

Test 1 Study Sheet

Math 100 – Spring 2003

Chapter 1: Silly Stories (and their morals)

- *Meanie Genie, Fountain of Knowledge, Dodge Ball*. You should be familiar with these problems and their solutions. (Note that complete solutions to each are presented in Sections 1.2 and 1.3.)
- You may be asked to work on a problem that is similar to these. Similar might mean only a small change (different sizes of cups in *Fountain of Knowledge*), or a problem that can be solved using similar thinking (like *Cannibals and Missionaries*).
- The homework problems assigned from Chapter 1 give examples of the types of problem solving activities you might see.
- If I were to give you a problem solving task that you cannot solve, be sure to show the work you do in a reasonably coherent manner, since it is possible to get significant credit without actually solving the problem if you show that you were using reasonable methods to attack the problem.

Locker problem.

- You should have a good understanding of the solution to this problem, including things like: relationship to factoring (divisors), relationship to square numbers, relationship between square numbers and the pattern of runs of closed lockers, facts that can be learned from a round by round approach, etc.

Section 2.2: Numerical Patterns in Nature

- How Fibonacci sequence works. (And notation: F_5 is the fifth Fibonacci number, etc.)
- Where Fibonacci sequence shows up in nature.
- Relationship between golden ratio (φ) and Fibonacci numbers.
- Geometric representation of Fibonacci sequence.

Section 2.3: Prime Numbers

- Definition of prime number, factor, divisor, multiple, remainder
- Geometric interpretation of multiplication and remainders (rectangular arrays).
- Every number can be written as a product of prime numbers multiplied together. (Why?, How?)
- Finding/recognizing prime numbers.
Sieve of Eratosthenes. Time saving observations when trying to prove a number is prime. How to find a prime number larger than any specified number and the proof that there is no largest prime number.

Section 2.4: Modular Arithmetic (Clock Arithmetic)

- Modular arithmetic basics (addition, subtraction, multiplication, exponents)
- Error-correcting codes (UPC, bank, ISBN)

Section 2.5: Secret Codes (Public key and private key)

- Difference between private key and public key cryptography
- Caesar-like Cyphers. How it works, why it isn't public key, how to crack if done letter by letter, idea of "block encoding"
- RSA. How it works (outline), why it is public key
- role of large prime numbers in RSA

General.

- Think about what we learned about and from mathematics by doing these activities and problems.
- Be sure that you understand the problems from the homework assignments.