

Module Test **B**

Module 20

Fill in the blank with the terms or numbers which best complete each statement.

1. **Complementary** events are mutually exclusive events; one of which must happen.
2. ${}_9P_4 = \frac{9!}{5!} = \underline{3,024}$
3. The **Law of Large Numbers** states that as the number of trials in an experiment increases, the experimental probability gets closer to the theoretical probability.
4. If the probability of an event occurring is $\frac{7}{9}$, the probability of the event not occurring is $\underline{\frac{2}{9}}$.

Determine whether each statement is true or false.

5. The Fundamental Counting Principle states that if there are m ways to make the first choice and n ways to make the second choice, then there are $m \cdot n$ ways to make the two choices. **True**
6. When the probability of an event is zero, the event is certain to occur. **False**
7. The events of having a birthday in the summer and having a birthday on Thanksgiving Day are mutually exclusive. **True**
8. Graphs are equivalent if their edges form the same connections of vertices. **True**

Solve.

9. A car manufacturer offers nine different models, each of which can be ordered in eight colors, with Options Packages A, B, or C. How many different cars can be purchased if a consumer chooses a model, a color, and one Options Package?

$$\underline{9 \cdot 8 \cdot 3 = 216 \text{ cars}}$$

10. Phil is loading five CDs into a six-disc changer. In how many different orders can the five CDs be played? ${}_6P_5 = \frac{6!}{1!} = 6! = 720$ ways

11. There are 12 students in a school club. How many different homecoming float committees consisting of four students are possible?
 ${}_{12}C_4 = \frac{12!}{8!4!} = 495$ committees

12. A worker at a museum has eight different sculptures, but there is room on the shelf for only four of them. How many different ways can the worker arrange four of the eight sculptures? ${}_8P_4 = \frac{8!}{4!} = 1,680$ ways

13. Carlos rolled a fair number cube (die) 30 times. The results are shown in the table.

Number	Number of Rolls
1	2
2	6
3	8

Number	Number of Rolls
4	4
5	7
6	3

What is the experimental probability of rolling an even number?

$$\frac{13}{30}$$

14. Use the information in Question 13 to find the theoretical probability of rolling an even number. $\frac{1}{2}$

15. A teacher draws two names from a bag containing the names of 15 senior, 10 junior, and 10 sophomore Student Council representatives, for the purpose of attending a Principal's luncheon. What is the probability that the teacher draws two seniors' names?
 $\frac{15}{40} \cdot \frac{14}{39} = \frac{7}{52}$

16. A research study is investigating a new type of heart pacemaker which has a 1% chance of failure. If two patients in the study are selected at random, and their pacemakers tested, find the probability that both pacemakers fail.
 $\frac{1}{100} \cdot \frac{1}{100} = \frac{1}{10,000}$ or $(0.01)(0.01) = 0.0001$

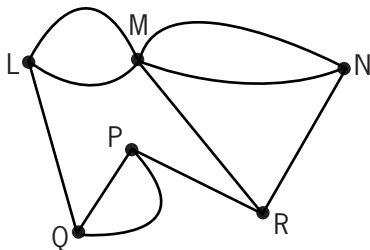
Answer the following questions with complete sentences.

17. Define permutation and combination and provide one example of each.

A permutation is an arrangement of objects in which the order of the objects matters. Possible example: Arrangements of numbers and letters on license plates are permutations because different license plates can have the same letters and numbers in different orders, such as 45KRW and 54KWR.

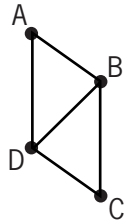
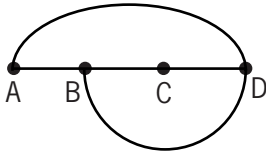
A combination is an arrangement of objects in which the order of the objects does not matter. Possible example: Salad ingredients are combinations because the order in which the ingredients of a salad are listed can be changed without changing the salad itself. A salad consisting of lettuce, tomato, egg, and cheese is the same as a salad consisting of egg, tomato, lettuce, and cheese.

18. Find the degree of each vertex in the graph below. Is the graph traversable? Explain why or why not.



The degrees are L: 3, M: 5, N: 3, P: 3, Q: 3, and R: 3. The graph is not traversable because more than two of the vertices have an odd degree.

19. Are the two graphs below equivalent? Explain why or why not.



Yes, these graphs are equivalent because all the connections match. For example, in the graph on the left, D connects to A, B, and C; and in the graph on the right, D connects to A, B, and C. This is true for all the vertices in both graphs.

20. Draw a tree diagram to show all possible orders of three fair coin tosses. H-T-H (Heads-Tails-Heads) is one such order.

