

2018학년도 건국대학교
재외국민과 외국인 전형 필기고사

자연계

- 시험 시간은 10:00 ~ 12:00 (120분)입니다.
- 수험생 성명, 수험번호, 지원 모집단위를 명확하게 기재하십시오.
- 문제지 하단의 쪽수(현재 쪽/전체 쪽수)를 보시고 페이지 누락 여부를 확인한 후, 누락된 페이지가 있으면 즉시 감독자에게 알리고 문제지를 교체받아야 합니다.
- 영어 문제지는 총 50문항, 500점 만점으로 되어 있으며, 수학 문제지는 총 25문항, 500점 만점으로 되어 있습니다.
- 각 문항별로 배점이 상이하므로 유의하시기 바랍니다. - 영어(5점, 10점, 15점), 수학(10점, 20점, 30점)
- 답안지 마킹은 컴퓨터용 사인펜만 사용하여야 하며, 마킹 후 수정이 불가능하므로 마킹 시 신중을 기하여 주시기 바랍니다.

※ 시험이 시작되기 전에는 표지를 넘기지 마십시오.

2018학년도 건국대학교 재외국민과 외국인 전형 필기고사

< 영어 >

성명		수험번호	
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*** 밑줄 친 단어와 의미가 같은 것을 고르시오. (1~7)**

1. I am looking for a reliable travel agency. [5점]
- ① relevant ② creditable
③ likable ④ accessible
2. The ceasefire will only provide a provisional solution to the crisis. [5점]
- ① permanent ② competent
③ delicate ④ temporary
3. There are no definitive explanations for this legend. [5점]
- ① final ② excellent
③ normal ④ attractive
4. Our share of the market has decreased sharply this year. [5점]
- ① destroyed ② improved
③ dwindled ④ evolved
5. It was predicted that a comet would collide with one of the planets. [5점]
- ① hit ② collapse
③ collaborate ④ intervene
6. A move towards healthy eating could help eliminate heart disease. [10점]
- ① illuminate ② invest
③ remove ④ reduce

7. It is described in the guide book as ‘an enchanting medieval city.’ [10점]
- ① pleasant ② ancient
③ disgusting ④ eccentric

*** 빈칸에 들어갈 말로 가장 적절한 것을 고르시오. (8~18)**

8. “_____” means to have an influence on someone or something or to cause them to change. [10점]
- ① pretend ② effect
③ attend ④ affect
9. “_____” means more suitable or useful than something else. [10점]
- ① relentless ② generous
③ respectable ④ preferable
10. “_____” is the study of the environment and the way that plants, animals, and humans live together and affect each other. [10점]
- ① evolution ② ecology
③ eclecticism ④ ethnicity
11. If it rains for three more days, it _____ for a month without a break. [10점]
- ① has been raining ② was raining
③ is raining ④ will have been raining
12. Most of us are aware that skin protects us from liquid, heat, cold, dirt, and bacteria. But that is not its only job. For instance, skin may show a person’s _____ state, too. Unusual sweating, for example, may be a sign that a person is nervous or under stress. [10점]
- ① excited ② physical
③ contagious ④ mental

24. Lichen are one of the few kinds of life that can survive in the mountains of Antarctica. These tiny plants live in small holes in the rocks. Outside, the extreme cold and strong winds (A)prevent any life at all from surviving. Inside the holes, these lichen (B)manage to find enough water and warmth to keep alive, even though they are frozen much of the time. This fact means that the lichen function extremely (C)fast and live a very long time. Scientists believe that a lichen may remain alive for thousands of years. If this is true, the lichen may be among the (D)oldest forms of life on earth. [15점]

- ① (A) ② (B) ③ (C) ④ (D)

25. 보기 중 아래 글의 내용과 다른 것은? [10점]

Edvard Munch (1863~1944) was a Norwegian painter and graphic artist who worked in Germany and Norway. His painting *The Scream* is considered by many to be the first work of expressionism. Munch wanted to draw human beings who breathe, feel emotions, love and live. So instead of drawing people and things as they really appear, he drew them in a way that expressed the fears within himself. As a young boy, he witnessed the death of his mother and sister, and some people say this was the reason for the deep fears he felt.

- ① *The Scream* is an early example of expressionism.
 ② Munch liked to express things as they really appeared.
 ③ *The Scream* shows Munch's strong inner fear.
 ④ The death of his mother and sister influenced Munch's works.

26. 다음 글의 제목으로 가장 적절한 것은? [10점]

I believe books will never disappear. Of all mankind's many different tools, undoubtedly the most surprising are books. All the others are extensions of the body. The telephone is an extension of his voice. The telescope and microscope are extensions of his sight. When Bernard Shaw refers to the library of Alexandria in his play, he says it is mankind's memory. I would add that it is also mankind's imagination.

- ① How to Read Books Efficiently
 ② Advice on the Choice of Books
 ③ The Importance of Books
 ④ How to Visit a Library

27. 다음 글의 "jet streams"에 대한 설명으로 적절한 것은? [10점]

In the upper troposphere, there are fast-moving "rivers" of air called jet streams. They were first noted in the 1930s but did not receive much attention until World War II, when high-flying aircraft encountered jet streams. Several jet streams meander like rivers around each hemisphere. The behavior of jet streams is variable and not well understood. The so-called polar jet stream moves from west to east across the United States. It varies in altitude and latitude with the seasons, reaching lower latitudes in the winter. This jet stream is believed to have an influencing effect on the severity of our winters.

- ① 1930년대부터 주목받기 시작했다.
 ② 움직임이 일정하여 예측이 가능하다.
 ③ 계절에 따라 위도와 경도가 달라질 수 있다.
 ④ 겨울의 길이에 영향을 미친다고 알려져 있다.

* 다음 글을 읽고 물음에 답하십시오. (28~29)

After the death of Copernicus in 1543, the study of astronomy was continued and developed by several astronomers, three of whom made their appearance in the last half of the sixteenth century. Notable among these was the Danish astronomer (A)Tycho Brahe (1546~1601), who built an observatory on the island of Hven near Copenhagen and spent most of his life observing and studying the stars and planets. Brahe is considered the greatest practical astronomer since the Greeks. (B)His measurements of the planets and stars, all made with the unaided eye (the telescope had not been invented), proved to be more accurate than any made previously. Brahe's data, published in 1603, were edited by his colleague Johannes Kepler (1571~1630), a German mathematician and astronomer who had joined Brahe during the last year of (C)his life. After Brahe's death, his lifetime of observations were at Kepler's disposal and provided (D)him with the data necessary for the formulation of three laws known today as Kepler's laws of planetary motion.

28. 위 글의 (A)~(D) 가운데 가리키는 대상이 다른 하나는? [10점]

- ① (A) ② (B) ③ (C) ④ (D)

29. 위 글에 서술된 Brahe에 대한 설명으로 적절한 것은? [10점]

- ① 그리스 시대 이후로 가장 위대한 천문학자로 간주된다.
 ② 망원경을 사용하여 천체를 관찰한 최초의 인물이다.
 ③ 죽기 직전에 관찰 자료를 책으로 출간하였다.
 ④ Kepler와 오랫동안 함께 천체를 관찰하였다.

30. 밑줄 친 부분에 들어갈 가장 적절한 문장은? [15점]

There are three alternative scenarios for the future fate of the universe. If the universe continues expanding forever, then it is destined for the Big Freeze, gradually being pulled apart into a cold wasteland of dying stars and black holes. If space stops stretching and turns back on itself, it will shrink until galaxies start colliding in the Big Crunch—breaking up into one huge black hole. _____. In the final scenario, the universe gradually slows down to a halt.* With the whole universe balanced perfectly, cosmic catastrophe will be prevented and space will be saved—at least for a few billion years more. *halt** 정지

- ① Thirdly, will the universe ever die?
 ② And then there is the third, more peaceful option.
 ③ Since Big Bang, the universe has been constantly expanding.
 ④ Lastly, most astronomers believe that the universe was born 15 billion years ago.

31. 아래 글의 종류로 가장 적절한 것은? [10점]

To Whom It May Concern:

This is to certify that Ms. Janet Smith joined our company in January 2016. She is one of the most competent employees I have had the opportunity to work with.

As my secretary and office manager, Ms. Smith has proved extremely diligent, considerate, honest and accurate. It gives me great pleasure to recommend Ms. Smith as an able and efficient employee.

- ① 자기 소개서
 ② 구직 신청서
 ③ 구인 안내문
 ④ 취업 추천서

32. 다음 글의 제목으로 가장 적절한 것은? [10점]

Hundreds of years before the birth of Christ, the Celts held a festival at the beginning of every winter for the Lord of the Dead. On October 31, people believed the spirits of the dead came back to earth in the forms of animals. At their festival on this day, the Celts used to make big fires to frighten the ghosts and chase them away. This celebration was the beginning of the holiday of Halloween.

- ① Various Festivals of the Celts
- ② What the Celts Do on Holidays
- ③ The Lord of the Dead in Winter
- ④ The Origin of Halloween

33. 글의 흐름상 다음 문장에 이어질 (A)~(C)의 순서로 가장 적절한 것은? [10점]

Sixty-five million years ago, the dinosaurs all suddenly disappeared from the earth.

- (A) These changes may have been disastrous for the dinosaurs.
- (B) Until recently, scientists did not understand why this happened, but then, in Mexico, they discovered a huge circle more than 160 kilometers wide.
- (C) This circle was caused by some very large object, probably a meteor, that hit the earth, and caused changes in the earth's climate and sea levels.

- ① (A)-(B)-(C)
- ② (A)-(C)-(B)
- ③ (B)-(C)-(A)
- ④ (C)-(B)-(A)

34. 글의 흐름상 다음 문장이 들어갈 위치로 가장 적절한 곳은? [15점]

The wind is free and nonpolluting.

- (A) If you drive from Los Angeles to Palm Springs, California, in the desert you will suddenly come upon acres and acres of windmills.
- (B) Wind power has been used for centuries. Windmills for pumping water have been significant advances in wind technology, and the wind turbines generate electricity directly.
- (C) However, the limited availability of sites with sufficient wind (at least 20 km/h) limits widespread development of wind power.
- (D) And the wind does not blow continuously.

- ① (A) ② (B) ③ (C) ④ (D)

35. 아래 밑줄 친 부분에 들어갈 가장 적절한 문구는? [10점]

Polar expeditions have contributed greatly to our understanding of science. For instance, we now know a lot more about _____. In the early days, explorers often suffered from some sort of mental illness. One cause of mental illness was later discovered; when people aren't used to living in extremely cold conditions, their bodies use up a lot of energy to keep warm, and this gets rid of all the vitamins in the body. The brain, deprived of vitamins, can't work normally, at least until the body becomes accustomed to the cold.

- ① the way to get over extreme cold
- ② climate changes in the polar regions
- ③ the effects polar conditions have on people
- ④ how to make polar expeditions

36. (A)와 (B)에 들어갈 말로 올바르게 짝지어진 것은? [10점]

Unlike plastic, which is artificial, rubber is a natural product. It is made from latex, a white liquid found in certain plants, especially the Para rubber tree. This tree originally came from the Amazon forests in Brazil. The Indians of that area used the latex from the rubber tree to make statues, cups, and shoes. When latex was discovered by Europeans, they soon found many uses for it. (A)_____, an English man named Charles Mackintosh invented a way to make waterproof rainwear with latex. His method is no longer used, (B)_____ even today, many people in England call a raincoat a "mackintosh."

- | | |
|---------------|-------|
| (A) | (B) |
| ① For example | thus |
| ② However | and |
| ③ As a result | still |
| ④ For example | but |

37. 다음 글의 빈칸에 들어갈 말이 순서대로 올바르게 짝지어진 것은? [10점]

Over 15 million people cross the twenty-five-mile-wide English Channel every year. Some of these people go across in airplanes and some by ferry boat. These days, many others drive or take the train through the "Chunnel," the tunnel that connects England and France. The idea of building a tunnel goes back to the nineteenth century, but it only became a serious possibility late in the twentieth century. The reasons for this were partly _____ and partly political. Until recently, most English people wanted England to remain _____. They did not want to be connected directly with the rest of Europe.

- ① social-peaceful
- ② technical-separate
- ③ cultural-developed
- ④ economical-dependent

38. 밑줄 친 (A)~(D) 가운데 글의 흐름과 어울리지 않는 것은? [15점]

Lawn tennis is a comparatively modern modification of the ancient game of court tennis. Major Walter C. Wingfield thought that something like court tennis might be played outdoors on the grass and in 1873 he introduced his new game under the name *Sphairistike* at a lawn party in Wales. (A) It was an immediate success and spread rapidly, but the original name quickly disappeared. Players and spectators soon began to call the new game "lawn tennis." (B) It was no wonder that people were not much interested in the differences between court tennis and lawn tennis. In 1874 a woman named Mary Outerbridge returned to New York with the basic equipment of the game, which she had obtained from a British Army store in Bermuda. (C) The first game of lawn tennis in the United States was played on the grounds of the Staten Island Cricket and Baseball Club in 1874. A year later, the U.S. Lawn Tennis Association was formed. (D) In the first international championship match for lawn tennis in 1900, American players defeated British players.

- ① (A) ② (B) ③ (C) ④ (D)

*** 다음 글을 읽고 물음에 답하십시오. (39~40)**

For many people, sitting still for a long time is one of the worst things about flying. Now doctors are discovering that there are good reasons to be unhappy about sitting still on long flight. In fact, it is not good for you at all: The blood in your legs does not flow well and you are more likely to get a blood clot (a small lump) in your leg. The clot may cause swelling and pain in the leg because the blood cannot flow past it. More serious problems can develop if part of a clot breaks off and travels to the lung. In this case, there is even the risk of death. To avoid risk, doctors recommend moving around as much as possible during a flight. Of course, you cannot stand up often or walk continually around the plane. But you can help the blood flow in your body by doing special exercises at your seat. _____.

39. 위 글의 마지막 부분에 이어질 말로 가장 적절한 것은? [10점]

- ① Flight attendants around the world noticed a dramatic increase in the number of air plane users.
- ② The general worsening of travel conditions in recent years has led to crowded planes and smaller seats.
- ③ Airliners' reducing the amount of seat space for each passenger can make people more likely to feel stressed.
- ④ Many airline companies now include instructions for these exercises in their in-flight magazines.

40. 위 글의 주제로 가장 적절한 것은? [10점]

- ① Ways to make your flying enjoyable
- ② Need for attending to the leg pain
- ③ Importance of exercise during a long flight
- ④ Tips for maintaining normal blood flow

*** 다음 글을 읽고 물음에 답하십시오. (41~42)**

Winking at somebody reminds people of a shared secret or is used as a private signal. Raising the eyebrows with the eyes wide open, or blinking (closing and opening both eyes very quickly) several times, expresses surprise, shock or sometimes disapproval. The phrase 'eyebrows were raised' is often used metaphorically. Frowning may suggest concentration, but is often a sign of disapproval or annoyance. Wrinkling the nose (moving it up and to one side) suggests there is a bad smell, but if your nose twitches and you take a few quick breaths this means you can smell something nice, especially food cooking. Children stick their tongues out to show they do not like somebody, but this is rude. Pursing the lips, making them very small and tight, is something people may do if they are concentrating hard. Sometimes, however, it shows a person is angry but trying hard to control their anger.

41. 위 글에 따르면 다음 중 부정적인 의미를 내포하지 않는 것은? [10점]

- ① frowning
- ② raising eyebrows
- ③ making lips small and tight
- ④ twitching nose with quick breaths

42. 다음 중 밑줄 친 metaphorically와 의미상 가장 가까운 것은? [10점]

- ① literally
- ② symbolically
- ③ inductively
- ④ politely

43. 다음 글의 내용과 일치하는 것은? [10점]

Newt Gingrich was Speaker of the House of Representatives from 1995 to 1998, when he resigned from the post. He is well known for his right-wing views, e.g., that Americans should pay less tax and that unemployed people should be given less money by the State. In 1995 he disagreed with President Clinton about how to spend the government's money that year, and their disagreement led to many government departments closing temporarily because they did not have any money. In 1997 the House Ethics Committee found that Gingrich had used tax laws wrongly and lied to the committee.

- ① The right wing people usually prefer more tax and more welfare.
- ② Gingrich and President Clinton had the same views on employment policy.
- ③ In 1995, many U.S. government departments closed due to lack of money.
- ④ After his resigning, Gingrich was found to have violated tax laws and accused.

*** 다음을 읽고 물음에 답하십시오. (44~45)**

American stage humor is very direct, whereas a lot of British comedy is more sophisticated and subtle. In the American series *Cheers*, for instance, the humor comes from characters like Coach and Woody being more stupid than any real person could possibly be. But in the British comedy *Fawlty Towers*, Basil Fawlty's funny characteristics are exaggerated versions of (A)those found in the type of Englishman he represents. Slapstick comedy, which is based on people falling over, bumping into each other, etc. is now less popular in Britain. British comedy makes frequent use of irony, humor which depends on a writer or performer suggesting the opposite of what is actually expressed. Many novels, films, stage plays, etc. use irony, even when discussing serious subjects such as death. The lack of irony in American comedy means that British people find some of (B)it boring.

44. 밑줄 친 (A)와 (B)가 가리키는 것이 올바르게 짝지어진 것은? [10점]

- | (A) | (B) |
|-------------------|-----------------|
| ① characteristics | humor |
| ② versions | British comedy |
| ③ characteristics | American comedy |
| ④ versions | irony |

45. 다음 중 위 글의 내용과 일치하는 것은? [10점]

- ① 미국의 코미디는 심각한 소재를 다루지 않는다.
- ② 영국의 코미디는 irony 요소를 자주 사용한다.
- ③ 미국에서 slapstick 코미디는 환영받지 못한다.
- ④ 영국의 코미디는 과장과 직접적 묘사로 대표된다.

*** 다음 글을 읽고 물음에 답하십시오. (46~47)**

In the 18th century, France and Britain did not have good relations. They fought over colonies in North America and also over the fur trade. France was largely Roman Catholic and Britain was mainly Protestant. This difference also caused tension. In 1756, a war (A)broke out between France and Britain. They fought in each other's colonies all over the world, including several regions in North America, such as the Ohio Valley. The British colonists on the east coast wanted new farmland for their growing population, and the French fur traders had forts in the Ohio area.

By 1758, the British had (B)captured the French fortress of Louisbourg, which guarded the entrance to the St. Lawrence River. This was the beginning of the end for French rule in North America. Quebec now lay unprotected. The British arrived on the St. Lawrence River before the French could (C)disport reinforcements to Quebec.

In September of 1759, the British attacked the French just outside Quebec City. The British were victorious and the following spring, they (D)conquered the last French stronghold, Montreal. French rule in North America ended, but the French influence continues to be felt in Canada. Today, more than five million French-speaking descendants of these early settlers live in the province of Quebec.

46. 밑줄 친 (A)~(D) 가운데 동사의 쓰임이 적절하지 않은 것은? [10점]

- ① (A) ② (B) ③ (C) ④ (D)

47. 다음 중 위 글의 내용과 일치하는 것은? [10점]

- ① 18세기 영국과 프랑스는 주로 종교적 차이로 인해 갈등이 많았다.
② 영국의 식민주의자들은 Ohio Valley에 수많은 요새를 가지고 있었다.
③ 1759년 프랑스는 North America에서의 지배권을 상실했다.
④ 오늘날 North America에서 프랑스의 영향은 찾아보기 어렵다.

*** 다음을 읽고 물음에 답하십시오. (48~50)**

It's hard to make friends if you stay home alone all the time. Get out and do things to put you in touch with others. Learn from people who seem to have lots of friends. Don't imitate all of the things they do, but try some of them yourself. Don't be afraid to talk about what you like and do best. Don't hide your strong points. People will be interested in you if there is something interesting about you. Plan things to talk about with people. The more you have to say, the more people will be interested in talking with you. Look people in the eye when talking to them. That way, they'll find it easier to talk to you. If your eyes are looking to the left, to the right, at the floor, people may think you're not interested in them and may stop being interested in you. Be a good listener. Let people talk about themselves. Ask lots of questions and show an interest in their answers. This alone will make people want to be your friend. Once you start to get to know someone, don't be friendly one day and then too shy to talk the next day. Be consistent. Consistency is something people look for in friends.

48. 이 글은 주로 무엇에 대한 것인가? [10점]

- ① Why it is important to make friends
② How to make your shy friends sociable
③ Different beliefs in the relationship with friends
④ Effective ways to form interpersonal relationships

49. 위 글의 내용과 일치하는 것은? [10점]

- ① People will think that you are too proud if you show them your strong points.
② People will feel embarrassed if you look them straight in the eye when you talk to them.
③ Having a few but true friends is much better than making friends with a lot of people.
④ People will want to be your friend if you ask them questions and show an interest in their answers.

50. 밑줄 친 Be consistent의 의미로 가장 적절한 것은? [10점]

- ① Do not frequently change your topics when you talk with people.
② Keep your decision, whatever it is, to the end once you have made it.
③ Behave in a predictable way when you meet people you get to know.
④ Meet consistently those people who have similar interests to yours.

2018학년도 건국대학교 재외국민과 외국인 전형 필기고사

< 수 학 >

성 명		수험번호		모집단위	
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- Ⓞ 수험생 성명, 수험번호, 지원 모집단위를 명확하게 기재하십시오.
- Ⓞ 문제지 하단의 쪽수(현재 쪽/전체 쪽수)를 보시고 페이지 누락 여부를 확인한 후, 누락된 페이지가 있으면 즉시 감독자에게 알리고 문제지를 교체받아야 합니다.
- Ⓞ 수학 문제지는 총 25문항, 500점 만점으로 되어 있습니다.
- Ⓞ 각 문항별로 배점이 상이(10점, 20점, 30점)하므로 유의하시기 바랍니다.
- Ⓞ 답안지 마킹은 컴퓨터용 사인펜만 사용하여야 하며, 마킹 후 수정이 불가능하므로 마킹 시 신중을 기하여 주시기 바랍니다.

1. 두 실수 a, b 에 대하여 이차방정식 $x^2 + ax + b = 0$ 의 한 근이 $\frac{1}{1-i}$ 일 때, $a+b$ 의 값은? (단, $i = \sqrt{-1}$) [10점]

① -1 ② $-\frac{1}{2}$ ③ 0 ④ $\frac{1}{2}$

2. 자연수 k 에 대하여 A_k 는 k 의 배수의 집합이다.
 $A_4 \cap A_{10} = A_a, (A_{12} \cup A_{16}) \subset A_b$
 를 만족시키는 두 자연수 a, b 에 대하여 $a+b$ 의 최댓값은? [10점]

① 22 ② 24 ③ 26 ④ 28

3. 두 실수 a, b 에 대하여 $a^2 + b^2 = a - b, ab = -1$ 이 성립할 때, $a+b$ 의 값은? [10점]

① $-\sqrt{3}$ ② -1 ③ 0 ④ 2

4. $999^3 - 1$ 을 $999 \times 10^3 + 1$ 로 나눈 몫은? [20점]

① 998 ② 999 ③ 1000 ④ 1001

5. 자연수 n 에 대하여 n 의 일의 자리 수를 $f(n)$ 이라 할 때,
 $f(3) + f(3^2) + f(3^3) + \dots + f(3^{10})$
 의 값은? [20점]

① 50 ② 51 ③ 52 ④ 53

6. $\log_3 2 = a, \log_3 5 = b$ 일 때, $\log_3 60$ 을 a, b 로 나타내면? [20점]

① $\frac{a-b+2}{a}$ ② $\frac{2a+b+1}{a}$
 ③ $\frac{3a+2b+2}{b}$ ④ $\frac{2a+b+1}{b}$

7. 점 A(2, 1)을 x 축, y 축에 대하여 각각 대칭이동한 점을 B, C라 할 때, 점 A와 직선 BC 사이의 거리는? [20점]

① $\frac{1}{\sqrt{5}}$ ② $\frac{2}{\sqrt{5}}$ ③ $\frac{3}{\sqrt{5}}$ ④ $\frac{4}{\sqrt{5}}$

8. 세 양수 a, b, c 에 대하여 다음이 성립할 때, $a+b+c$ 의 값은? [20점]

$$\begin{aligned} \log_2 ab + \log_4 bc &= \frac{5}{2} \\ \log_2 bc + \log_4 ca &= 4 \\ \log_2 ca + \log_4 ab &= \frac{5}{2} \end{aligned}$$

- ① 7 ② 8 ③ 9 ④ 10

9. 1, 2, 3, ... , 10 이 적힌 10장의 카드가 쌓여 있는데 카드에 적힌 수의 값이 작은 것이 위에 오도록 쌓여 있다. 이 카드 묶음에서 맨 위에 있는 카드를 맨 아래로 내리고 그 후 맨 위에 놓이게 되는 카드를 버리는 시행을 한다. 이와 같은 시행을 반복할 때, 맨 마지막에 남게 되는 카드에 적힌 숫자는? [20점]

- ① 1 ② 3 ③ 5 ④ 7

10. 집합 $X = \{1, 2, 3, 4, 5\}$ 에 대하여 X 에서 X 로의 함수 $f: X \rightarrow X$ 가 다음 조건을 모두 만족시킨다.

(i) $f \circ f = f$
 (ii) 함수 f 의 치역이 $\{3, 4, 5\}$ 이다.
 (iii) $f(2) - f(1) = 2$

이때, $\sum_{k=1}^5 f(k)$ 의 값은? [20점]

- ① 16 ② 18 ③ 19 ④ 20

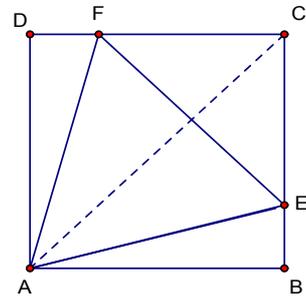
11. 실수 전체의 집합 R 에서 R 로의 함수 f 가 다음 조건을 모두 만족시킨다.

(i) $-1 \leq x \leq 1$ 일 때, $f(x) = \sqrt{1-x^2}$
 (ii) 모든 실수 x 에 대하여 $f(x+2) = f(x)$

함수 $y = f(x)$ 의 그래프가 직선 $y = ax + 1$ 과 서로 다른 네 점에서 만나도록 하는 양수 a 의 값은? [20점]

- ① $\frac{1}{4}$ ② $\frac{1}{3}$ ③ $\frac{1}{2}$ ④ $\frac{3}{4}$

12. 한 변의 길이가 1인 정사각형 모양의 종이 ABCD를 대각선 AC를 따라 접으면 변 BC 위의 점 E가 변 CD 위의 점 F로 옮겨진다. 삼각형 AEF가 정삼각형일 때, 선분 AE의 길이는? [20점]



- ① $\sqrt{6} - \sqrt{2}$ ② $\sqrt{5} - \sqrt{2}$
 ③ $2 - \sqrt{2}$ ④ $\sqrt{7} - \sqrt{3}$

13. 좌표평면 위에 세 점 $A(0, 0)$, $B(3, 1)$, $C(4, 5)$ 가 있다. 선분 AB 위의 점 D와 선분 AC 위의 점 E에 대하여 삼각형 CDE의 넓이는 삼각형 ADE의 넓이의 2배이고, 삼각형 BCD의 넓이는 삼각형 ADE의 넓이의 6배일 때, 직선 DE의 기울기는? [20점]

- ① $\sqrt{2}$ ② 2 ③ 3 ④ 4

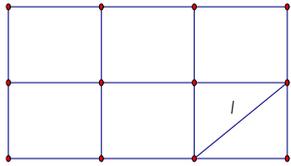
14. 이차함수 $f(x) = (x-2)^2$ 에 대하여 <보기>에서 옳은 것만을 있는 대로 고른 것은? [20점]

<보기>

ㄱ. 방정식 $f(x) - x = 0$ 은 서로 다른 양의 실수를 근으로 갖는다.
 ㄴ. 서로 다른 두 실수 a, b 에 대하여 $f(a) = f(b)$ 이면 $a + b = 4$ 이다.
 ㄷ. 모든 양의 실수 a 에 대하여 $f(-a^2) > f(4a)$ 가 성립한다.

- ① ㄱ ② ㄴ ③ ㄱ, ㄴ ④ ㄱ, ㄴ, ㄷ

15. 길이가 145m 인 철망을 이용하여 다음 그림과 같이 합동인 직사각형 모양으로 된 6개의 동물 우리를 만들려고 한다. 직사각형 하나의 대각선의 길이를 l m 라고 할 때, l^2 의 최솟값은? [20점]



- ① 144 ② 145 ③ 146 ④ 147

16. 함수 $f(x) = \frac{x+|x|}{2}$ 에 대하여 함수 $g(x)$ 는 $g(2x-1) = f(x+2)$ 를 만족시킨다. 이때, $g(1) + g(-1)$ 의 값은? [20점]
- ① 2 ② 3 ③ 4 ④ 5

17. 어느 달에 신종 플루 바이러스 감염이 의심되어 병원을 찾은 환자 100명은 고열, 기침, 두통 중 한 가지 이상의 증상을 보였다. 고열 증세가 있는 환자는 48명, 기침을 하는 환자는 40명, 두통을 호소하는 환자는 28명, 기침과 두통이 있는 환자는 9명이었다. 병원 당국은 고열과 기침 증세가 동시에 있거나 고열과 두통이 동시에 있는 환자를 신종 플루 바이러스 감염 의심자로 일차 분류하였다. 일차 분류된 환자의 수는? [20점]

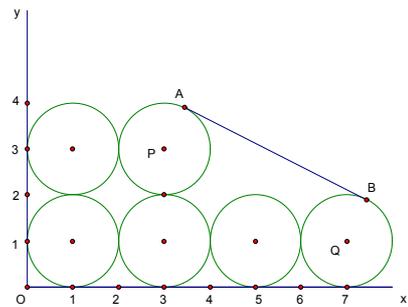
- ① 1 ② 7 ③ 11 ④ 13

18. 다음 연립부등식을 만족하는 영역의 넓이는? [20점]

$$\begin{cases} (x-1)^2 + (y-1)^2 \leq 2 \\ (x+y-2)y \geq 0 \end{cases}$$

- ① $\frac{\pi}{2} + 2$ ② $\pi - 1$ ③ $\pi + 1$ ④ $\frac{3}{2}\pi - 1$

19. 그림과 같이 각각의 원은 반지름의 길이가 1이고 다른 원, x 축 또는 y 축과 접한다. 중심이 P인 원과 중심이 Q인 원에 동시에 접하는 선분 AB의 길이는? [20점]



- ① $\sqrt{18}$ ② $\sqrt{20}$ ③ $\sqrt{22}$ ④ $\sqrt{24}$

20. 함수 $f(x) = \sum_{k=1}^{10} (x-k)^2$ 이 최솟값을 가질 때의 x 의 값은? [20점]

- ① 5 ② $\frac{11}{2}$ ③ 6 ④ $\frac{13}{2}$

21. 다음 두 조건을 모두 만족하는 이차함수 $y=f(x)$ 의 최댓값은? [20점]

- (i) 방정식 $f(2x)=0$ 의 서로 다른 두 실근의 합이 1이다.
 (ii) 방정식 $f(x)=0$ 의 실근은 α, β 이고, 방정식 $f(x)-x=0$ 의 실근은 $\alpha, \beta-1$ 이다.

- ① 0 ② 1 ③ 2 ④ 3

22. 각 자연수 n 에 대하여 A_n 은 연속하는 n 개의 자연수로 이루어진 집합이다. A_n 이 다음 조건을 모두 만족할 때, 집합 A_{10} 의 원소 중에서 가장 작은 수는? [20점]

- (i) $A_1 = \{1\}$
 (ii) 집합 A_{n+1} 의 원소 중에서 가장 작은 수는 집합 A_n 의 원소 중에서 가장 큰 수보다 n 만큼 크다.

- ① 80 ② 82 ③ 84 ④ 86

23. 점 A(3, 0)에서 직선 $x-y+1=0$ 과 직선 $2x-y+1=0$ 에 내린 수선의 발을 각각 B, C라 할 때, 삼각형 ABC의 외접원의 지름의 길이는? [30점]

- ① 3 ② $\sqrt{10}$ ③ $\sqrt{11}$ ④ $\sqrt{12}$

24. x 에 대한 방정식

$$|x-a^2-a| + |x-a^2+a| = a^2$$

의 해가 무수히 많도록 하는 모든 실수 a 의 값의 곱은? [30점]

- ① -4 ② -2 ③ 0 ④ 2

25. 수열 $\{a_n\}$ 이 다음과 같이 귀납적으로 정의될 때, a_{100} 의 값은? [30점]

$$a_1 = \frac{1}{2}, \quad a_{n+1} = \frac{n}{(n+2)a_n} \quad (n=1, 2, 3, \dots)$$

- ① $\frac{99}{101}$ ② $\frac{100}{101}$ ③ 1 ④ $\frac{102}{101}$

※ 시험이 시작되기 전에는 표지를 넘기지 마십시오.