

NAME:

**Problem 1 (5 points):** *A casting director is casting for a play with roles for one female and four males. There are four females and five males (including Bill and Ted) auditioning for the roles. In how many ways can the roles be filled if Bill is given a role? (Extra Credit: What if both Bill and Ted are given roles?)*

**Solution:** There are  $P(4, 1)$  ways to cast the female role. There are 4 male roles Bill can play, and  $P(4, 3)$  ways to fill the remaining 3 male roles. Thus, the number of ways to cast the play is:

$$P(4, 1) \cdot 4 \cdot P(4, 3) = 384.$$

If Bill and Ted are both cast, then there are  $P(4, 2)$  ways to assign them the 4 male roles. There are  $P(3, 2)$  ways to fill the remaining male roles, so the total number of ways to cast the play if both Bill and Ted are given roles is:

$$P(4, 1) \cdot P(4, 2) \cdot P(3, 2) = 288.$$

**Problem 2 (5 points):** *How many 8-letter words can be formed from the word “tomorrow”? You do not need to simplify your answer.*

**Solution:**

$$C(8, 3) \cdot C(5, 2) \cdot P(3, 3).$$

**Problem 3 (5 points):** *The NBA.com store sells three kinds of Trailblazer hats and eight kinds of Trailblazer shirts. You are buying Bill a Trailblazer hat and shirt and you are also buying Ted a Trailblazer hat and shirt. You don't want to get them the same kind of hat or the same kind of shirt, though. How many ways can you make your purchase from NBA.com? (Caution: This is different from the question “How many ways can you make your gift?”)*

**Solution:**

$$C(3, 2) \cdot C(8, 2) = 84.$$