

Name:

## Math 185 Final Exam

**Directions:** There are three sections. Each section covers questions that were done from each of the three exams that we had in total. From every section select **three** questions that you want to do. Then choose to do a tenth question anywhere on the remaining questions. Every question is worth ten points. Make sure to show all your work. There will be no credit given for a correct answer with no explanation while most of the credit for even a wrong answer but with a good explanation. Make sure to answer **all parts** of the question. The exam is **2 hours and 20 minutes**.

### Section 1

**Problem 1:** Consider the arithmetic sequence: 7956, 8022, 8088, ... , 12246.

- Determine the common difference for this sequence and write down its formula  $s_n$ .
- Determine how many terms this sequence has.
- Determine the sum of all the terms in this sequence.

**Problem 2:** A bank gives 17% interest every year. Initially \$3400 is put into the bank.

- Find the formula  $s_n$  for the amount of money in this bank account in the  $n$ -th year.
- How much money will be in the bank account in the 6th year?

**Problem 3:** Write the number 2011 into base six.

**Problem 4:**

- Convert the number  $6423_7$  to decimal form.
- Convert the number  $2012_3$  to decimal form.

**Problem 5:** A store had a price for a particular product at \$600. The store decided to raise this price by 20%. By what percentage must it now reduce this new price to change this price to \$504?

### Section 2

**Problem 6:** Define sets  $D_n$  to be the set of all positive divisors of  $n$ . For example,  $D_6 = \{1, 2, 3, 6\}$ . Form a three way Venn diagram using the sets  $D_{56}$ ,  $D_{64}$ , and  $D_{48}$ .

**Problem 7:** In a conference 220 physicists are asked if they like calculus, geometry, or algebra. The results were that 130 physicists like calculus, 150 like algebra, and 120 like geometry. It was also known that 50 liked calculus and geometry, 60 liked algebra and geometry, and 90 liked calculus and algebra. There were also 10 physicists who liked all three subjects.

- How many did not like any of the three subjects?
- How many like only geometry?
- How many like only calculus?
- How many like only algebra?

**Problem 8:** A collection of dollar bills, five dollar bills, and twenty dollar bills adds up to \$398. It is known there are ten more five dollar bills than single dollar bills, and seven more twenty dollar bills than single dollar bills. Set up an algebraic equation for this word problem and then solve it.

**Problem 9:** Let  $A, B, C$  be sets. Prove that  $(A \cup B) - C = (A - C) \cup (B - C)$  by using Venn diagrams.

**Problem 10:** There are 90 people in a bar. There were three times as many smokers than smokers and drinkers, and twenty more drinkers than smokers and drinkers. There were also 10 people who were neither smokers nor drinkers. Determine how many people were smokers and drinkers by using a Venn diagram and setting up an algebraic equation.

### Section 3

Problem 11:

- Find the canonical prime factorizations of the numbers 3240 and 5400.
- Use the prime factorization to determine the GCD and LCM of these numbers.
- Then determine the number of positive divisors each of these numbers has.

Problem 12:

- Write the decimal 1.9375 into a reduced fraction.
- Write the decimal  $1.9\overline{3}$  as a reduced fraction.

Problem 13: A die (six sided cube with numbers from 1 through 6) is rolled three times. What is the probability that the sum of the outcomes adds up to 6?

Problem 14: Suppose that a father has three children. What is the probability that all children are sons (boys) if at least one of them is a son (boy)? (This question is not hard but is a little tricky, it uses conditional probability).

Problem 15: An box contains 10 red balls, 8 blue balls, and 6 yellow balls. What is the probability of choosing six balls so that there are two of each color?

Problem 16:

- Determine prime factorization for 1819 by using Erathoteses algorithm.
- Determine GCD of 4904 and 3065 by using Euclidean algorithm. (No credit given for any other method)
- Use knowledge of GCD in above problem to determine LCM of 4904 and 3065

**Remember to show all work. Make sure that you answered all questions every problem was asking. Make sure that you have a total of ten questions selected with at least three from every section. If you finish early it is recommended to recheck all your work and do more additional problems. If you do more than required the best ten will be selected. Doing additional problems will not hurt your score, so it is recommended to do more. The final exam is biggest part of your grade, do your best on it by using all your available time.**

**HAVE A GOOD SUMMER BREAK!**