

1. Let $f(T)$ be the number of permutations π from S_n with $\text{Des}(\pi) = T$. Find a nice formula for $f(T)$.
2. Prove that $\sum_{d|n} \sigma(d) \mu(\frac{n}{d}) = 1$, where $\sigma(d)$ is the number of divisors of d .
3. Let $\phi(n)$ be the Euler function. Prove that $\phi(n) = \sum_{d|n} \mu(d) \frac{n}{d}$.