MATHMOISELLE: Mathematics Contest in Modern Languages, VIIth edition, 06/02/2016

10thclass/M1

First and last name of the student

Calculus problems

1. The modulus of the complex number $\left(\frac{1+i}{1-\sqrt{3}i}\right)^{2016}$ is equal to:

a) 2^{1008} b) 2^{-1008} c) $\sqrt{2}^{1008}$ d) $\sqrt{2}^{-1008}$

2. The value of the product $P=\sqrt{3-\sqrt{5}}\cdot\sqrt[3]{1+\sqrt{5}}\cdot\sqrt[6]{7+3\sqrt{5}}$ is:

a) $P=-3$ b) $P=-2$ c) $P=1$ d) $P=2$

3. The value of the sum $S=\ln(tg1^{\circ})+\ln(tg2^{\circ})+\ldots+\ln(tg89^{\circ})$ is:

a) $S=1$ b) $S=-1$ c) $S=0$ d) $S=2$

Logical problems

1. A student has to sit 4 exams in 10 days. In how many ways can these exams be scheduled, so that he sits one exam on the first day?

a) 2016 b) C_{10}^{4} c) A_{10}^{4} d) $4\cdot C_{9}^{4}$

2. At a meeting of the students' council of a certain county, the participants, boys and girls, are seated round a big round table. It is known that: 9 of the girls have another girl seated to their right; 12 of the girls have a boy seated to their right; 3 out of 5 boys have a girl seated to their right. One of the students is randomly chosen to write the minute of the meeting. What is the probability of a girl being randomly selected?

a) $P=\frac{19}{35}$ b) $P=\frac{19}{41}$ c) $P=\frac{21}{35}$ d) $P=\frac{21}{41}$

3. Ioan, Vasile, Costin and George are four friends whose last names are Ionescu, Vasilescu, Georgescu and Costescu, but the initials of their first names are different from the initials of their last names. Ionescu and Vasilescu are black-eyed, George is blue-eyed, and Vasile is green-eyed. What are the complete names of the four friends?

a) I.G., V.I., G.C., C.V. b) I.C., V.I., G.V., C.G c) I.V., V.I., G.C., C.G.
d) I.V., V.C., G.I., C.G.

Practical applications

1. Out of 120 consumers of coffee, 70 drink it with sugar, 60 with cream, while 50 take both sugar and cream in their coffee. How many consumers of sugarless black coffee are there?

a) 80 b) 40 c) 50 d) 100

2. The function $N(t)=14e^{-0,0715t}$ estimates the amount of radioactive material (expressed in grams) decomposed after *t* days. Determine the number of days required for half the material to decompose. (It is known that $\ln 2 \approx 0,6931$)

a) 8.9 days b) 9.1 days c) 9.6 days d) 8.5 days

3. Alex practices a competitive sport. At a very difficult tournament, his handball team has acquired the score p, where $p=p(n)=\left[\left(\sqrt{2}\right)^{10-n}\cdot\left(\sqrt[7]{3^n}\right)\right]$, after each $n-$th match he has played (28 matches on the whole, played in tournament manner, which means that each team has played against all the other contesting teams). If $n=1,2,...,10$ represents the number of matches played by the team of Alex and $[a]$ the set part of the real number a, then the number of teams participating to the tournament *E* and the number of points *p* acquired by the team of Alex after 7 matches are:

a) *E* = 8, *p* = 10 *b)* *E* = 10, *p* = 10 *c)* *E* = 8, *p* = 8 *d)* *E* = 10, *p* = 8.

MATHMOISELLE: Mathematics Contest in Modern Languages, VIIth edition, 06/02/2016

10thclass/M2

First and last name of the student

Calculus problems

1. The result of the calculus $\dfrac{\left(4^{n+1}-4^{n}\right)^{\frac{1}{2}}}{\left(8^{n-1}-7\cdot 8^{n-2}\right)^{\frac{1}{3}}}$ is:

a) $\sqrt{3}$; b) 4; c) $4\sqrt{3}$; d)2

2. If $\log_4 80 = a$ then $\log_4 5$ is equal to:

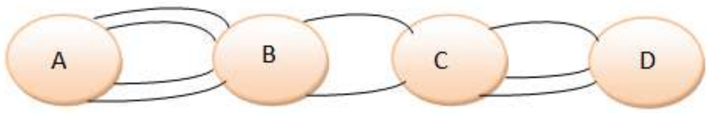
a)$1-a$ $b)a-2$ $c)a+2$ $d)2-a$

3. Calculating $\dfrac{\left(\dfrac{2016}{2015}\right)^{-1}+2016^{-1}}{\sqrt[3]{2\cdot 2016}\cdot\left(\dfrac{\sqrt[3]{4}}{\sqrt[3]{2016}}\right)^{-2}}$ we get:

a)1008^{-1} $b)2016$ $c)\sqrt[3]{2016}$ $d)1008$

Logical problems

1. There are four roads leading from place A to place B and two roads from place B to place C. If there are three routes from place C to place D, then the number of roads leading from A to D, via B and C, is:



a)9 $b)12$ $c)24$ $d)26$

2. If $2\ln x-\ln y=\ln\left(x-\dfrac{1}{4}y\right)$ for $4x>y>0$, then $\dfrac{x}{y}$ is:

a) $-\dfrac{1}{2}$ *b)* $\dfrac{3}{2}$ *c)* 1 *d)* $\dfrac{1}{2}$

3. The syllabus of a class contains 10 subject-matters, and five different subjects must be scheduled every day. How many possibilities are there for a day's timetable?

a) A_{10}^{5} $b)C_{10}^{5}$ $c)P_{10}$ $d)1823$

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10^th class/M_2

First and last name of the student

Practical applications

1. A ship's crew set sail in point A(1,3), being headed to point C(m,-3). If, on their shortest route from A to C, they pause to allow the passage of another ship, which has the coordinates B(-3, 0), then m is:

$$a)2 \quad b)-7 \quad c)6 \quad d)7$$

2. A student wants to get from his home H(0,0) to school S(5,6), following the GPS tracker on his phone. He intends to drop by one of his friends' house on his way, either Bogdan's B(2,3) or Catalin's C(0,1). In this case, his shortest route to school is:

$$a)\sqrt{13}+3\sqrt{2} \quad b)1+5\sqrt{2} \quad c)5+3\sqrt{2} \quad d)10$$

3. The function $N(t)=12+29\log_2 t,\ 0<t\leq 16$, models the number of words per minute at which a tenth grade student types a text on the computer keyboard. The maximum number of words the student can type per minute is:

a) 5 words per minute;
b) 8 words per minute;
c) 128 words per minute;
d) 45 words per minute;