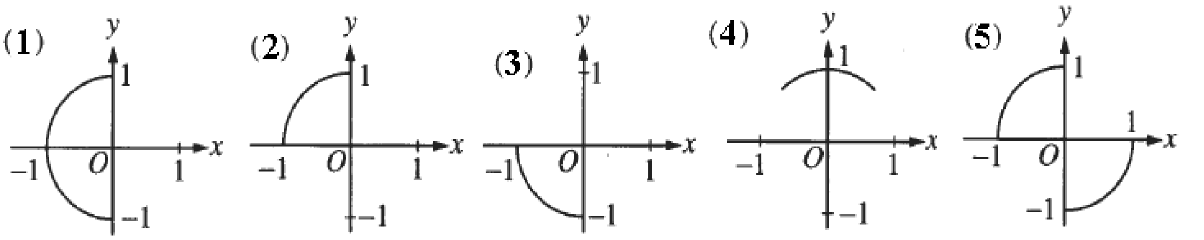
Problems.

Problem 1.
A circle is tangent to straight lines $x-4=0$ and $x=10$, and its center lies on the straight line $x+2y+5=0$ and has coordinates $(x_o;y_o)$. Then the sum $2x_o+y_o$ is …

Problem 2.
Let the vector $(m;2;3)$ be a linear combination of vectors $(0;1;1)$ and $(1;1;2)$. Then the value m is equal to…

Problem 3.
Which of the graphs will be the graph of the parameter given function $\begin{cases} x=\sin t \\ y=\cos t \end{cases}$, if $t\in\left[-\frac{\pi}{2};0\right]$?



Problem 4.
The value of the expression $8+i^8+i^{18}+i^{28}+i^{38}+i^{48}+i^{58}+i^{68}+i^{78}+i^{88}$ is equal to…

Problem 5.
The weight of the cargo stowed in a number of boxes is 10 tons. The weight of each box doesn't exceed 1 ton. What is the least number of rides the truck with the weight-bearing capacity of 3 tons has to do to securely transport the cargo?

Problem 6.
Matrix A is a square nonsingular matrix of the third order, all elements of which are non-zero. The greater number of zeros which A^{-1} can have, is equal to …

Problem 7.

When the boat moves on the surface of the water the resistance force of the environment F is directly proportional to the speed v ($F = kv$, where k - coefficient of proportionality). At the moment of the engine shutdown the outboard motorboat is moving at a speed of 224 m/min., and 3 min. later it's speed is equal to 112 m/min. 9 min. after the engine shutdown the outboard motorboat will be moving at a speed of ______ m/min.

Problem 8.
Four-digit number was divided to its sum of digits. What maximal result could be obtained?

Problem 9.
If $\int\limits_{-1}^{1} \frac{dx}{(e^x+1)(x^2+1)} = I$, then $\frac{24I}{\pi}$ is equal to …

Problem 10.
Captain Silver buried treasure on a desert island. There are only two palms on this island: a small one and a big one. They are situated at a distance of 400 m from each other. Silver told the rest of the pirates that the treasure is located at a three times greater distance from the small palm than from the big one. If L is the largest possible length of the ditch the pirates have to dig to find the treasure, then the value of the expression $\frac{L}{15\pi}$ is equal to…

Problem 11.
Given that $f(x) = \sqrt{(1+tg(2x))\cdot(1+tg(4x))\cdot(1+tg(6x))\cdot\ldots\cdot(1+tg(32x))}$. Then the value of the derivative $f'(0)$ will be…

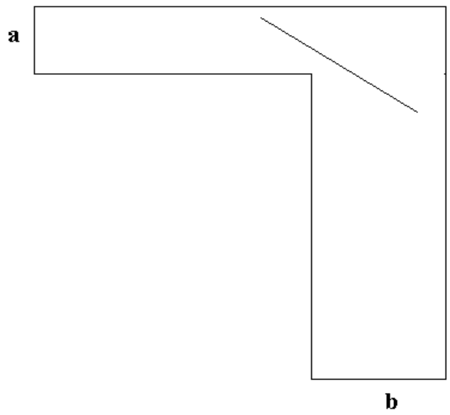
Problem 12.
From 27 equal small wooden cubes was constructed a big cube 3x3x3. A tree worm is situated inside the central cube. At each moment he could gnaw a path from the cube where he situated to any adjacent (with respect to a face) cube and crawl there. However, he don't return to a cube where he already was before. What maximal number of small cubes could the worm visit?

Problem 13.
Engineers always tell the truth whereas businessmen always lie. Let's take F and G

for engineers. A announces, that B states, that C assures, that D says, that E insists that F denies, that G is an engineer. C also announces that D is a businessman. How many businessmen are there in this team if A is a businessman too?

Problem 14.

Two tunnels $a = 1{,}5\sqrt{1{,}5}м$ and $b = 2{,}5\sqrt{2{,}5}м$ wide are connected with each other at the right angel (see Figure). Workers carry tubes of different length along these tunnels. Indicate in meters the greater length of the tube which can be carried along these tunnels in horizontal position. (ignore the thickness of the tube).



Problem 15.

Let the limit of sequence

$$\sqrt{1},\ \sqrt{1+\sqrt{1}},\ \sqrt{1+\sqrt{1+\sqrt{1}}},\ldots,\underbrace{\sqrt{1+\sqrt{1+\ldots\sqrt{1}}}}_{n\ раз}$$

be equal to P, then the value of the expression $10\left(\sqrt{5}-1\right)P$ will be…

Problem 16.

Given that the function $\varphi(x)$ is such as $\int_0^1 \varphi(\alpha x)d\alpha = 8\cdot\varphi(x)$ and $\varphi(1) = 1024$. Then the value $\varphi(256)$ is equal to …