

Review for Exam 3  
Math 102

Complete the following exercises for a review. Questions on the exam will be similar to questions on this review, questions from the homework assignments and the suggested exercises.

1. Use a tree to help you count the number of ways to create a pizza with 1 topping, if there are 3 choices for crusts and 5 choices for toppings.
2. How many branches would a tree describing the number of ways to build a 3 digit even number from the digits 3,4,5,6, where digits may repeat.
3. How many license plates that begin with two letters and end with 4 digits can be made using only the letters A,B,C,D,E,F,G, and H and the numbers 1,3,5,7,9?
4. How many ways can you choose 3 toppings to go on a pizza if there are 12 toppings to choose from?
5. How many ways can a club of 15 people choose a president and a vice president if everyone is eligible?
6. How many ways can the same club choose a 3 member board of directors to govern?
7. How many ways can the same club choose a a president, a vice president and a 2 member board to govern?
8. Suppose you have an urn with 4 red balls, 3 green balls and 5 white balls.
  - (a) How many ways can you draw 4 balls from the urn?
  - (b) How many ways can you draw 1 red and 3 white balls from the urn?
  - (c) How many ways can you draw 2 green balls and 2 white balls from the urn?
  - (d) How many ways can you draw 4 white balls from the urn?
9. Suppose you are in a theatre and there are 6 seats in a row.
  - (a) How many ways can 6 people occupy these seats?
  - (b) How many ways can we seat 6 people in these seats if there are 15 people?
  - (c) Suppose the group consists of 4 men and 2 women. How many ways can seat them if the women want to sit together? How many ways can we seat them if women want to sit separately?
10. Suppose you draw 5 cards from a standard deck. How many ways can you draw 3 cards of one suit and 2 cards of another suit?
11. Suppose you draw 5 cards from a standard deck. How many ways can you draw 4 cards of one rank and 1 card of another rank?
12. Suppose you draw 6 cards from a standard deck. How many ways can you draw 3 cards of one rank and 3 cards of another rank?
13. There are 12 flavors of ice cream. How many 4 scoop ice cream cones can be made if all scoops have to differ and the order of the scoops matters? What if the order of the scoops doesn't matter? What if you want two scoops of one flavor and two scoops of another flavor and order matters?
14. Go back to problem 8 and compute the probability of the events described in (b), (c), and (d).

15. Draw a probability tree for drawing 2 balls in succession without replacement and use it to find the following probabilities.
- (a) The probability that the second ball is red given the first ball is red.
  - (b) The probability that the second ball is green.
  - (c) The probability that the first ball is red given the second ball is green.
16. What is the probability of rolling a sum of 3 on a pair of 6-sided dice?
17. What is the probability of not rolling a sum of 3 on a pair of 6-sided dice?
18. What is the probability of drawing either a 10,J,Q or a heart when drawing one card from a deck of cards?

19. The following table classifies 1456 people by their sex and whether or not they favor a gun law. Use it to answer the questions below.

	Male ( $S_1$ )	Female ( $S_2$ )	Totals
Favor ( $A_1$ )	392	649	1041
Oppose ( $A_2$ )	241	174	415
Totals	633	823	1456

- (a) Find the probability that a randomly chosen person opposes a gun law given that they are male.
  - (b) Find the probability that a randomly chosen person is male given that they favor a gun law.
  - (c) Find the probability that a randomly chosen person is female given that they favor a gun law.
  - (d) Find the probability that a randomly chosen person favors a gun law given that they are female.
20. Find the probability that the sum on a pair of dice is less than 5 given that the sum on the dice is odd. Are these two events independent?
21. Suppose you draw two cards in succession from a standard 52-card deck without replacement. What is the probability that the second card is a King given that the first card is a Jack? Are these two events independent? Repeat this experiment with replacement. Are the events independent now?
22. Suppose that you have sample space  $S$  and events  $A$  and  $B$ . Suppose that  $P(A) = 0.4$ ,  $P(B) = 0.7$  and  $P(A \cap B) = 0.3$ . Draw a probability Venn diagram and use it to find the following probabilities.

- (a)  $P(A \cup B)$
- (b)  $P(S)$
- (c)  $P(A')$
- (d)  $P(B')$
- (e)  $P((A \cup B)')$
- (f)  $P(A - B)$
- (g)  $P((A \cap B)')$
- (h)  $P(B \cap A')$
- (i)  $P(B - A)$

23. A lottery ticket costs \$1. You pick a 3 digit number using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and digits can be repeated. If your number matches the winning number you win \$500. What is the expected value of your lottery ticket?
24. You are rolling one die. If you roll a 1,2, or 3 you lose \$2. If you roll a 4 you win \$10. If you roll a 5 you lose \$1. If you roll a 6 you win \$2. What is the expected value of this game? Is it fair?
25. You flip a coin 12 times. What is the probability that it will come up heads exactly 6 times? What is the probability it will come up tails exactly 2 times?
26. You roll a single die 8 times. What is the probability that a 5 or 6 will come up 3 times? What is the probability that the number will be even 5 times?