Name Answer Key

Statistics; Sec 5.3 – Trees and Counting Techniques

Answer all questions using complete sentences.

1. What is the main difference between a situation in which the use of the permutations rule is appropriate and one in which the use of the combinations rule is appropriate?

   Permutations counts the number of different arrangements (order matters!)

   Combinations counts the number of groups possible.

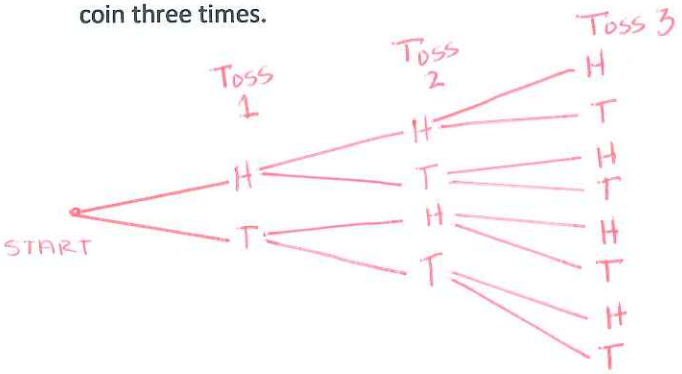
2. For each of the following situations, explain why the combinations rule or the permutations rule should be used.
   a. Determine the number of different groups of 5 items that can be selected from 12 distinct items.

      Combinations

   b. Determine the number of different arrangements of 5 items that can be selected from 12 distinct items.

      Permutations

3. Complete the following steps.
   a. Draw a tree diagram to display all possible head–tail sequences that can occur when you flip a coin three times.



   b. How many sequences contain exactly two heads?

      3

   c. Assuming the sequences are all equally likely, what is the probability that you will get exactly two heads when you toss a coin three times?

      3/8

4. Four wires (red, green, blue, and yellow) need to be attached to a circuit board. A robotic device will attach the wires. The wires can be attached in any order, and the production manager wishes to determine which order would be fastest for the robot to use. Use the multiplication rule of counting to determine the number of possible sequences of assembly that must be tested. *Hint:* There are four choices for the first wire, three choices for the second wire, and so on.

$4 \times 3 \times 2 \times 1 = 4! =$ 24 sequences

5. Barbara is a research biologist for Green Carpet Lawns. She is studying the effects of fertilizer type, temperature at time of application, and water treatment after application. She has four fertilizer types, three temperature zones, and three water treatments to test. Determine the number of different lawn plots she needs in order to test each fertilizer type, temperature range, and water treatment configuration.

$\underset{\text{FERT}}{4} \times \underset{\text{Temp}}{3} \times \underset{H_2O}{3} =$ 36 plots

6. Compute ${}_5P_2 = 20$

7. Compute ${}_5C_2 = 10$

8. There are three nursing positions to be filled at Lilly Hospital. Position 1 is the day nursing supervisor, position 2 is the night nursing supervisor, and position 3 is the nursing coordinator position. There are 15 candidates qualified for all three of the positions. Determine the number of different ways the positions can be filled by these applicants.

${}_{15}P_3 = \frac{15!}{12!3!} = 2730$

9. The University of Montana ski team has five entrants in a men's downhill ski event. The coach would like the first, second, and third places to go to the team members. In how many ways can the five team entrants achieve first, second, and third places?

$\underset{1^{st}}{5} \quad \underset{2^{nd}}{4} \quad \underset{3^{rd}}{3} =$ 60 ways

10. The qualified applicant pool for six management trainee positions consists of seven women and five men.

    a. How many different groups of applicants can be selected for the positions?

$${}_{12}C_6 = 924$$

    b. How many different groups of trainees would consist entirely of women?

$${}_{7}C_6 = 7$$

    c. If the applicants are equally qualified and the trainee positions are selected by drawing the names at random so that all groups of six are equally likely, what is the probability that the trainee class will consist entirely of women?

$$7/924 \approx 0.008$$