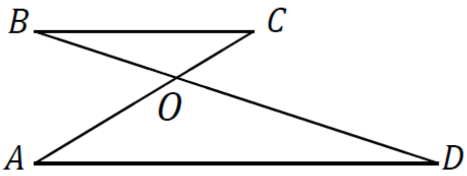
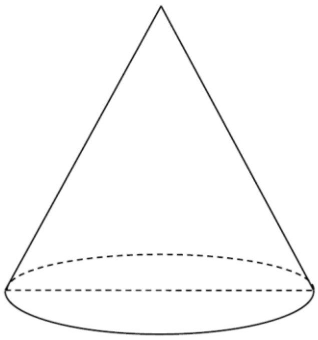
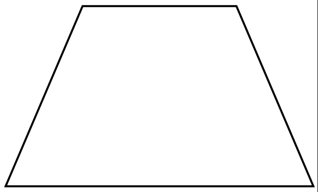
No.	Items	Score	
	ALGEBRA		
1.	Calculate: $36^{0,25} \cdot 6^{0,5} - 6$. *Solution:* *Answer:*____.	L 0 1 2 3 4 5	L 0 1 2 3 4 5
2.	Prove that the value of the expression $\frac{\log_7 12 - 2\log_7 2}{\log_{49}\frac{1}{9}}$ is an integer. *Solution:*	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
3.	Determine the complex numbers z, such that $\begin{vmatrix} z & 2 \\ 2i & i \end{vmatrix} = 3 - 2z$, where $i^2 = -1$. *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

4.	In a class boys represent 40% of the total number of pupils. After 6 more boys came in the class, the number of boys became equal to the number of girls. Determine the number of girls in the class. *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
5.	Determine the smallest integer value of a, such that one of the solutions to the equation $x^2 - (2a-6)x + 9 - 6a = 0$ belongs to the interval $(1; +\infty)$. *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

<table>
<tr><th colspan="4">GEOMETRY</th></tr>
<tr><td>6.</td><td>On the picture, $AD \parallel BC$, $AD = 20$ cm, $BC = 8$ cm, and O is the point of intersection of the straight lines AC and BD. Determine the length of the line segment OC, if it is known that it is 6 cm less than the length of the line segment OA.


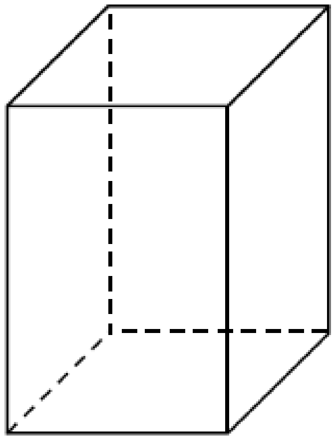
Solution:

Answer:____________________.</td><td>L
0
1
2
3
4
5</td><td>L
0
1
2
3
4
5</td></tr>
<tr><td>7.</td><td>The axial section of a right circular cone is a triangle with the sides of 13 cm, 13 cm and 10 cm. Determine the volume of the cone.

Solution:

Answer:____________________.</td><td>L
0
1
2
3
4
5</td><td>L
0
1
2
3
4
5</td></tr>
<tr><td>8.</td><td>In a isosceles trapezoid, the angle at the longer base is $60°$, and the altitude is 3 cm. Determine the area of the trapezoid, if it is known that its diagonal is 6 cm.

Solution:

Answer:____________________.</td><td>L
0
1
2
3
4
5
6
7
8</td><td>L
0
1
2
3
4
5
6
7
8</td></tr>
</table>

<table>
<tr><td>9.</td><td>The base of a right prism is a rhombus with the side of 5 cm and one diagonal of 6 cm. Determine the area of the lateral surface of the prism, if it is known that the height of the prism is congruent with the height of the rhombus.



Solution:

Answer:____.</td><td>L
0
1
2
3
4
5
6
7
8</td><td>L
0
1
2
3
4
5
6
7
8</td></tr>
<tr><td colspan="4">FUNCTIONS</td></tr>
<tr><td>10.</td><td>Study the monotonicity of the function $f\colon \mathbb{R} \to \mathbb{R},\ f(x) = \left(\frac{1}{\sqrt{2}-1}\right)^{x}$.

Solution:

Answer: ____.</td><td>L
0
1
2
3
4
5</td><td>L
0
1
2
3
4
5</td></tr>
</table>

11.	Consider the functions $f:[0;\ +\infty)\to\mathbb{R},\ \ f(x)=\sqrt{x}+1,\ \ g:\mathbb{R}\to\mathbb{R},\ \ g(x)=-2x^2+8x+5.$ Determine the intersection of the ranges $E(f)$ and $E(g)$ of the functions f and g. *Solution:* *Answer:* ______________________________.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
12.	Consider the arithmetic progression $(a_n)_{n\geq 1}$, where $a_1=102, r=-3$. Determine the sum of the positive terms of the progression. *Solution:* *Answer:*______________________________.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

ELEMENTS OF COMBINATORICS, MATHEMATICAL STATISTICS, FINANCIAL CALCULUS AND PROBABILITY THEORY			
13.	In a pack there are 6 red dragees, 8 yellow dragees and 1 green dragee. Petru randomly takes 4 dragees from the pack. Determine the probability that Petru takes dragees of all colors. *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
14.	In a competition 10 athletes accumulated the following number of points: 100, 80, 50, 60, 80, 90, 50, 70, 50, 110. Athletes, whose results are higher than the arithmetic mean and higher than the median of the corresponding statistical series, are promoted to the next stage. Determine how many athletes are promoted to the next stage. *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

Annex

$$\log_a b - \log_a c = \log_a \frac{b}{c},\ a \in \mathbb{R}_+^* \setminus \{1\},\ b, c \in \mathbb{R}_+^*$$

$$\log_a b^c = c \log_a b\,,\ a \in \mathbb{R}_+^* \setminus \{1\},\ b \in \mathbb{R}_+^*, c \in \mathbb{R}$$

$$\log_{a^c} b = \frac{1}{\mathrm{c}} \log_a b\,,\ a \in \mathbb{R}_+^* \setminus \{1\},\ b \in \mathbb{R}_+^*, c \neq 0$$

$$\mathcal{A}_{trapezoid} = \tfrac{1}{2}(a+b)h,$$

$$\mathcal{A}_{rhombus} = \frac{1}{2} d_1 d_2$$

$$\mathcal{A}_{parall.} = a h_a$$

$$\mathcal{V}_{cone} = \frac{1}{3}\pi R^2 H$$

$$a_n = a_1 + (n-1)r, \qquad S_n = \tfrac{a_1 + a_n}{2} \cdot n$$

$$C_n^m = \frac{n!}{m!\,(n-m)!}, \qquad 0 \le m \le n$$