

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## COMBINATIONS AND PROBABILITY ALGEBRA 2 WITH TRIGONOMETRY

Since many probability problems involve counting, it is natural that combinations could be used to find probabilities where the counting becomes very large.

**Exercise #1:** Consider a classroom containing 18 girls and 12 boys. A teacher would like to create a four-person committee from these students, where the order in which she chooses the students to be on the committee does not matter.

- (a) How many different ways can the teacher create this four-person committee?
- (b) How many different ways can the teacher create this four-person committee if it only has girls on it?
- (c) What is the probability that a committee that is randomly selected would contain only girls?
- (d) What is the probability that a committee that is randomly selected would contain two girls and two boys?

By applying the fundamental definition of probability, combinations can help us greatly in terms of finding probabilities in situations when it is far too difficult or time consuming to list a sample space.

**Exercise #2:** Adrianna is trying to choose five DVD's to take with her on vacation. She is selecting from six action movies, eight comedies, and four dramas. If she randomly selects the five find the probability she will choose:

- (a) Five comedies
- (b) Two action, two comedies, and one drama



In the last two lessons, you truly learned all that you need to know to calculate the probabilities in this lesson.

**Exercise #3:** A very odd florist is making a random arrangement of six flowers. He has eight tulips, twelve roses, and six daisies to choose from.

- (a) Determine the total number of ways to select six flowers from the florist's 26 flowers.
- (b) If the flowers are chosen at random, what is the probability they are all roses?
- (c) If the flowers are chosen at random, what is the probability there are two of each type?
- (d) If the flowers are chosen at random, what is the probability they are all tulips or all daisies?

**Exercise #4:** Franklin has five quarters in his pocket, two nickels, and three dimes. If he pulls two coins out at random, what is the probability that he has fifty cents in his hand?

(1)  $\frac{1}{5}$

(3)  $\frac{2}{7}$

(2)  $\frac{1}{2}$

(4)  $\frac{2}{9}$

**Exercise #5:** Harold draws five marbles out of a bag that contains 12 red marbles and 10 blue marbles. Which of the following calculated the probability that Harold draws out three red marbles and two blue marbles?

(1)  $\frac{{}_{12}C_3 + {}_{10}C_2}{{}_{22}C_5}$

(3)  $\frac{{}_{10}C_2}{{}_{12}C_3}$

(2)  $\frac{{}_{12}C_3 \cdot {}_{10}C_2}{{}_{22}C_5}$

(4)  $\frac{{}_{12}C_5}{{}_{22}C_5}$

**Exercise #6:** Mr. Jim Shorts is trying to form a six-person volleyball team from his 9<sup>th</sup> grade physical education class which consists of 10 girls and 14 boys. If he picks a team at random, to the nearest percent, what is the probability that the team will consist of all girls or all boys?

(1) 17%

(3) 5%

(2) 2%

(4) 21%



**COMBINATIONS AND PROBABILITY**  
**ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK**

**APPLICATIONS**

1. Maria has cards numbered one through ten in her hand. Joel randomly pulls two cards out of the deck, without replacement. Which of the following gives the probability that Joel pulled two cards with numbers less than 5 out of the deck?

(1)  $\frac{2}{15}$

(3)  $\frac{2}{5}$

(2)  $\frac{4}{25}$

(4)  $\frac{5}{9}$

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2. A 3<sup>rd</sup> grade classroom contains 12 girls and 8 boys. If the teacher randomly picks three students to demonstrate a math problem, which of the following is closest to the probability they are all girls?

(1) 15%

(3) 28%

(2) 4%

(4) 19%

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3. Frederick randomly grabs two paperclips from a dish containing eight blue and six red clips. Which of the following is the probability that the two paperclips are the same color?

(1)  $\frac{1}{20}$

(3)  $\frac{24}{91}$

(2)  $\frac{43}{91}$

(4)  $\frac{14}{91}$

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4. A florist wants to make an arrangement of five flowers that he will pick from a collection of 14 red roses and 10 white roses. Which of the following calculates the probability, if the flowers are chosen at random, that the arrangement will contain three red roses and two white roses?

(1)  $\frac{{}^{14}C_3 + {}^{10}C_2}{{}^{24}C_5}$

(3)  $\frac{{}^{14}C_3 \cdot {}^{10}C_2}{{}^{24}C_5}$

(2)  $\frac{{}^{10}C_2}{{}^{14}C_3}$

(4)  $\frac{{}^{10}C_2}{{}^{24}C_2} \cdot \frac{{}^{14}C_3}{{}^{24}C_3}$

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5. Eight Arlington and fourteen Wappingers runners enter a race where the top three finishers end up being from Arlington. Which of the following is closest to the probability of this happening by chance alone?

(1) 8.5%

(3) 1.2%

(2) 17.4%

(4) 3.6%

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6. A company takes a sample of 20 boxes of cereal from their production line. They believe that of the 20 boxes, four will have too little cereal in them and sixteen will have the correct amount. The company then randomly selects four of the boxes from the twenty and weighs them. Assuming the company is correct about the number of light boxes, find:
- (a) The probability that the four boxes selected will all have the correct amount.
- (b) The probability that the four boxes selected will all be too light.
- (c) The probability that the four boxes will all have the correct amount or will all be too light.
- (d) The probability that three of the four boxes will have the correct amount and one will be too light.
7. A lawsuit has been brought by female managers of a company. Recently the company decided to promote three of eight mid-level managers to top vice-president positions. Of the eight mid-level managers, five were women and three were men, yet all of the promotions went to the men. The lawyer for the women believes that they have a case if the probability of only men getting these three promotions by chance alone is less than 5%. Do the female employees have a case? Justify your answer.
8. Carlos is assembling a bouquet of flowers for his girlfriend's birthday. He randomly picks four roses from a collection of 12 white roses, 21 red roses, and 10 pink roses. He finds that all four roses that he picked are the same color. What is the probability this happened by chance alone?

