Study Guide for Math 22 Exam 1.

(1) Stirling's formula for estimating n! Use it to estimate $n!$ in scientific notation for large values of n.

$$\text{Stirling's formula:} \quad n! \approx \left(\frac{n}{e}\right)^n \sqrt{2\pi n}$$

For example,

$$1000! \approx \left(\frac{1000}{e}\right)^{1000} \sqrt{2\pi(1000)} = 10^{\log\left(\left(\frac{1000}{e}\right)^{1000} \sqrt{2\pi(1000)}\right)}$$

$$= 10^{1000\log(1000/e)+.5\log(2000\pi)}$$

… etc.

(2) The meaning of n choose k, and how to calculate it.
(3) One to one and onto functions.
(4) The Euclidean Algorithm. Know how to use it to calculate the GCD of two numbers m and n, and how to use it to calculate a and b in $\text{GCD}(m,n) = am + bn$.
(5) Mathematical induction. Know how to set up and prove a statement by induction.
(6) Counting problems: counting numbers of subsets, etc.
(7) Union, intersection, complement, Venn diagrams, De Morgan's laws.
(8) Equivalence relations, equivalence classes, partitions, and general relations, and ways of representing them.
(9) Modular or congruence arithmetic.
(10) The RSA code.
(11) Truth values for basic connectives in propositional logic (Appendix A.1).