2024

INTERNATIONAL ANTALYA MATHEMATICS OLYMPIAD

5TH GRADE QUESTION BOOKLET

NAME SURNAME : .....

SCHOOL : ..... GRADE : .....

SIGNATURE : .....

EXAMINATION RULES

1. It is forbidden to take the exam with a phone. Please hand in your phone to the attendant. This exam consists of 25 multiple-choice questions and the exam duration is 120 minutes.

2. Each question has only one correct answer. Mark your correct answer by completely crossing out the relevant box on your answer sheet. No marking in the question booklet will be evaluated.

3.All questions are of equal value and four wrong answers will cancel one correct answer. Questions left blank will not have a positive or negative effect on the evaluation.

4. The questions are NOT in order of difficulty. Therefore, it is recommended that you review all questions before you start answering.

5. It is forbidden to use aids such as compasses, rulers, calculators and scratch paper. Do all your work on the question booklet.

6. During the exam, you will not talk to the staff and you will not ask them any questions. It is unlikely that there will be a mistake in the questions. If this happens, the exam academic board will take appropriate action. In this case, you should mark the option that you think is the most correct.

7. Students are not allowed to ask each other for pencils, erasers, etc.

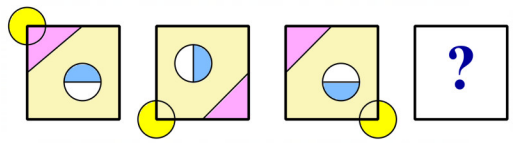
8. It is forbidden to leave the exam for the first 60 minutes. A candidate who goes out will not be allowed to take the exam again.

9. Do not forget to hand in your answer sheet and question booklet to the staff before leaving the exam hall.

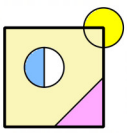
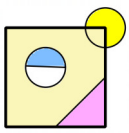
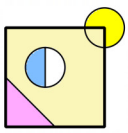
1. Mertcan takes a selfie with his friends. When they look at the photo, they see that it is written backwards as in the mirror. What is the difference between the apartment number seen in the photo and the real number of the apartment?

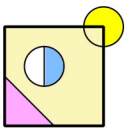
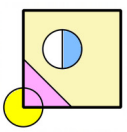
A) **0** B) **2907** C) **90** D) **2997** E) **200**

2. The following successive figures are constructed according to a specific rule.



Which of the following could be the fourth figure?

A)  B)  C) 

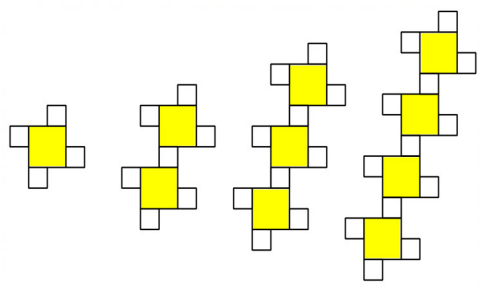
D)  E) 

3. What is the sum of the numerator and denominator of the following fraction in its simplest form?

$$\frac{12 + 2 \times 2 - 1}{12 \div 2 + 2 \times 1}$$

A) **19** B) **7** C) **17** D) **23** E) **27**

4. In the pattern below, in step **1**, there are a total of **5** squares, **4** small and **1** large. How many squares are there in the **10**th step in this figure pattern created with the help of these small and large squares?



A) **42** B) **41** C) **45** D) **49** E) **39**

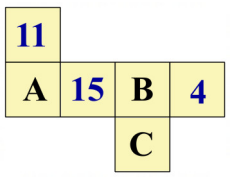
5. If the product of four different positive integers is **360**, what is the maximum sum of these four integers?

A) **76** B) **23** C) **48** D) **47** E) **66**

6. Some books will be chosen at random from a library containing **25** Turkish, **20** Mathematics, **10** Science and **9** English books. What is the minimum number of books to be selected so that there are at least **13** books of the same course?

A) **43** B) **44** C) **53** D) **50** E) **39**

7. In the figure below, there is an opened cube whose sum of the opposite sides is equal. According to this, what is the sum of $\mathbf{A+B+C}$?



A) **27** B) **23** C) **29** D) **36** E) **24**

8. $n!$ denotes the product $1 \cdot 2 \cdot 3 \cdots n$. What is the sum of the numerator and denominator in the simplest form of the fraction below?

$$\frac{5!+6!+7!}{6!+7!}$$

A) **90** B) **84** C) **85** D) **97** E) **86**

9. $\mathbf{A}$, $\mathbf{B}$ and $\mathbf{C}$ are different digits, and a four-digit number is obtained by adding the following three-digit numbers:

$$\begin{array}{r} \mathbf{AAB} \\ \mathbf{ABA} \\ +\mathbf{BAA} \\ \hline \mathbf{BCCB} \end{array}$$

What is the sum of $\mathbf{A+B+C}$?

A) **9** B) **11** C) **7** D) **10** E) **8**

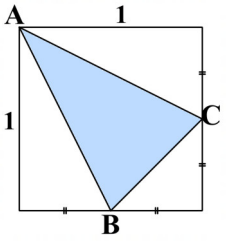
10.

$$\frac{2^{16}+2\cdot 2^{3}}{2^{17}}-\frac{2^{14}+8}{2^{16}}$$

What is the simplest form of the above rational expression?

A) $\frac{3}{8}$ B) **2** C) $\frac{1}{8}$ D) $\frac{1}{4}$ E) $\frac{1}{2}$

11. The area of a triangle is equal to half of the base times height. The area of a right triangle is equal to half of the product of the lengths of the perpendicular sides. Use this information to solve the following question.



In the figure above, a triangle is drawn inside a square with a side of $\mathbf{1}$ unit and two of its vertices are on the midpoints of the sides of the square. Find the area of this shaded triangle.

A) $\frac{\mathbf{1}}{\mathbf{5}}$ B) $\frac{\mathbf{1}}{\mathbf{4}}$ C) $\frac{\mathbf{3}}{\mathbf{8}}$ D) $\frac{\mathbf{1}}{\mathbf{2}}$ E) $\frac{\mathbf{5}}{\mathbf{8}}$

12. Telephone numbers in a town have $\mathbf{6}$ digits and are assigned according to the following rule.

- All digits are different from each other.
- In the number $\mathbf{ABCDEF}$, the equality $\mathbf{A+D+F=B+C+E}$ is satisfied.
- The first digit from the left is nonzero.

According to this, what is the number in the ones digit of the smallest phone number in this town?

A) $\mathbf{1}$ B) $\mathbf{3}$ C) $\mathbf{4}$ D) $\mathbf{2}$ E) $\mathbf{6}$

13. For any number A, $k(A)$, $b(A)$ and $t(A)$ are defined as follows.

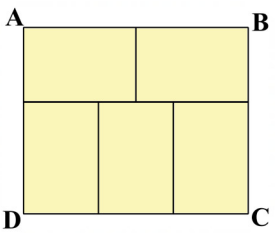
- $k(A)$: The smallest digit of the number A
- $b(A)$: The largest digit of the number A
- $t(A)$: Sum of the digits of the number A

For example, for the number $A = 45601$, $k(A) = 0$, $b(A) = 6$ and $t(A) = 4+5+6+0+1 = 16$.

Accordingly, what is the number in the tens position of the largest even number of five digits with all digits different such that $b(A) = 7$, $t(A) = 25$ and $k(A)$ is an odd number?

A) $\mathbf{4}$ B) $\mathbf{3}$ C) $\mathbf{5}$ D) $\mathbf{2}$ E) $\mathbf{1}$

14.



Five congruent rectangles are joined as shown in the figure to form the large rectangle ABCD. Since the perimeter of rectangle ABCD is $\mathbf{99}$ cm, what is the length of the perimeter of one of the congruent rectangles?

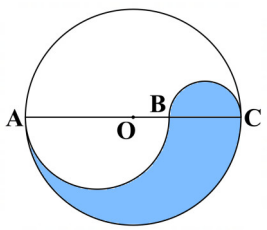
A) $\mathbf{45}$ B) $\mathbf{36}$ C) $\mathbf{39}$ D) $\mathbf{48}$ E) $\mathbf{36,5}$

15. The area of a circle with radius r is found by the formula πr^2.

For example, the area of a circle with radius 4 is

$$Area = \pi r^2 = \pi 4^2 = 16\pi.$$

In the figure below, $[AC]$ is the diameter of the great circle. Two semicircles with diameters $[AB]$ and $[BC]$ are drawn on this diameter. Since $|AB| = 8$ and $|BC| = 6$, what is the ratio of the shaded area to the non shaded area?



A) $\frac{4}{9}$ B) $\frac{3}{5}$ C) $\frac{2}{3}$ D) $\frac{1}{2}$ E) $\frac{3}{4}$

16. How many different remainders can be obtained by dividing numbers whose product of digits is 45 and whose digits are less than 6 by 9?

A) 7 B) 6 C) 3 D) 4 E) 9

17. There are 6 shelves in a bookcase and there are $23, 25, 32, 29, 26, 33$ books on each shelf respectively. At least how many books should be moved so that each shelf has exactly the same number of books?

A) 12 B) 13 C) 10 D) 8 E) 9

18. For any real number x, the representations $\lfloor x \rfloor$ and $\lceil x \rceil$ are called the floor integer of real number x and the ceiling integer of real number x, respectively, and are defined as follows.

If x is an integer,

$$\lfloor x \rfloor = \lceil x \rceil = x;$$

If x is not an integer,

$\lfloor x \rfloor$ = The largest integer less than x

$\lceil x \rceil$ = The smallest integer greater than x.

For example, $\lfloor 3,4 \rfloor = 3$, $\lceil 3,4 \rceil = 4$, $\lfloor 3 \rfloor = \lceil 3 \rceil = 3$.

If $10 < x < 24$ and $10 < y < 24$, what is the maximum value of the following expression?

$$\left\lfloor \frac{x}{4} \right\rfloor - \left\lceil \frac{y}{3} \right\rceil$$

A) 2 B) 0 C) 1 D) 3 E) 4

19. The following operations are allowed on the given numbers:

■ Multiplying the number by **2**.

■ Add **2** to the number.

According to this, at least how many operations must be done to get the number **400** from the number **1**?

A) **8** B) **9** C) **10** D) **12** E) **16**

20. What is the sum of the digits of the number

$$32^5 \cdot 5^{23}$$

A) **5** B) **10** C) **9** D) **4** E) **7**

21. How many three-digit numbers less than **500** are exactly divisible by the number in the hundreds place?

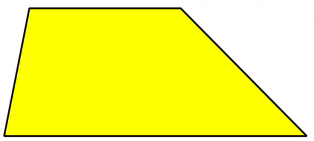
A) **200** B) **209** C) **198** D) **211** E) **199**

22. How many of the digits of the following number are zeros?

$$(10^7 + 777) \cdot 10^7 + 77 \cdot 10^8 - 1$$

A) **11** B) **7** C) **9** D) **3** E) **4**

23. The area of a trapezoid is equal to half of the sum of the upper and lower base multiplied by the height. A ruler measures lengths $\mathbf{2\%}$ more than their actual value. Pınar calculates the area of the trapezoid using the lengths of the bottom base, top base and height that she found with the ruler. If the actual area of the trapezoid is $\mathbf{10000}$, how much larger is the area found by Pınar than the real area?



A) $\mathbf{398}$ B) $\mathbf{402}$ C) $\mathbf{401}$ D) $\mathbf{400}$ E) $\mathbf{404}$

24. The code for a positive number $\boldsymbol{n}$ is constructed as follows. First, the number $\boldsymbol{n}$ is written in powers of all primes from smallest to largest. Then, the code of the number is formed by writing these powers side by side with a comma between them, including zero.

$$\boldsymbol{n = 2^a \cdot 3^b \cdot 5^c \cdot 7^d \cdots p^k \xrightarrow{\text{CODE}} (a, b, c, d, \ldots, k)}$$

For example,

$$\mathbf{20 = 2^2 \cdot 3^0 \cdot 5^1 \xrightarrow{\text{CODE}} (2, 0, 1)}$$

$$\mathbf{30 = 2^1 \cdot 3^1 \cdot 5^1 \xrightarrow{\text{CODE}} (1, 1, 1)}$$

$$\mathbf{315 = 2^0 \cdot 3^2 \cdot 5^1 \cdot 7 \xrightarrow{\text{CODE}} (0, 2, 1, 1)}$$

According to this, multiplying the number whose code is $\mathbf{(1, 2, 3, 4)}$ by which number gives the number whose code is $\mathbf{(4, 2, 4, 5)}$?

A) $\mathbf{280}$ B) $\mathbf{840}$ C) $\mathbf{480}$ D) $\mathbf{168}$ E) $\mathbf{96}$

25. Two types of tickets are sold for a concert: standing or seated. Three quarters of the participants in this concert are sitting in four fifths of the seats reserved for the concert. $\mathbf{24}$ of the seat tickets are not sold and these seats remain empty. According to this, how many people attended the concert standing?

A) $\mathbf{24}$ B) $\mathbf{30}$ C) $\mathbf{36}$ D) $\mathbf{42}$ E) $\mathbf{32}$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