

FINITE MATH, FALL 2016 - MIDTERM II

Name: _____

Below you will find 8 questions and 2 additional bonus questions. Pick any 6 questions to answer from questions 1-8. In addition, only answer one Bonus question.

Problem 1. If two fair dice are rolled, find the probabilities of the following events:

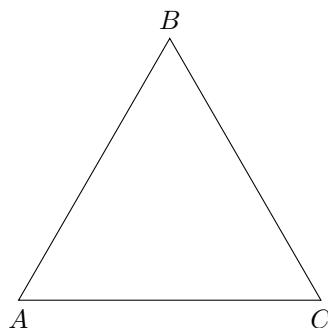
- (1) A sum of 8, given that the sum is greater than 7.
- (2) A sum of 6, given that the roll was a "double" (meaning the dice show the same number).
- (3) A double, given that the sum was a 9.
- (4) A double, given that the sum was a 8.

Problem 2. An English teacher gave her class two tests. 25% of the class passed both test and 42% of the class passed the first test. What percentage of those who passed the first test also passed the second test?

Problem 3. .

- (1) In flipping a coin 23 times, what is the probability of getting all heads or all tails?
- (2) In tossing four fair dice, what is the probability of getting at least one 3?

Problem 4. Three ants are sitting on the vertices of a triangle, point A,B,C. Each of the ants can only walk along the edges of the triangle. They can only go left or right. Once they have picked a direction, they keep walking along that direction.



What's the probability that any two ants will collide?

Problem 5. In a study conducted three years ago, 82% of the people in a randomly selected sample were found to have "good" financial credit, while the remaining 18% were found to have "bad" financial credit. Current records of the people show that 30% of those with bad credit rating have since improved their ratings to good.

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While 15% of those with good credit have since changed their ratings to bad. What percentage of people with good credit now had bad 3 years ago?

Problem 6. Show that

$$\binom{n}{r} = \binom{n}{n-r}$$

Problem 7. A die is rolled 12 times. Find the probability of rolling the following events:

- (1) Exactly 12 ones.
- (2) No more than 3 ones.
- (3) Exactly 2 ones.

Problem 8. Given the following situation, find the expected value of:

- (1) In a club with 20 senior members and 10 junior members, what is the expected value of a junior member being on a 3-member committee?
- (2) From a group of 2 women and 5 men, a delegation of 2 is selected. Find the expected value of the number of women in the delegation.

Problem 9. BONUS

Prove that

$$\binom{n}{r} + \binom{n}{r+1} = \binom{n+1}{r+1}$$

Problem 10. BONUS

Prove that if A and B are independent events, then A and B' are independent as well.