NAME ______________________

Module 20 Solving Problems Using Probability, Statistics, and Discrete Math

Lesson 3 Solving Advanced Probability Problems

additional practice

René has two glasses of diet soda and sets them down on a table that already has eight glasses of regular soda on it. Now René is not sure which glasses contain diet soda. She randomly selects two glasses.

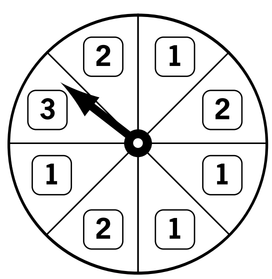
1. What is the probability René selects two glasses containing diet soda?
   $\frac{2}{10} \cdot \frac{1}{9} = \frac{1}{45}$

2. What is the probability René does not select two glasses containing diet soda?
   $1 - \frac{1}{45} = \frac{44}{45}$

3. What is the probability the first cup René selects contains diet soda, and the second does not? $\frac{2}{10} \cdot \frac{8}{9} = \frac{8}{45}$

4. What is the probability the first cup René selects does not have diet soda, and the second does? $\frac{8}{10} \cdot \frac{2}{9} = \frac{8}{45}$

Rod and Sue are playing a game that includes a spinner. The directions of the game say that each player can spin the spinner two times. Assume that the spinner cannot be controlled by the players and stops randomly; find each of the probabilities.



5. P(both spins are 1)
   $\frac{4}{8} \cdot \frac{4}{8} = \frac{16}{64} = \frac{1}{4}$

6. P(both spins are 2)
   $\frac{3}{8} \cdot \frac{3}{8} = \frac{9}{64}$

7. P(both spins are 3)
   $\frac{1}{8} \cdot \frac{1}{8} = \frac{1}{64}$

8. P(first spin is 1, second spin is 3)
   $\frac{4}{8} \cdot \frac{1}{8} = \frac{4}{64} = \frac{1}{16}$

9. P(neither spin is 2)
   $\frac{5}{8} \cdot \frac{5}{8} = \frac{25}{64}$

10. P(both spins are 4)
   $\frac{0}{8} \cdot \frac{0}{8} = 0$

Hospitals have backup generators in case of a power failure. One hospital's safety director reports there are a 0.002 chance of a power failure and a 0.0001 chance that the backup generator will fail to operate. Assume these failures are independent events.

11. What percentage of the time can a hospital expect to have their normal power supply working? **1 − P(normal power failure) = 1 – 0.002 = 0.998 = 99.8% of the time, the hospital can expect to have a normal power supply.**

12. What is the probability a power failure will occur, and the backup generator will fail?

(0.002)(0.0001) = 0.0000002

13. What is the probability a power failure will occur, and the backup generator will work?

(0.002)(0.9999) = 0.0019998

The table shows the results of a realtor company's survey of 2,000 new or used home buyers in suburban American cities one year after purchase.

	Satisfied	Not Satisfied	Total
New Home	500	100	600
Used Home	1,000	400	1,400
Total	1,500	500	2,000

14. Find the probability a person surveyed bought a new home. $\frac{600}{2{,}000} = \frac{3}{10}$

15. Find the probability a person surveyed was satisfied. $\frac{1{,}500}{2{,}000} = \frac{3}{4}$

16. Find the probability a person surveyed bought a new home and was not satisfied.

$\frac{600}{2{,}000} \cdot \frac{500}{2{,}000} = \frac{3}{40}$

In a certain district, 55% of the voters in an election are women. It is predicted that 60% of women and 48% of men will vote for the Democratic candidate. An exit pollster picked every twentieth voter and asked for whom they voted.

17. Find the probability the person polled was a woman who voted for the Democratic candidate. **(0.55)(0.60) = 0.33**

18. Find the probability the person polled was a man who did not vote for the Democratic candidate. **(0.45)(0.52) = 0.234**

19. Find the probability the person polled was a woman who did not vote for the Democratic candidate. **(0.55)(0.40) = 0.22**

A NASA International Space Station critical component has a 0.02 probability of failure. In case of a failure, NASA builds in redundancy so that identical backup components with the same probability of failure will take over in case of failure.

20. What is the probability the original component and one backup component will both fail? **(0.02)(0.02) = 0.0004**

21. What is the probability the original component and two backup components will all three fail? **(0.02)(0.02)(0.02) = 0.000008**

22. How many backup components must be installed to insure that the probability of at least one of the components will work is 0.999999? Hint: "at least one will work" is the complement of "all will fail."

One original plus three backup components must be installed;

1 − P(original and 3 backups fail) = 1 − [(0.02)(0.02)(0.02)(0.02)] =

1 − 0.00000016 = 0.99999984