<u>All the formulas listed below should be memorized.</u>

(Some of them may be found in Appendix A.)

<u>Also, you are required to know how to use them in calculations.</u>

(1) $\sum_{k=m}^{n}(ca_k+db_k)=c\sum_{k=m}^{n}a_k+d\sum_{k=m}^{n}b_k$	(4) **Summarizing n terms of geometrical progression with the first term b and common ratio r:** $b+br+br^2+\ldots+br^{n-1}=b\frac{r^n-1}{r-1}$
(2) $\sum_{k=m}^{n}c=c\sum_{k=m}^{n}1=c(n-m+1)$	(4a) **Summarizing terms of infinite geometrical progression** ($\lvert r\rvert<1$): $b+br+br^2+\ldots=\frac{b}{1-r}$
(3a) **Summarizing n terms of arithmetical progression with the first term a_1 and common difference d:** $a_1+a_2+\ldots+a_n=$ $=a_1+(a_1+d)+(a_1+2d)+\ldots+(a_1+(n-1)d)=$ $=\frac{a_1+a_n}{2}n$ (3b) $\sum_{k=m}^{n}k=m+(m+1)+(m+2)+\ldots+n=$ $=\frac{m+n}{2}(n-m+1)$ (3c) $\sum_{k=1}^{n}k=\frac{1+n}{2}n$	**Telescoping:** (5a) $\sum_{k=m}^{n}(a_k-a_{k-1})=$ $=(a_m-a_{m-1})+(a_{m+1}-a_m)+\ldots+(a_n-a_{n-1})=$ $=a_n-a_{m-1}$ (5b) $\sum_{k=m}^{n}(a_k-a_{k+1})=$ $=(a_m-a_{m+1})+(a_{m+1}-a_{m+2})+\ldots+(a_n-a_{n+1})=$ $=a_m-a_{n+1}$ (6) **Harmonic numbers:** $H_n=\sum_{k=1}^{n}\frac{1}{k}=1+\frac{1}{2}+\frac{1}{3}+\ldots+\frac{1}{n}\approx\ln n+\gamma+\frac{1}{12n}$, where $\gamma\approx 0.57721\ldots$ (Euler's constant)

Properties of Logarithms $(a > 0, a \neq 1)$		
$\log_a x^y = y \log_a x$	$\log_a \frac{x}{y} = \log_a x - \log_a y$	$\log_a (xy) = \log_a x + \log_a y$
$\log_a x = \frac{\log_b x}{\log_b a}$	$\log_a x = \frac{1}{\log_x a}$	$x^{\log_a y} = y^{\log_a x}$

Properties of Exponential functions $(a > 0, a \neq 1)$		
$a^0 = 1,\ a^1 = a,\ a^{-1} = \frac{1}{a}$	$a^m \cdot a^n = a^{m+n}$	$\frac{a^m}{a^n} = a^{m-n}$
$(a^m)^n = (a^n)^m = a^{mn};\ \sqrt[n]{a^m} = a^{\frac{m}{n}}$		

Derivatives of Exponential and Logarithmic Functions (e is a base of a natural logarithmic function; $a > 0$ and $a \neq 1$)	
$(e^x)' = e^x;\ (a^x)' = a^x \cdot lna$	$(lnx)' = \frac{1}{x};\ (log_a x)' = \frac{1}{x \cdot lna}$