

Module Test **A**

Module 20

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

1. A **permutation** _____ is an arrangement of objects in which the order matters.
2. ${}_6P_2 = \frac{6!}{4!} =$ **30** _____
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 $\frac{7}{12}$, then the probability of the event not occurring is $\frac{5}{12}$ _____.

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 $m + n$ ways to make the two choices. **False** _____
6. When the probability of an event is one, the event is certain to occur. **True** _____
7. The events of having a birthday in the summer and having a birthday on a holiday are mutually exclusive. **False** _____
8. If two graphs have the same number of edges, they are equivalent. **False** _____

Solve.

9. Carol packed five shirts, three pairs of shorts, and seven pairs of socks for her vacation. If an outfit consists of one shirt, one pair of shorts, and one pair of socks, how many different outfits are possible?

$$\mathbf{5 \cdot 3 \cdot 7 = 105 \text{ outfits}}$$

10. In how many ways can eight classmates line up for a fire drill?

$${}_8P_8 = \frac{8!}{0!} = \underline{8! = 40,320 \text{ ways}}$$

11. There are 14 different colored markers in a desk drawer. Greg needs three markers. How many different sets of three markers are possible?

$${}_{14}C_3 = \frac{14!}{11!3!} = \underline{364 \text{ sets}}$$

12. A school science fair has eight finalists. How many different ways can the judges award 1st, 2nd, and 3rd place ribbons?

$${}_8P_3 = \frac{8!}{5!} = \underline{336 \text{ ways}}$$

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

Number	Number of Rolls
1	2
2	8
3	6

Number	Number of Rolls
4	3
5	4
6	7

What is the experimental probability of rolling a one or three?

$$\frac{8}{30} = \frac{4}{15}$$

14. Use the information in Question 13 to find the theoretical probability of rolling a one or three. $\frac{2}{6} = \frac{1}{3}$

15. A bag contains 10 lemon, 15 grape, and 15 orange candies. Without looking into the bag, Lisa selected one candy, ate it, and then, selected and ate another candy. What is the probability that Lisa ate two orange candies?

$$\frac{15}{40} \cdot \frac{14}{39} = \frac{7}{52}$$

16. A computer microchip factory has a defect rate of 2%. A Quality Control Director randomly pulls two microchips each day for inspection. Find the probability both chips are defective on a given day. Assume that defects are independent events.

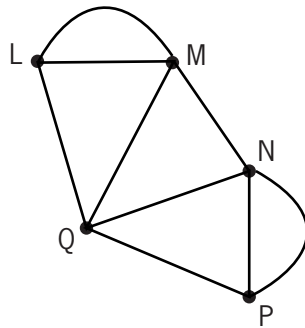
$$\frac{2}{100} \cdot \frac{2}{100} = \frac{1}{2,500} \text{ or } (0.02)(0.02) = 0.0004$$

Answer the following questions with complete sentences.

17. Explain why the events of selecting two kings from a well-shuffled deck of playing cards, *without* replacement, are dependent.

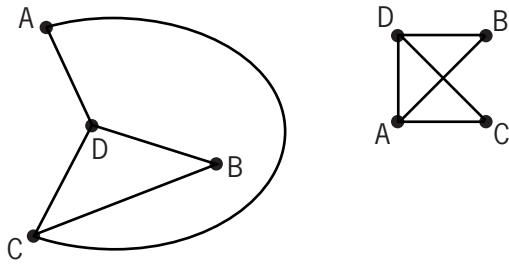
The events are dependent because the occurrence of the first event affects the probability of the second event. The probability of selecting a king the first time is $\frac{4}{52}$ because there are four favorable outcomes out of 52 possible outcomes (four kings out of 52 cards in the deck). If a king is selected the first time, the probability of selecting a king the second time is $\frac{3}{51}$ because there are only three remaining kings out of 51 remaining cards in the deck. If a king is not selected the first time, the probability of selecting a king the second time is $\frac{4}{51}$ because there are four remaining kings out of 51 remaining cards in the deck.

18. Is the graph below traversable? If so, explain why, and name a traversable path. If not, explain why not.



Yes, the graph is traversable because exactly two of its vertices (L and P) have an odd degree. One possible path is L-M-L-Q-M-N-Q-P-N-P. All paths must begin/end with L and P.

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



No, these graphs are not equivalent because the connections don't all match.

For example, in the graph on the left, A connects to C and D; but in the graph on the right, A connects to B, C, and D.

20. Draw a tree diagram to show all possible gender orders of three children in a family. B-G-G (Boy-Girl-Girl) is one such gender order.

