

第1問 次の英文を読んで、後の問いに答えなさい。

What is game theory? And what does it have to do with strategy? Of course, strategy arises in many aspects of human life, including games. Games often have winners or losers. This is an introduction to a way of thinking about strategy, a way of thinking derived from the mathematical study of games. Of course, the first step is to answer those questions — what is game theory and what does it have to do with strategy? But rather than answer the questions immediately, let us begin with a very simple game called Nim. Actually, Nim is a whole family of games, from smaller and simpler versions up to larger and more complex versions. As an example, though, we will only look at the very simplest version. Three coins are laid out in two rows as shown in Figure 1.

One coin is in the first row, and two are in the second. The two players take turns, and on each turn a player must take at least one coin. At each turn, the player can take as many coins as he/she wishes from a single row, but can never take coins from more than one row on any round of play. The winner is the player who picks up the last coin(s). Thus, the objective is (あ) to leave a coin or coins in a single row.

There are some questions about this game that we would like to answer. What is the best sequence of plays for each of the two players? Is there such a best strategy at all? Can we be certain that the first player can win? Or the second? These are questions you might like to know the answer to, for example, if someone offered to make you a bet on a game of Nim.

Let us say that our two Nim players are Anna and Barbara. Anna will play first. We will visualize the strategies of our two players with a tree diagram. The diagram is shown in Figure 2. Anna will begin with the oval at the left, and each oval shows the coins that the player will see in case she arrives at that oval. Thus, Anna, playing first, will see all three coins. Anna can then choose among three plays at this first stage. The three plays are:

1. Take one coin from the top row.
2. Take one coin from the second row.
3. Take both coins from the second row.

The arrows shown leading away from the first oval correspond from top to bottom to these three moves. Thus, if Anna chooses the first move, Barbara will see the two coins shown side by side in the top oval of the second column. In that case, Barbara has the choice of taking either [ア] or [イ] coins from the second row, leaving either [ウ] or [エ] for Anna to choose in

the next round as shown in the ovals of the third column. Of course, by taking [オ], leaving [カ] for Anna, Barbara will have won the game.

In a similar way, we can see in the diagram how Anna's other two choices leave Barbara with other alternative moves. Looking to strategy 3, we see that it leaves Barbara with only one possibility; but that one possibility means that Barbara wins. From Anna's point of view move 2, in the middle, is the most interesting. As we see in the middle oval, second column, this leaves Barbara with one coin in each row. Barbara has to take one or (い) — those are her only choices. But each one leaves Anna with just one coin to take, leaving Barbara with nothing on her next turn, and thus winning the game for Anna. We can now see that Anna's best move is to take one coin from the second row, and once she has done that, there is nothing Barbara can do to keep Anna from winning.

Now we know the answers to the questions above. There is a best strategy for the game of Nim. For Anna, the best strategy is "Take one coin from the second row on the first turn, and then take whichever coin Barbara leaves." For Barbara, the best strategy is "If Anna leaves coins on only one row, take them all. Otherwise, take any coin." We can also be sure that Anna will win if she plays her best strategy.

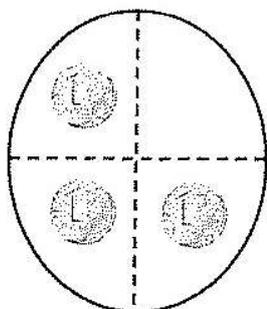


Figure 1

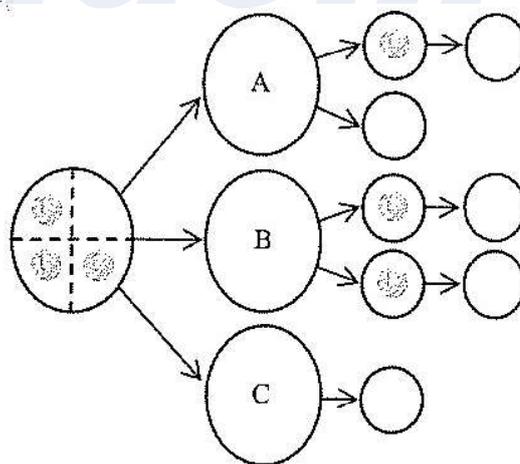


Figure 2

Roger A. McCain, *Game Theory* (一部改変)

Game Theory : A Nontechnical Introduction to the Analysis of Strategy by Roger A McCain. World Scientific Publishing Company. 2014

問 1. 下線部の Nim のルールとして誤っているものを1つ選び、その番号を答えなさい。

- (1) プレーヤーは交互に少なくとも1枚のコインを取らなければならない。
- (2) 横並びの列からはできるだけ多くのコインを取らなければならない。
- (3) 縦並びの列からは複数のコインを取ることはできない。
- (4) 最後にコインを取ったプレーヤーを勝者とする。

問 2. (あ) には次の(1)~(6)の語句をある順序に並べた表現が入る。2番目と5番目に入るものの番号を答えなさい。

- | | | |
|------------|---------------------|-----------------|
| (1) he/she | (2) in the position | (3) is required |
| (4) that | (5) the opponent | (6) to put |

問 3. Figure 2 の楕円 A ~ C の中のコインの配置はどのようになるか。楕円の中のコインがある位置に○を書き入れなさい。ただしコインは右から順に取るものとする。

Windom

問 4. [ア] ~ [カ] に入る数字を答えなさい。

問 5. (い) に入れるのに最も適切なものを1つ選び、その番号を答えなさい。

- | | | | | |
|-------------|-----------|------------|---------------|----------------|
| (1) another | (2) other | (3) others | (4) the other | (5) the others |
|-------------|-----------|------------|---------------|----------------|

問 6. Anna が一手目に最善の手を選択すると Barbara に勝ち目がなくなる。その最善の手を示し、勝ち目がなくなる理由を日本語で書きなさい。

問 7. 本文で述べられた Anna と Barbara のゲームについての記述として正しいものを選び、その番号をすべて答えなさい。

- (1) If Anna takes two coins on the first turn, she loses the chance of winning.
- (2) There is the same number of winning sequences of plays for each of the two players.
- (3) The total number of coins taken by the winner is always larger than that taken by the loser.
- (4) Depending on Anna's plays, it is possible that there is a coin left for Barbara's second turn.
- (5) Regardless of Anna's move, the best strategy for Barbara is to take as many coins as possible on each of her turns.

Windom

第2問 次の英文を読んで、後の問いに答えなさい。

【 あ 】

There is a long history of society blaming mothers for the ill health of their children. «A»Preliminary evidence of fetal harm has led to regulatory over-reach. First recognized in the 1970s, fetal alcohol syndrome (FAS) is a collection of physical and mental problems in children of women who drink heavily during pregnancy. In 1981, ①the US Surgeon General advised that no level of alcohol consumption was safe for pregnant women. Drinking during pregnancy was stigmatized and even criminalized. Bars and restaurants were required to display warnings that drinking causes birth defects. Many moderate drinkers stopped consuming alcohol during pregnancy, but rates of FAS did not fall.

Although those who drink heavily during pregnancy can endanger their children, the risks of moderate drinking were overstated by policy-makers — a point recently reaffirmed by ②the Danish National Birth Cohort study, which did not find adverse effects in children whose mothers drank moderately during pregnancy. Nonetheless, warnings about alcohol during pregnancy made in inappropriate contexts still cause pregnant women to suffer social condemnation and to agonize over an occasional sip.

In the 1980s and 1990s, surging use of crack cocaine (a smokable form of the drug) in the United States led to media hysteria around ‘crack babies’ — those who had been exposed to cocaine in the womb. Pregnant women who took drugs lost social benefits, had their children taken away and were even sent to prison. [ア] Exposed infants were stigmatized as a biologically doomed underclass. [イ]

Previous generations found other ways to blame women. [ウ] Until the nineteenth century, medical texts attributed birth deformities, mental defects and criminal tendencies to the mother’s diet and nerves, and to the company she kept during pregnancy.

Although it does not yet go to the same extremes, ③public reaction to DOHaD research today resembles that of the past in disturbing ways. A mother’s individual influence over a vulnerable fetus is emphasized; the role of societal factors is not. And studies now extend beyond substance use, to include all aspects of daily life.

【 い 】

④A 2013 story on the health-information website WebMD reported findings of a four-fold increased risk of bipolar disorder in adult offspring if a mother had influenza during pregnancy, but it emphasized that the overall risk observed was small and that bipolar disorder is treatable. It stated that the study considered only one of many possible risk factors and did not establish cause and effect. Furthermore, the headline did not lead with the scary number.

Much less context was given in coverage of «B»a 2012 paper showing that second-generation

offspring of rats eating a high-fat diet during pregnancy had an 80% chance of cancer, compared with 50% of control rats. ‘Why you should worry about grandma’s eating habits’, read one headline. “Think twice about that bag of potato chips because you are eating for more than two,” warned another story. These articles did not state that the rats were bred for high cancer rates. Nor did they include inconsistent results: third-generation offspring of female rats on high-fat diets actually had lower incidences of tumours than their control peers.

Inadequately supported and poorly contextualized statements are also found in well-intentioned educational materials. The website beginbeforebirth.org, put together by researchers at Imperial College London, advocates ways to “support and look after pregnant women”. ⁶A video on the website portrays a 19-year-old released from prison after a stint for looting. “Perhaps his problems stretch right back to the womb,” the narrator says. “Could better care of pregnant women be a new way of preventing crime?” At best, such suggestions overstate conclusions of current research.

【 う 】

Today, an increasing segment of DOHaD research recognizes that fathers and grandparents also affect descendants’ health. Studies suggest that diet and stress modify sperm epigenetically and increase an offspring’s risk of heart disease, autism and schizophrenia. In humans, the influence of fathers over mothers’ psychological and physical state is increasingly recognized. So are effects of racial discrimination, lack of access to nutritious foods and exposure to toxic chemicals in the environment.

We urge scientists, educators and reporters to anticipate how DOHaD work is likely to be interpreted in popular discussions. Although no one denies that healthy behaviour is important during pregnancy, all those involved should be at pains to explain that findings are too preliminary to provide recommendations for daily living.

“Don’t blame the mothers” *Nature* vol. 512, 14 August 2014 (一部改変)

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注 fetal : 胎児 (fetus) の

stigmatize : 非難する

sip : ごく少量の飲酒

deformity : 奇形

bipolar disorder : 双極性障害、躁うつ病

control : 比較対象(通常食を与えられたラット)

tumour : 腫瘍

sperm : 精子

schizophrenia : 統合失調症

Surgeon General : 公衆衛生局長官

adverse effect : 悪影響

womb : 子宮

DOHaD: Developmental Origins of Health and Disease

coverage : 報道、記事

incidence : 発生率

stint for looting : 強盗罪での入獄

epigenetically : DNA の変化を伴わずに

問1. 空所【 あ 】～【 う 】には各節のタイトルとしてそれぞれ次の (a)～(c) のいずれかが入る。各空所とタイトルの組み合わせとしてもっとも適切なものを(1)～(6)の中から1つ選び、その番号を答えなさい。(maternal imprint : 母親の影響)

- (a) ALARMING PRECEDENTS
- (b) BEYOND THE MATERNAL IMPRINT
- (c) CONTEXT IS KEY

- | | |
|---------------------------|---------------------------|
| (1) : あ—(a), い—(b), う—(c) | (2) : あ—(a), い—(c), う—(b) |
| (3) : あ—(b), い—(a), う—(c) | (4) : あ—(b), い—(c), う—(a) |
| (5) : あ—(c), い—(a), う—(b) | (6) : あ—(c), い—(b), う—(a) |

問2. 下線部《A》の意味にもっとも近いものを(1)～(5)の中から1つ選び、その番号を答えなさい。

- (1) 胎児期の損傷の影響は広範囲に及び、成長後にまでも及ぶという証拠が出てきている。
- (2) 胎児の損傷が母親に過大な負担を感じさせているということが明らかになってきた。
- (3) 胎児の損傷に対する罪を母親にかぶせすぎだという証拠はまだ十分ではない。
- (4) 母親の生活態度が胎児の損傷に想像以上の影響を与えるということが明らかになってきた。
- (5) 十分な証拠があるわけではないのに、胎児の損傷の責任を母親に負わせ過ぎてきた。

問3. 母親の飲食などが子供の精神的・身体的状態に与える影響についての二重下線部①～⑥の態度を、次のAとBに分類したとき、Aに入るものの番号をすべて答えなさい。

- A : その影響を過度に強調しているもの
- B : その影響を過度に強調してはいないもの

問4. 本文の記述によれば、FAS(胎児性アルコール症候群)の防止にとって必要なことは次の(1)～(5)の中のどれか。もっとも適切なものを1つ選び、その番号を答えなさい。

- (1) 妊娠中も授乳中も飲酒を完全にやめる
- (2) 妊娠中は飲酒を完全にやめ、授乳中も過度の飲酒はひかえる
- (3) 妊娠中は飲酒を完全にやめる
- (4) 妊娠中も授乳中も過度な飲酒はひかえる
- (5) 妊娠中は過度な飲酒をひかえる

問5. 空所 [ア] ~ [ウ] にはそれぞれ次の3つのうちのどれか1つの文が入る。各空所とそこに入る文の組み合わせとしてもっとも適切なものを(1)~(6)の中から1つ選び、その番号を答えなさい。(disparage : 軽蔑する, autism : 自閉症, prosecute : 起訴する)

A : As late as the 1970s, 'refrigerator mothers' (a disparaging term for a parent lacking emotional warmth) were faulted for their children's autism.

B : More than 400 pregnant women, mostly African American, have been prosecuted for endangering their fetuses in this way.

C : Today, fetal exposure to crack or cocaine is considered no more harmful than exposure to tobacco or alcohol, but criminal prosecution of pregnant women who take such drugs continues.

(1) : アー A, イー B, ウー C

(2) : アー A, イー C, ウー B

(3) : アー B, イー A, ウー C

(4) : アー B, イー C, ウー A

(5) : アー C, イー A, ウー B

(6) : アー C, イー B, ウー A

問6. 下線部《B》の2012年の論文は、妊娠中のラットの高脂肪食がその孫の世代に与える影響を調べたものであるが、その論文を紹介したいくつかの記事には、本当なら言及すべき2つの点に言及していないという問題があった。その2つの点とは何と何か。それぞれ20~30文字の日本語で答えなさい。ただし句読点も1文字とする。

問7. 下線部《C》の意味をもっともよく表しているものを(1)~(6)の中から1つ選び、その番号を答えなさい。

- (1) 関係者が、その発見はまだ日常生活に対するアドバイスをする根拠になるほど確かなものではない、ということを説明することはできないだろう。
- (2) 関係者は、その発見はまだ日常生活に対するアドバイスをする根拠になるほど確かなものではない、ということを説明しようと努めるべきだ。
- (3) そこに含意されていることに基づいて日常生活に対するアドバイスをすることは、まだできないであろう。
- (4) そこに含意されていることはまだ確かなことではないが、それでも日常生活に対するアドバイスは試みるべきだ。
- (5) その重要性を否定しようとする者は、日常生活に対するアドバイスができないということを説明すべきだ。
- (6) その重要性を否定しようとする者は、日常生活に対するアドバイスをする努力をすべきだ。

第3問 次の英文の空所 ア～シ に、それぞれ与えられた文字で始まる単語を入れなさい。

Our cultural backgrounds influence not only how we marry but how we make choices in nearly every area of our lives. From early on, members of individualist societies are taught the special (ア: i____) of personal choice. Even a walk through the local grocery store becomes an opportunity to teach lessons (イ: a____) choosing, particularly in the United States, where stores routinely offer hundreds of options. As soon as children can (ウ: t____), or perhaps as soon as they can accurately point, they are asked, “Which one of these would you like?” A parent would probably narrow down the number of choices and explain the (エ: d____) between this cereal and that one, or that toy and this one, but the child would be encouraged to express a preference. After a (オ: w____), the child would graduate to making tougher choices, and by the ripe old age of four, he may well be expected to both understand and respond to the daunting question, “What do you want to be when you grow up?” From this, children learn that they should be able to figure out what they like and dislike, what will make them happy and (カ: w____) won’t. Because their happiness is on the line, their own (キ: o____) truly matter, and they must figure out how to judge the outcomes of their choices.

By contrast, members of collectivist societies place greater (ク: e____) on duty. Children are often told, “If you’re a good child, you’ll do what your parents tell you,” and the parents need not explain themselves. From what you eat to what you wear, the toys you play (ケ: w____) to what you study, it is what you’re *supposed* to do that’s most important. As you grow older, (コ: i____) of being asked what you want, you may be asked, “How will you take care of your parents’ needs and wants? How will you (サ: m____) them proud?” The assumption is that your parents, and elders in general, will show you the right way to live your life so that you will be protected from making a costly (シ: m____). There are “right” choices and “wrong” ones, and by following your elders, you will learn to choose correctly, even relinquish choice when appropriate.

Sheena Iyengar, *The Art of Choosing*

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注 daunting: 難しい relinquish: 放棄する