Name: ________________________________

Possible 100

Received

**DO NOT OPEN YOUR EXAM UNTIL TOLD TO DO SO.**

You may use one page (one side) of notes, but no other materials or resources (such as a calculator, notes, old HW, etc.). There is no sharing with a friend or neighbor.

**FOR FULL CREDIT, SHOW ALL WORK RELATED TO FINDING EACH SOLUTION.**

In answering the following questions, **except where noted**, do not simplify the answers. For example, leave your answer in the form $\binom{5}{3}$ or $12!$ or $P(4,3) \cdot P(7,4)$ or $2^5 - 2^3$ or $7 \cdot 6 \cdot 5 \cdot 4$ or …
For the next three questions, suppose that you are at a restaurant where there are 2 appetizers, 5 main dishes, and 3 desserts.

/4 How many different meals can be chosen if you have an appetizer, then a main dish, and then a dessert?

/4 How many different meals can be chosen if you can choose 5 items of any type (so for example you could choose 5 main dishes, or 5 desserts, or 2 main dishes and 3 deserts, etc.), where you can choose the same item more than once and the order in which you eat them doesn’t matter?

/4 Suppose you are with a friend and you each want to choose a full meal (appetizer, main dish and dessert), but you want to make sure you choose different meals. How many different meals can the two of you choose to both order a full meal but with no repetition of items?

For the next three questions, suppose a bag of 10 apples contains 2 rotten and 8 good apples, and a shopper selects a sample of 3 apples from the bag.

/4 How many different samples are possible?

/4 How many samples contain all good apples.

/4 How many samples contain at least 1 rotten apple?
Shade in the set \((R \cup S)' \cup (R \cap S \cap T)\).

What set does the following diagram represent?

A group of 100 workers were asked if they were college graduates and if they belonged to a union. 60 were not college graduates, 20 were nonunion college graduates, and 30 were union members. How many of the workers were neither college graduates nor union members?

If \(A \cap B = B\), then \(A \cup B =\)
A basketball player shoots ten free throws. In how many ways can he make 7 and miss 3 shots (in any order)?

A family has 6 members. How many different family groups (including all or none) can come to dinner?

A corporation has a board of directors consisting of 10 members. How many different committees of 3 persons could they select?

In the previous question, suppose the board instead needs to select a chair, a vice-chair, and a secretary. In how many ways could they select these 3 persons?

For the next four questions, suppose there is a deck of 50 cards of 5 different colors of cards numbered 1 to 10. We will choose 7 cards.

In how many ways can you choose 7 cards from the 50?

In how many ways can you choose 7 cards and have exactly 2 of them be 9’s?

In how many ways can you choose the 7 cards and end up with a straight (e.g. 1–7 or 2–8 or …), where color doesn’t matter?

In how many ways can you choose the 7 cards and have a really full house which consists of 3 of one number and 4 of another number?
For the next two questions, consider that in California, a typical license plate for a car has a number, then three letters, then three numbers. Assume each number can be a digit from 0 through 9.

/4 How different license plates could there be?

/4 How many different license plates with no repetition of numbers or letters could there be?

For the next five questions, suppose there are three boys and three girls at a party. Simplify these next five answers, i.e. give actual numbers (and show your work).

/4 In how many different ways could we choose one couple (one boy, one girl)?

/4 In how many different ways could we choose any two of the six kids (of either gender)?

/4 In how many different ways could we divide the six kids into three boy-girl couples?

/4 In how many ways can they be seated in a row such that no person is seated next to someone of the same gender?

/4 In how many different ways could we choose a president and a vice-president from these six kids?