(1) Modular arithmetic:

The definition of prime numbers.

How to do the division (especially the case when the dividend is negative).

How to compute the gcd of two given integer using Euclidian's algorithm.

How to express the gcd of two given integer a and b in terms of a and b using Extended Euclidian's Algorithm.

How to compute a to the power of s modulo m using fewer multiplication (refer to the first question of hw6).

How to compute an inverse of "a" modulo m given some integer a and m.

How to solve problems about the Chinese Remainder Theorem.

How to solve the congruence relation for x of the form: ax is congruent to b modulo m.

How to encrypt and decode a message m using RSA cryptosystem.

The result stated by Fermat's Little Theorem.

(2) Counting, Permutation, and Combination:

The results of Pigeonhole Principle (the original one and the generalized one)

Some important set identities like |A U B| = |A| + |B| - |A intersects B|.

The formulas for permutation and combinations and some important identities like C(n,k) = C(n, n-k).

How to compute the number of non-negative solutions to the equation like x_1 + x_2 + x_3 = 10.

How to compute the number of positive solutions to the equation like x_1 + x_2 + x_3 = 10.

(3) Linear Recurrences:

How to solve some linear recurrence like: a_{n} = c_{1}*a_{n-1} + c_{2}*a_{n-2}.

(There could be 2 cases. You need to remember how to deal with the problems given different situations)

(4) Discrete Probability:

The definition of the probability of a given event E with the sample space S.

Some important identities like Pr(E) = 1 - Pr(the complement of E) and Pr(E_1 U E_2) = Pr(E_1) + Pr(E_2) - Pr(E_1 intersects E_2).
The definition of conditional probability.
The definition of independence between 2 events.
The definition of a random variable.
The definition of the expected value of a given random variable and how to compute it.
The definition of the variance of a given random variable and how to compute it.

(5) Trees:
The preorder, inorder, and postorder traversal of a tree.
How to reconstruct a tree given its preorder and postorder traversal.
How to construct the Huffman codes for a set of symbols in which each symbol is associated with a probability.
How to use a given Huffman code to compress/encode and decompress/decode the a message.

(6) Finite-State Machines/Automata:

The definition of finite-state machines, i.e., their components.
How to decide whether or not a given finite-state automata (a finite-state machine without output) accepts a given string x by using the transition diagram related to this automata.
How to give a description of the string x that can be accepted by a given finite-state automata.

(7) All the homework problems and your notes.