Annex

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

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

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

$$V = \pi \int_a^b f^2(x)dx$$

$$\int x^\alpha dx = \frac{x^{\alpha+1}}{\alpha+1} + C, \qquad \alpha \in \mathbb{R} \setminus \{-1\}$$

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

$$c^2 = a^2 + b^2 - 2ab\cos\gamma$$

$$\frac{a}{\sin\alpha} = \frac{b}{\sin\beta} = \frac{c}{\sin\gamma}$$

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

$$\mathcal{A}_\Delta = \frac{1}{2} a h_a$$

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

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

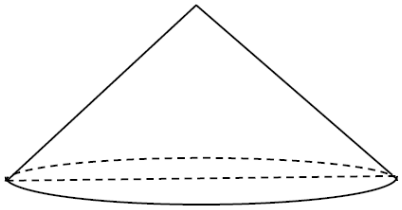
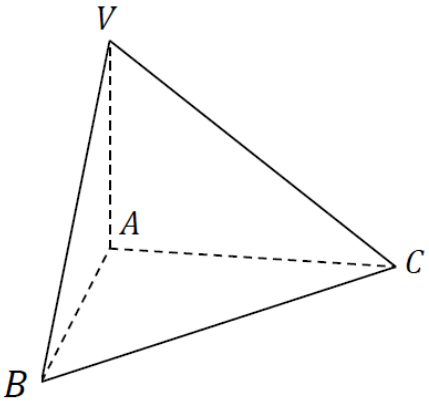
$$T_{k+1} = C_n^k a^{n-k} b^k, k \in \{0, 1, 2, \ldots, n\}$$

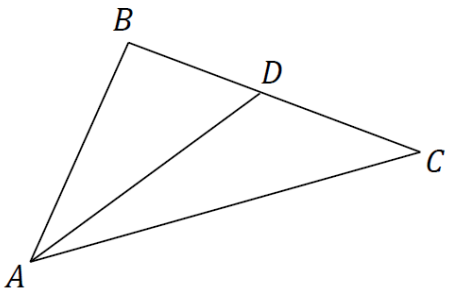
$$C_n^m = \frac{n!}{m!\,(n-m)!}, \qquad 0 \leq m \leq n$$

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

No.	Items	Score	
	ALGEBRA		
1.	Calculate the value of the expression: $1{,}5 + \log_2 \sqrt{8}$. *Solution:* *Answer:*_____.	L 0 1 2 3 4 5	L 0 1 2 3 4 5
2.	Solve in the set $\mathbb{C}$ the equation $(2 + i)z = 5$. *Solution:* *Answer:*_____.	L 0 1 2 3 4 5	L 0 1 2 3 4 5
3.	Consider $D(x) = \begin{vmatrix} 2^{x-1} & 4 \\ 8 & 4^x \end{vmatrix}$. Solve in the set $\mathbb{R}$ the equation $D(x) = 0$. *Solution:* *Answer:*_____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

4.	Consider the expression $E(\alpha) = (\cos\alpha + 1)^2 + (\cos\alpha - 1)^2 - 3$. Show that the value of the expression $2\sqrt{3} \cdot E(15°)$ is a natural number. *Solution:*	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
5.	Solve in the set $\mathbb{R}$ the inequation $\frac{\lvert x\rvert}{\log_{0,2}(2x+3)} \geq 0$. *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 represents a right-angled triangle with the cathetus of $\sqrt{2}$ cm. Determine the area of the lateral surface of the cone. *Solution:*  *Answer:*_____.	L 0 1 2 3 4 5	L 0 1 2 3 4 5
7.	The base of the pyramid $VABC$ is the right-angled triangle ABC, where $m(\angle A) = 90°$, $AB = 6$ cm, $AC = 8$ cm. The edge VA is perpendicular to the plane of the base of the pyramid and is congruent to the median from the vertex A of the triangle ABC. Determine the volume of the pyramid $VABC$. *Solution:*  *Answer:*_____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8

8.	Consider the triangle ABC, where $m(\angle A) = 60°$ and the bisector AD divides the side BC into the segments $BD = 2$ cm and $CD = 4$ cm. Determine the measure of the angle C. *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.	Consider the function $f: \mathbb{R} \to \mathbb{R}, f(x) = \left(\frac{e}{3}\right)^x$. Establish the monotonicity of the function f. *Solution:* *Answer:*_____.	L 0 1 2 3 4 5	L 0 1 2 3 4 5

10. Consider the function $f:[-2;6]\to\mathbb{R},\quad f(x)=\sqrt{x+3}+2.$

a) Compare: $f'(5)$ and $\frac{\sqrt{2}}{3}-\frac{\sqrt{2}}{4}$.

Solution:

*Answer:*_____.

L 0 1 2 3 4 5 6 7 8 L 0 1 2 3 4 5 6 7 8

b) Calculate $\lim\limits_{x\to 1}\frac{f(x)\left(\sqrt{x+3}-2\right)}{1-x^2}$.

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 numerical value of the volume of the solid obtained by rotating of the region, bounded by the graph of the function f and x – axis, about the x – axis.

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.	On six identical cards the letters A, P, O, L, L, O are written, one on each card. Four cards are taken at random consecutively. Determine the probability that, in the taken order, the word POLO is obtained. *Solution:* *Answer:*_____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8
12.	Determine the term that does not contain x in the binomial expansion $\left(x\sqrt{x}+\frac{1}{x}\right)^{10}$. *Solution:* *Answer:*_____.	L 0 1 2 3 4 5 6 7 8	L 0 1 2 3 4 5 6 7 8