

I

次の空所を埋めよ。（配点 40）

(1) $i^2 = -1$ とする。 $\frac{1}{3-i}$ を $a+bi$ (a, b は実数) の形で表すとき, $a = \boxed{\text{ア}}$, $b = \boxed{\text{イ}}$ である。

(2) $-3 \leq x \leq 4$ のとき, 関数 $f(x) = x^2 - 3x - 10$ の最大値は $\boxed{\text{ウ}}$ であり, 最小値は $\boxed{\text{エ}}$ である。

(3) 関数 $f(x) = x^2 - 2ax + a^2 + a - 2$ に対し, $I = \int_0^2 f(x)dx$ とする。ただし, a は定数とする。

I を a の式で表すと $\boxed{\text{オ}}$ となり, I を最小にする a の値は $\boxed{\text{カ}}$ である。

(4) $\log_2(x-1) + \log_2(x-3) = 3$ を満たす x の値は $\boxed{\text{キ}}$ である。

(5) 座標平面上に半径 1 の 2 つの円 C と C' があり, C の中心と C' の中心は直線 $x+2y=8$ について対称であるとする。 C が x 軸および y 軸に接し, その中心が第 1 象限にあるとき,

C の方程式は $\boxed{\text{ク}}$ であり, C' の方程式は $\boxed{\text{ケ}}$ である。

II

$\triangle ABC$ において $AB = 6$, $AC = 7$, $BC = 8$, $\angle BAC = \theta$ とするとき, 次の空所を埋めよ。（配点 30）

(1) $\cos \theta = \boxed{\text{ア}}$ であり, $\sin \theta = \boxed{\text{イ}}$ である。

(2) $\triangle ABC$ の面積は $\boxed{\text{ウ}}$ である。

(3) $\triangle ABC$ の外接円の面積は $\boxed{\text{エ}}$ である。

(4) $\triangle ABC$ の内接円の半径は $\boxed{\text{オ}}$ である。

III

関数 $f(x) = x^3 + ax^2 + bx + c$ について, 次の問いに答えよ。ただし, a, b, c は定数とする。（配点 30）

(1) $f(x)$ を微分せよ。

(2) $f(x)$ が $x = -3$ および $x = 1$ で極値をとるとき, a, b の値を求めよ。

(3) a, b を (2) で求めた値とする。3 次方程式 $f(x) = 0$ が異なる 3 個の実数解をもつような c の値の範囲を求めよ。

I 次の 1 ~ 6 において、間違っている箇所をそれぞれ1つ選び、その番号をマークせよ。(配点 30)

1 A: Do you have a part-time job now?
B: Not at the moment. But I need to get one soon because I want to a driving license.
① ②
How about you? Are you working?
A: Yes. I have a great job at a café near the beach. They are always looking for staff.
③
You should apply.
④

2 C: That's a nice shirt. Is it new?
①
D: Yes. I buy it yesterday.
②
C: The color really suits you. I'd like one too.
③ ④

3 E: Is the store open yet?
①
F: No, it's still close.
②
E: What are the opening hours?
③
F: It opens at eleven in the morning and closes at seven in the evening.
④

4 G: Do you live far from school?
H: Quite far. Today I took by bus because of the rain, but I usually come on my bike.
① ②
G: I have to come in my car. It takes an hour or more. I'm thinking of getting a place
③
nearer to school.
④

5 J: What's your plan for the weekend?

K: My sister's coming to stay so we'll probably go shopping. She loves shopping.

①

②

J: That sound like fun. Have a nice weekend.

③

④

6 L: I'm just going out to the post office.

①

M: Really? Could you doing me a favor and post these letters for me?

②

③

L: Sure. No problem. I can do that.

④

M: Thanks.

Ⅱ 次の、ある学校図書館についての FAQ (Frequently Asked Questions) を読み、下記の設問に答えよ。(配点 20)

FAQ

Q: When is the library open?

A: The library is open Monday to Friday from 8 a.m. to 5 p.m.

Q: How many books can I borrow?

A: You can borrow up to five books at a time.

Q: How can I borrow books for?

A: You can borrow most books for one month but a few are only available overnight.

Q: What if I return a book late?

A: You will have to pay a fine of 50 cents per book for each day overdue.

Q: Do I need ID to borrow a book?

A: Yes. Please bring your student card.

Q: Can I copies in the library?

A: Yes. You can use the photocopier in the library. Each copy costs 10 cents.

Q: Can I check from home if the library has a book I want?

A: Yes. You can search for titles on the library website.

Q: Can I borrow magazines from the library?

A: No. Magazines can only be read in the library.

Q: Can I watch videos in the library?

A: Yes. Choose a movie from the display in the library. Take it to the librarian who will allocate you a video box.

Q: Can I borrow books from other libraries?

A: Yes. You can check the availability of books in other school libraries and order them.

(1) Which of the following words is best to fill in ~ ? Choose the best answer and mark the number on the answer sheet.

- | | | | | |
|--------------------------------|----------|-----------|--------|-----------|
| <input type="text" value="7"/> | ① long | ② many | ③ much | ④ short |
| <input type="text" value="8"/> | ① does | ② happens | ③ has | ④ depends |
| <input type="text" value="9"/> | ① borrow | ② cost | ③ make | ④ write |

(2) Which of the following statements is **NOT** correct according to the FAQ? Choose the best answer and mark the number on the answer sheet. 10

- ① Students cannot use the library on weekends.
- ② Without a student ID, you are not able to borrow books.
- ③ It is possible to borrow magazines from the library.
- ④ The use of the library photocopier costs money.

(3) George has borrowed the maximum number of books, but he is late taking them all back by two days. So he must pay a fine. He also wants to photocopy 20 pages. How much money will he need to pay for the fine and the photocopies when he returns the books today? (Hint: one dollar is 100 cents) 11

- ① Five dollars
- ② Seven dollars
- ③ Twenty five dollars
- ④ Twenty seven dollars

Ⅲ 表を参照しながら英文を読み、下記の設問に答えよ。(配点 30)

The education ministry is proceeding with plans to invite the World Mind Sports Games, WMSG, to be held in Tokyo in 2020, the same year as the Summer Olympics and Paralympics.







There are five events in the WMSG, including chess and *go*, to [12] the Education, Culture, Sports, Science and Technology Ministry would like to add *shogi*. *Shogi* is unique for allowing players to *redeploy pieces they capture. The other events are bridge, checkers and *xiangqi*, or Chinese chess. Chess is played by [13] people in Japan and 500 million worldwide, according to the domestic player associations, while checkers is said to be played by as many as [14] people around the world. They are called “mind sports,” in contrast to physical sports like soccer or track and field. Chess and *go* were official events at the 2010 Asian Games in Guangzhou, China.

The WMSG were first held in 2008 in Beijing, and are on the same four-year schedule as the Summer Olympics. France hosted the Games in 2012. Japanese took home medals in

go and other events in Beijing.

Events for the ‘mind Olympics’ that Japan hopes to host in 2020

Player numbers are estimates from domestic player associations.

Details	Player population	
	Japan	Worldwide
Go  Players alternate placing stones to capture territory	4 million	40 million
Shogi  Including the “drop rule” unique to Japan, which allows captured pieces to be returned to the board	10 million	unknown
Chess  Players seek to capture each other’s king	1 million	500 million
Checkers  A board game in which players attempt to capture each other’s pieces	100	1 billion
Bridge  A card game played between two teams of two players each	200,000	100 million
Xiangqi  Originated in China. Shogi-type games are thought to have developed from this game	200,000	500 million

The ministry wants *shogi* to be included in the events for the 2020 Games. *Shogi* is highly popular domestically, with 10 million people said to follow professional *shogi* tournaments. The ministry is working with groups such as Nihon Ki-in, a national *go* association, to put together *the WMSG bid. It is also seeking to broaden the game’s domestic reach through such methods [15] requiring primary school pupils to study it. “Japanese culture and history are reflected in *go* and *shogi*. I’d like to increase its appeal through the mind Olympics,” said a former Nihon Ki-in director.

注 *redeploy 再配置する

*the WMSG bid WMSG への競技候補申請

(The Japan News, Mar 3, 2015)

(1) Which of the following words is best to fill in ? Choose the best answer and mark the number on the answer sheet.

① what ② where ③ whom ④ which

(2) Which of the following words is best to fill in and ? Choose the best answer and mark the number on the answer sheet.

① 1 billion ② 500 million ③ 10 million ④ 1 million

① 1 billion ② 500 million ③ 10 million ④ 1 million

(3) Which of the following words is best to fill in ? Choose the best answer and mark the number on the answer sheet.

① that ② but ③ as ④ which

(4) Which TWO of the following statements are correct? Choose TWO answers and mark the numbers on the answer sheet.

- ① The WMSG include five events now besides chess and *go*.
- ② Players can redeploy pieces they capture in all the events in the WMSG.
- ③ Chess and *shogi* were official events at the 2010 Asian Games in China.
- ④ The second WMSG were held in France.
- ⑤ Japanese players did not participate in the first WMSG.
- ⑥ The Education, Culture, Sports, Science and Technology Ministry would like to include *shogi* in the events for the 2020 Games.

Ⅳ 次の英文では、Sarah と Sam が食べ物について話している。それぞれを読んで、下記の設問に答えよ。(配点 20)

Sarah is British and Sam is American. They have been together as a couple for many years.

【SARAH says】

When Sam and I did a month-long teaching course abroad, I was happy to discover that they sold baked beans in the supermarket. For many British people, beans on toast makes a great breakfast or light lunch. I decided to cook beans on toast for us every morning! It took Sam three days to tell me that he didn't like it — for him it's a strange combination and not something he would eat for breakfast!

Something else I enjoy eating is a jacket potato (a baked potato in U.S. English — we say jacket because the skin on the potato is like a jacket) with a filling like cheese and coleslaw or tuna and sweet corn. Sometimes I like to have it as a “pub lunch” — a casual lunch with friends at the pub. Sam is a little scared of the tuna and sweet corn combination, and I don't think he really understands having a potato as a meal!

There are some kinds of American food I find quite strange though too ... One combination I wasn't sure of when I first met Sam was bacon with maple syrup.

In the U.K., bacon is strictly savory and I might put a bit of ketchup or brown sauce on it, but never anything sweet! In the U.S., maple syrup is commonly served together with bacon as a breakfast food. The 17 and savory combination is something I think Americans quite enjoy, but I don't think it's as common in the U.K.

【SAM says】

People in the U.K. are fond of putting a variety of food on toast. In addition to beans on toast, Sarah quite likes spaghetti hoops on toast. This, I must say, horrifies me as it's something I'd never put on toast. There's also cheese on toast, a classic British comfort food, which involves melting cheese on toast.

Another standard pub lunch dish I found unusual at first was the ploughman's lunch, a traditional meal consisting of bread, cheese, cold ham and pickle, often served separately on a plate rather than as a sandwich. This kind of meal was once popular with ploughmen (farm workers who use plows, or ploughs in British English). As an American, I can't help but think: 18

We're very fond of sandwiches in America; shortly after meeting Sarah, when she was introducing me to cheese on toast, I made her a grilled cheese sandwich, which, despite its name, isn't grilled. Very similar to cheese on toast, we add another slice of bread and fry the whole thing in butter. I'll take it over cheese on toast any day, and Sarah will too!

Though Brits are famous for meat pies, they also make sweet ones like we do in America. Although Sarah likes most pies, she still struggles to appreciate the classic American pumpkin pie. She can't seem to get over what she sees as a strange combination: vegetable, sugar and cinnamon.

(The Japan News. Apr 17. 2015)

(1) Which of the following phrases is best to fill in 17 ? Choose the best answer and mark the number on the answer sheet.

17 ① sweet ② creamy ③ spicy ④ salty

(2) Which of the following sentences is best to fill in 18 ? Choose the best answer and mark the number on the answer sheet.

- 18 ① So this British comfort food is popular around the world!
② The ploughman's lunch is better than any other lunch!
③ I don't recommend a cheese sandwich to you, Sarah.
④ Why didn't they just make a sandwich?

(3) Which **THREE** of the following statements are correct? Choose **THREE** answers and mark the numbers on the answer sheet. 19

- ① It took Sarah three days to know that Sam didn't want beans on toast for breakfast.
② American people eat jacket potatoes and British people eat baked potatoes.
③ Bacon and maple syrup is a favorite combination for many Americans.
④ When Americans make a grilled sandwich, they add a slice of bread to cheese on toast, put butter on the whole thing and grill it.
⑤ It is common for American people to eat a ploughman's lunch.
⑥ "Plough" is used in Britain instead of "plow."
⑦ Sam likes grilled cheese sandwiches but Sarah does not.
⑧ It seems to Sam that Sarah can get over the pumpkin pie.