

# Discrete Mathematics Drill

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## 1 Named Numbers

1. Show all partitions of  $\{1, 2, 3, 4, 5, 6, 7\}$  into three sets.
2. Use a combinatorial argument to show that  $S(n, 2) = 2^{n-1} - 1, n > 2$ .
3. List all permutation of order 7 which are the product of two cycles.
4. What is  $\sum_{k=0}^{\infty} (-1)^k c(n, k)$  ( $c(n, k)$  the Stirling numbers of the first kind).
5. Solve:  $a_n = 5a_{n-1} - 6a_{n-2} + 2^n, a_0 = 2, a_1 = 3$ .
6. Let  $F(x) = \sum_{k=0}^{\infty} f_{2k} x^k, f_{2k}$  are the Fibonacci numbers  $f_0, f_2, f_4 \dots$  can you find  $F(x)$ ?
7. Solve the recurrence relation  $a_n = a_{n-1} + 1 + \sum_{k=1}^{n-1} a_k, a_1 = 1, n > 1$