

# MA 416

## REVIEW II

March 9, 2020

I. Let  $R$  be a relation on  $S = \{a, b, c\}$  that is symmetric and antisymmetric. What are the possibilities for  $R$ ?

II. A donut shop makes 3 kinds of donuts, chocolate, jelly and glazed. A customer wants 25 donuts and at least 2 of each kind. The store only has 7 chocolate and 10 jelly but an unlimited number of glazed. How many combinations can be made?

III. How many positive integers less or equal to 1000 are neither perfect squares nor perfect cubes?

IV. Page 156 number 15.

V. Page 156 number 8

VI. Find  $\binom{n-1}{k-1} + \binom{n-2}{k-1} + \binom{n-3}{k-1} + \binom{n-3}{k}$  as one binomial coefficient.

VII. In the numbers 1, 2, 3, 4, 5, 6, 7, 8 how many permutations are there such that

- no number is in its natural position
- exactly 3 numbers are in their natural position
- at least one number is in its natural position
- at least two numbers are in their natural position
- What is the probability that no number is in its natural position?

VIII. A donut shop makes 3 kinds of donuts, glazed, jelly and creme Find the generating function for the number of boxes with  $n$  donuts if there are a multiple of 3 glazed, an odd number of jelly and no more than 5 creme.

IX. Find a recursion for the number of tilings of a  $1$  by  $n$  board with red white blue and green monomials if no two red can be adjacent. What are the initial conditions? What is the number when  $n=3$ ?

X. What sequence is  $1/(1 - x - x^2)$  the generating function for?