Discrete. Extra review questions 3. Time_____
Show all work for full or partial credit. Put a box around your final answer in each part.

1. Consider a round, rotating table with 7 seats, and 5 knights: one of whom is Lancelot and another of whom is Arthur.

   • How many ways to seat all five knights, up to rotation? (Two seats will be empty.)

   360

   • How many ways (still up to rotation) to seat all 5, if Arthur and Lancelot have to be seated with at least one knight between them? (The empty seats don't count as a knight.)

   180

2. Consider a round, rotating table with 14 seats, and 7 knights and 7 knaves.

   • How many ways to seat all 14, up to rotation, if no two knaves may be adjacent?

   6!7!

3. On page 2, question 6 of quiz 9, we again are walking east and north from the lower left corner to the upper right of the neighborhood map of Parma: 3 blocks by 6 blocks.

   • How many ways to walk if you may not visit the corner of Gerald and 67th, but you must visit the corner of Forest and 60th?

   21

   • How many ways to walk if you may not use the block of Gerald from 67th to 60th, but you must use the block of 54th between Gerald and Kenneth?

   2

4. You must distribute 20 identical donuts to five knights.

   • How many ways to distribute them if each knight can get any number?

   $\binom{24}{4}$

   • How many ways to distribute them if each knight must get at least one donut, with no upper limits?

   $\binom{19}{4}$

5. You must buy 20 donuts of five types.

   • How many ways to buy them if each type can be any number?

   $\binom{24}{4}$

   • How many ways to buy them (any number of each type) and then distribute them to 20 knights, where each knight gets one donut?

   5^{20}

6. How many multigraphs with labeled vertices are there, with 7 nodes, and with 15 total edges (no loops)?

   $\binom{35}{20}$

7. How many multigraphs with labeled vertices are there, with 7 nodes, and with at most 2 edges between each pair of nodes (no loops)?

   $3^{\binom{7}{2}}$

8. Draw two multigraphs (no loops) that both have the same degree sequence: 4,3,2,1 ...but which are not isomorphic. The definition of isomorphic for multigraphs says that $\{x, y\}$ is an edge of multiplicity n iff $\{f(x), f(y)\}$ is an edge of multiplicity n.

   (answer in class)

9. Is it possible to have a degree sequence $5, 4, 3, 2, 1$? Why not?

   (answer in class)

10. Study all quiz questions!

11. Study homework questions, especially those which are similar to quiz questions!

12. Study examples from notes!