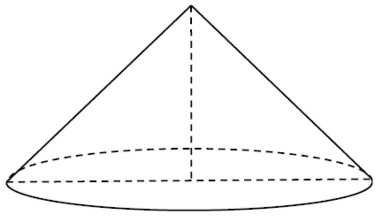
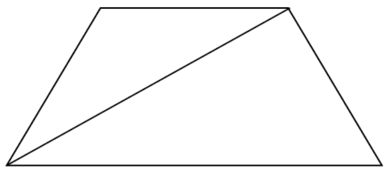
<table>
<tr><th>No</th><th>Items</th><th colspan="2">Score</th></tr>
<tr><td colspan="4">ALGEBRA</td></tr>
<tr><td>1.</td><td>Calculate the value of the expression $0{,}2+\sqrt[3]{\frac{34}{125}-2}.$
Solution:

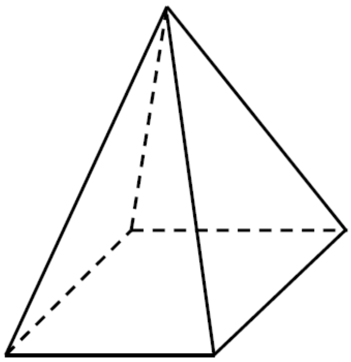
Answer:____.</td><td>L
0
1
2
3
4
5</td><td>L
0
1
2
3
4
5</td></tr>
<tr><td>2.</td><td>Solve in the set $\mathbb{R}$ the inequality $64\cdot 0{,}25^{t}<1.$
Solution:

Answer:____.</td><td>L
0
1
2
3
4
5</td><td>L
0
1
2
3
4
5</td></tr>
<tr><td>3.</td><td>Determine the real values of x, such that the matrix $A=\begin{pmatrix}\frac{1}{x} & 4+x\\ 2 & x^{3}\end{pmatrix}$ is invertible.
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>

4.	Determine the real values of p and q, such that the complex number $z = 3 - i$ is a solution of the equation $z^2 + pz + q + 8i = 0$, 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
5.	Consider $\alpha \in \left(\frac{\pi}{2},\ \pi\right)$ and $\beta \in \left(0,\ \frac{\pi}{2}\right)$, such that: $$\frac{\alpha}{2} + \beta = \frac{\pi}{2}, \qquad 27\sin^2\alpha + 6\cos\alpha - 26 = 0.$$ Determine the value of $\sin\beta$. *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

GEOMETRY			
6.	The axial section of a right circular cone is a right triangle. Determine the area of the lateral surface of the cone, if the height of the cone is 3 cm.  *Solution:* *Answer:*____.	L 0 1 2 3 4 5	L 0 1 2 3 4 5
7.	In an isosceles trapezoid the diagonal is perpendicular to the lateral side and has a length of 100 cm. Determine the perimeter of the trapezoid if the height of the trapezoid is 60 cm.  *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

8.	The area of the lateral surface of a regular quadrilateral pyramid is 200 cm^2, and the dihedral angles at the base of the pyramid are of $60°$. Determine the volume of the pyramid.  *Solution:* *Answer:*______________________________.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
MATHEMATICAL ANALYSIS			
9.	The numbers $30,\ k,\ -2$ are consecutive terms of an arithmetic progression. Determine the value of k. *Solution:* *Answer:*______________________________.	L 0 1 2 3 4 5	L 0 1 2 3 4 5
10.	Consider the function $f:\mathbb{R}\to\mathbb{R},\quad f(x)=\frac{x}{x^2+4}$.		
	a) Determine the points of local extrema of the function f. *Solution:* *Answer:*______________________________.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

	b) Calculate: $\lim_{x\to 0}\frac{\sqrt{x^2+x+1}-1}{f(x)}$. *Solution:* *Answer:* ______________________________.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
	c) Determine the real value of $m > 0$, such that the line $x = m$ divides the figure bounded by the graph of the function f, coordinate axes and the line $x = 2\sqrt{3}$ in two figures of equal areas. *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. NEWTON'S BINOMIAL THEOREM. ELEMENTS OF PROBABILITY THEORY AND MATHEMATICAL STATISTICS			
11.	A random 4-digit number with non-repeating digits is formed using the digits 1, 2, 3, 4, 5, and 6. Determine the probability that the formed number contains the digit 5. *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
12.	The sum of the coefficients of the first three and the last three terms in the binomial expansion $\left(\sqrt{x}+\frac{1}{\sqrt[3]{x}}\right)^n$ is equal to 112. Determine the middle term in the expansion. *Solution:* *Answer:*____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

Annex

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

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

$$\cos(2\alpha) = 2\cos^2\alpha - 1$$

$$\left(\frac{f}{g}\right)' = \frac{f'\cdot g - f\cdot g'}{g^2}$$

$$(x^\alpha)' = \alpha\, x^{\alpha-1}, \qquad \alpha \in \mathbb{R}$$

$$\int \frac{dx}{x} = \ln|x| + C$$

$$\mathcal{A}_{lat.srf.area} = \pi RG$$

$$\mathcal{V}_{pyramid} = \frac{1}{3}\mathcal{A}_b H$$

$$(a+b)^n = C_n^0 a^n + C_n^1 a^{n-1} b + C_n^2 a^{n-2} b^2 + \cdots + C_n^k a^{n-k} b^k + \cdots + C_n^n b^n$$

$$T_{k+1} = C_n^k a^{n-k} b^k, k \in \{0, 1, 2, \dots, n\}, \qquad C_n^k = \frac{n!}{k!\,(n-k)!}, \qquad A_n^k = \frac{n!}{(n-k)!}, \qquad 0 \le k \le n$$