

MTH 122 Discrete Math Review Guide Test # 2 Semester 082

Test Friday March 13th

Section 3.4 Integers and Division

What $a \mid b$ means

Prime number, composite number

Prime factorization

greatest common divisor, least common multiple -- compute these for a pair of numbers in factored form

How to determine if numbers a and b are congruent modulo m

When are two numbers relatively prime; When is a set of numbers pairwise relatively prime.

Section 3.5

Be able to compute the gcd of two numbers using the Euclidean algorithm **showing work** (like assigned exercises)

Convert a number from decimal (base 10) to another base (base 8, binary, or base 16) (by computing remainders upon repeated division by base).

Convert from another base to base 10 by computing its base expansion **showing work** (Like assigned exercises).

Use Table for converting between hex, octal, and binary.

Section 5.1 Know how to apply the sum rule and the product rule to counting. Apply to problems like examples in text, those done in class, and in assigned exercises.

Section 5.2 Apply pigeon hole principle to simple problems like assigned ones.

Section 5.3

Know what a permutation is, what a combination is.

Know the formula for calculating the number of r -permutations from a set of size n .

Know the formula for calculating the number of r -combinations from a set of size n

Apply both of these formulas to problems like the examples in the text and the assigned exercises.

Section 6.1

Discrete Probability: Terms experiment, sample space, event.

How to calculate probability of an event from a sample space of equally likely outcomes using the formula $|E| / |S|$ and the sum and product rules, combinations and permutations formulas from 5.1 and 5.3

How to calculate the probability of the complement of an event (Theorem 1) – apply to problems.

How to calculate the probability of the union of two events (by formula in Theorem 2 – Principle of Inclusion-Exclusion).

How to determine whether two events are independent or dependent.

M122 Discrete Mathematics Practice Questions for Test 2 Semester 082

Section 3.4

1. Which of the following pairs of numbers satisfy $a \equiv b \pmod{6}$ (Circle any).

$$a = 6, b = 12$$

$$a = 14, b = 26$$

$$a = 21, b = 26$$

2. List three numbers that are congruent to 3 mod 5.

3. Write down the prime factorization of 968.

4. Which of the following numbers are relatively prime to 12? (Circle)

2

4

5

7

15

35

5. Find the greatest common divisor and least common multiple of $2^2 3^4 5$ and $2(3^2)7$

Section 3.5

6. Demonstrate the Euclidean algorithm for greatest common divisor by showing the steps in the computation of $\gcd(36,48)$

7. a) Express the binary number 0010 1001 in base 10.

b) Express the decimal (base 10) number 96 as a number in base 8.

c) Express the following base sixteen (hexadecimal) number in binary:
AC8 (use Table).

d) Express the following base 8 number (octal) in binary (use Table)
360

e) Express the binary number 1111 1010 in base sixteen.

Section 5.1

8. How many license plates can be made using either 1 or two letters followed by either 4 or 5 digits?

9. a) How many bit strings of length 6 start with a 1?

b) How many bit strings of length 6 end with two 0's?

c) How many bit strings of length 8 either start with a 1 **OR** end with two 0's (or both).

Section 5.2

10. Using the pigeon hole principle: In a room of 25 people,

a) at least how many must have birthdays in the same month?

b) at least how many must be born on the same day of the week?

Section 5.3

11. a) There are 12 students playing on the SJC softball team. How many different ways can we select first, second, and third base players.

b) Suppose we need to choose 3 of the 12 students on the softball team to stay on the bench. How many different ways can we choose three students?

Section 6.1

13. Suppose you toss a coin *three times* and observe what comes up each time - H (heads) or T (tails).

- a) How many possible outcomes are in the sample space?.
- b) What is the probability of getting 3 heads in the three tosses?
- c) What is the probability of **not** getting three heads?

14. Which is the correct formula for the probability of the union of two events ?

- a) $P(A \cup B) = P(A) + P(B) + P(A) \cdot P(B)$.
- b) $P(A \cup B) = P(A) \cdot P(B)$
- c) $P(A \cup B) = P(A) + P(B)$
- d) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

15. Suppose $P(A) = .2$, $P(B) = .3$, and $P(A \cap B) = .06$.

- a) What is the probability $P(A \cup B)$?
- b) A and B are independent / dependent. (Circle) Show:
- c) What is the probability of A-complement, $P(\overline{A})$?

16. In the game of five card stud poker, you are dealt five cards. What is the probability of getting

- a) three of a kind b) four of a kind c) a full house d) two pairs e) royal flush

17. a) Roll a die twice and observe what is rolled. How many outcomes are in the sample space?

- b) Write down the set of outcomes representing rolling a sum of 10.
- c) What is the probability of rolling a sum of 10?