Required:

- Reading from Artin’s book *Algebra*: Background Material (Set Theory, Techniques of proof).

- Solve the following problems:

1) Prove by induction that for all natural numbers $n$, the sum of the odd natural numbers up to $(2n - 1)$ is given by: $1 + 3 + \ldots + (2n - 1) = n^2$.

2) Let $d_N$ be the number of diagonals in a regular $N$-gon. Prove that $d_{N+1} = d_N + (N - 1)$. Deduce from this a closed formula for $d_N$, and prove this formula by induction.

3) Define a sequence of real numbers as follows: $a_1 = \sqrt{2}$, and $a_n = (\sqrt{2})^{a_{n-1}}$ for all $n > 1$. Prove that $a_n < 2$ for all $n$.

4) From Artin’s book *Algebra*:
   
   a) Problems 2, 3, Cramer’s Rule, pp.36.
   
   b) Problems 3, 4, Set Theory, pp.598.
   
   c) Problems 4, 5, 6, Techniques of Proof, pp.598.

Suggested:

- Self-test: Try to solve the problems in Artin’s book *Algebra*, at the end of Chapter 1 (say: problems 3, 4, 5, of each of the sections and all the “Miscellaneous problems”).