

## Find the Sums

1.  $1+11+21+\dots+1000001$

2.  $1+\frac{1}{3}+\frac{1}{9}+\dots+\frac{1}{3^k}+\dots$

3.  $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\dots+\frac{2^n-1}{2^n}$

4.  $\frac{1}{1\cdot 2}+\frac{1}{2\cdot 3}+\dots+\frac{1}{k\cdot(k+1)}+\dots$

5.  $\binom{n}{0}+\binom{n}{1}+\binom{n}{2}+\dots+\binom{n}{n}$  (here  $\binom{n}{k}=\frac{n!}{k!(n-k)!}$  )

6.  $\binom{n}{0}^2+\binom{n}{1}^2+\binom{n}{2}^2+\dots+\binom{n}{n}^2$

7. In the sum  $1+2+3+\dots+10^n$  each term was replaced with the product of its digits (for example, 2015 was replaced with  $2\cdot 0\cdot 1\cdot 5=0$  ). Find the new sum.

8.  $\ln(\tan 1^\circ)+\ln(\tan 2^\circ)+\dots+\ln(\tan 89^\circ)$

9.  $\sin \alpha+\sin 2 \alpha+\dots+\sin n \alpha$

10.  $\frac{1}{1\sqrt{2}+2\sqrt{1}}+\frac{1}{2\sqrt{3}+3\sqrt{2}}+\dots+\frac{1}{n\sqrt{n+1}+(n+1)\sqrt{n}}$