体, 1 体のような並べ方がある.



ここで,  $n$  体の人形の並べ方の総数を  $a_n$  とすると

$$a_1 = 1, a_2 = 2, a_3 = 3, \dots, a_{12} = \boxed{(71)} \boxed{(72)} \boxed{(73)}, a_{13} = \boxed{(74)} \boxed{(75)} \boxed{(76)}, a_{14} = \boxed{(77)} \boxed{(78)} \boxed{(79)}, \dots$$

となる. ただし, 列の先頭の人形の前には門があり, その門の方向を前方とする.

(2) 同じ人形  $n$  体 ( $n$  は 2 以上の整数) を, 2 体または 3 体ずつ前方を向かせて列に並べる. その並べ方の総数を  $b_n$  とすると

$$b_2 = 1, b_3 = 1, b_4 = 1, \dots, b_{12} = \boxed{(80)} \boxed{(81)} \boxed{(82)}, b_{13} = \boxed{(83)} \boxed{(84)} \boxed{(85)}, b_{14} = \boxed{(86)} \boxed{(87)} \boxed{(88)}, \dots$$

となる. ただし, 列の先頭の人形の前には門があり, その門の方向を前方とする.

数学V

A社はB氏を報酬  $w$  で雇っている ( $w$  は正の実数). A社の売り上げはB氏の努力水準に依存しており, B氏の努力水準が低いとA社の売上は200だが, B氏の努力水準が高い場合, A社の売上は70%の確率で500となり, 30%の確率で200のままとなる. そして, このことはB氏も知っている. ただし, B氏は努力水準を高める際に17.5の苦痛を感じる. そのため, 報酬  $w$  の下で努力水準を高めると, B氏の実質的な報酬は  $w - 17.5$  となってしまう. B氏は完全にテレワークをしており, B氏の努力水準をA社が直接知ることはいないし, B氏が努力水準を高めるよう強制することもできない. すると,  $w > w - 17.5$  であることから, B氏は努力水準を高めないことが合理的な行動となる.

以下では, 不確実性下の意思決定をみついているが, (1), (2), (3) のいずれにおいても, A社, B氏共に期待値の大小のみに関心があるものと仮定して解答すること.

- (1) いま, A社は売上が500になったときにはB氏の報酬を  $w_1$  に引き上げ, 200のときには  $w_0$  にすえおくアイデアを思いついた. B氏が努力水準を高めるためには,  $w_1 \geq w_0 + \frac{(89)(90)(91)}{(92)(93)}$  である必要がある.

次に, B氏は, A社をやめても他の会社に報酬100で雇われることが可能であるとする.

- (2) A社の利潤を売上からB氏への報酬を引いた残りだと単純化すると,  $w_1$  と  $w_0$  を適切に定めることにより, B氏にA社をやめさせず, かつ努力水準を高めさせるためには, A社の利潤の期待値を  $\frac{(94)(95)(96)}{(97)(98)}$  以下とする必要がある. また, A社の利潤の期待値が最大化されたとき,  $w_1 : w_0 = 5 : 4$  を満たす  $w_0$  の値は  $\frac{(99)(100)(101)}{(102)(103)}$  である.

以下では, B氏の  $w_0$  の値をこの  $\frac{(99)(100)(101)}{(102)(103)}$  とする.

- (3) 実は, B氏の関心は報酬  $w$  そのものではなく, そこから得られる満足と解釈される  $10\sqrt{w}$  であることが分かった. そのため, 努力水準を高める際の苦痛17.5もこの満足から差し引かれ, 努力水準を高めたときのB氏の満足は  $10\sqrt{w} - 17.5$  となる. B氏は(実質的な)報酬を最大化する人ではなく, 満足を最大化する人だとしたとき, B氏にA社をやめさせず, かつ努力水準を高めさせるためには,  $w_1 \geq \frac{(104)(105)(106)}{(107)(108)}$  でなければならない.