Grade 8

Problem №1.

Let $X = \frac{2019}{2018} + \frac{2018}{2019} + \frac{2019}{2020}$ and $Y = \frac{1}{2020} + \frac{1}{2019} - \frac{1}{2018}$. Which of the following equations is correct?

A) X-Y=4 B) X+Y=1 C) Y=X+4 D) X=4-Y E) None of preceding

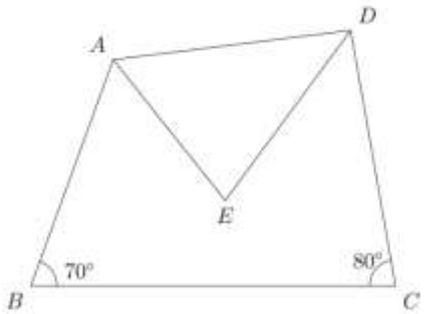
Problem №2.

Let a, b and c are distinct prime numbers such that $a(c-b) = 18$ and $b(c-a) = 40$. Find $a + b + c$.

A) 13 B) 17 C) 19 D) 21 E) None of preceding

Problem №3.

ABCD is a quadrilateral where AE and DE are angle bisectors. Find the value of m∠AED.



A) 60° B) 75° C) 90° D) 100° E) None of preceding

Problem №4.

If $5^2 + 5^3 + 5^4 + \ldots + 5^{20} = M$, then what is the value of $5^2 + 5^3 + 5^4 + \ldots + 5^{18}$?

A) $M+19$ B) $M-5^{21}$ C) $M-5^{19}\cdot 6$ D) $\frac{M-36}{9}$ E) $\frac{M}{25}$

Problem №5.

How many distinct isosceles triangles can be created with integer sides and perimeter of 200 units?

A) 49 B) 64 C) 81 D) 96 E) None of preceding

Problem №6.

For how many integers n is $|n^2-6n+5|$ prime?

A) 1 B) 2 C) 3 D) 4 E) 5

Problem №7.

How many ways can you select three integers from 1 to 10 such that no two integers chosen are consecutive?

A) 30 B) 56 C) 120 D) 360 E) None of preceding

Problem №8.

Find the sum of all real solutions of the equation $(x-5)^{2x-6}=1$.

A) 9 B) 10 C) 13 D) 15 E) None of the preceding

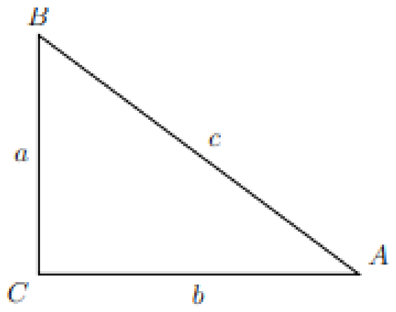
Problem №9.

Suppose $\overline{xx}$, $\overline{yy}$, $\overline{zz}$ are two-digit whole numbers. If $x^2+y^2+z^2=74$ then find the number of positive divisors of $(xx)^2+(yy)^2+(zz)^2$.

A) 12 B) 13 C) 14 D) 15 E) 16

Problem №10.

Find the area of the right triangle ABC if $a+b+c=28$ and $a^2+b^2+c^2=288$.



A) 230 B) 288 C) 84 D) 56 E) 28

Problem №11.

Maria flips six fair coins. What is the probability that at least half one of the coins land heads?

A) $\frac{10}{32}$ B) $\frac{1}{2}$ C) $\frac{41}{64}$ D) $\frac{21}{32}$ E) None of the preceding

Problem №12.

A rectangular box has integer edge lengths in the ratio $1 : \frac{3}{2} : 2$. Which of the following could be the volume of the box?

A) 120 B) 144 C) 168 D) 192 E) 216

Problem №13.

The sum of the first 20 terms of an arithmetic sequence which has first term 1 is equal to the sum of the first 10 terms of an arithmetic sequence which has first term 10. If positive integers x and y are the respective common differences of the sequences, what is the minimum possible value of $x + y$?

A) 35 B) 38 C) 40 D) 43 E) None of the preceding

Problem №14.

The number $N = 11111 \dots 111$ is formed by writing 105 ones in a row. What is the sum of the digitsof the product $105 \times N$?

A) 504 B) 555 C) 630 D) 945 E) 1105

Problem №15.

Eight chess players play in a round-robin tournament, where each player plays every other player exactly once. A win is worth 1 point for the winner and 0 point for the loser and a tie is worth 0.5 points for the both players. Given that seven of the players' cumulative scores were $0, 1, 2.5, 3, 3.5, 5$ and 7 points, how many points did the eighth player score?

A) 3 B) 4 C) 5 D) 6 E) 7