

COT 3100 Summer 2026 Homework #5
Please Consult WebCourses for the due date/time

Unless otherwise specified, please leave answers in factorials, combinations, powers, etc.

1) This question considers permutations of “WORLD CUPS O C C C E R”.

- a) How many permutations are there total?
- b) How many permutations contain the substring “LOUDER”?
- c) How many permutations start and end with vowels?
- d) How many permutations do NOT have consecutive vowels in them?
- e) How many permutations contain the vowels in order (A before E, before I, before O)?

2) A class contains 17 girls and 21 boys. For all parts of this question, each boy and girl are distinguishable from one another. Treat each student as distinguishable from each other student. Answer the following questions:

- a) In how many ways can a committee of one boy and one girl be chosen?
- b) In how many ways can a committee of five students be chosen?
- c) In how many ways can a committee of four girls and three boys be chosen?
- d) In how many ways can a committee of six students be chosen such that all the students on the committee are the same sex?
- e) In how many ways can the girls and boys form a line where no two boys are standing next to one another?

3) Consider an ant that is walking on a Cartesian grid, starting at (0,0) and ending at (15, 19). The ant always chooses to walk exactly one unit either up (1 unit positive y direction) or to the right (1 unit positive x direction) whenever he arrives at a Lattice point. (A Lattice point is a point with integer coordinates.) For each of the following restrictions, answer how many ways the ant can make its journey? Answer each part independent of the others.

- a) No restriction other than what is listed above.
- b) Ant can not visit the point (11, 13).
- c) Ant can not visit the points (6, 4) and (11, 13).
- d) Ant must visit (4, 3), (8, 10) and (13, 14).
- e) Ant must visit (13, 6) and (4, 9).

4) The ant from question three now starts at $(1, 3)$ and wants to end at $(15, 13)$ and can only walk one unit in the positive x-axis direction or one unit in the positive y-axis direction as was the case in the previous question. But now, the ant is ONLY allowed to visit Cartesian coordinates where either the x-coordinate or the y-coordinate is an odd number. How many different paths can the ant take now?

5) Consider the nine points $(0, 0)$, $(0, 1)$, $(0, 2)$, $(1, 0)$, $(1, 1)$, $(1, 2)$, $(2, 0)$, $(2, 1)$ and $(2, 2)$ on the Cartesian grid. How many different lines pass through at least 2 of these nine points?