

Worksheet: Applications of
Permutations and Combinations

Name: Key

Set up and solve. Box your answer.

1. Telephone numbers in the United States have ten digits. The first three are the area code and the next seven are the local telephone number. How many different 7-digit telephone numbers are possible within each area code? Note that a local telephone number cannot begin with 0 or 1.)

$$\underline{8} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \boxed{8,000,000}$$

2. A college student is preparing a course schedule of next semester. The student may select one of two mathematics courses, one of three science courses, one of five courses from the social sciences and one of five from the humanities. How many schedules are possible?

$$(2)(3)(5)(5) \quad \boxed{150}$$

3. Eight horses are running in a race. In how many different ways can these horses come in first, second and third. (Assume there are no ties.)

$${}^8P_3 = \frac{8!}{(8-3)!} = \frac{8!}{5!} = 8 \cdot 7 \cdot 6 \quad \boxed{336}$$

4. How many three-digit numbers can be formed under the conditions that the leading digit cannot be zero and the number must be a multiple of 5?

$$\underline{9} \quad \underline{10} \quad \underline{2} \quad = \boxed{180}$$

↑
0 or 5 only

5. A combination lock will open when the right choice of three numbers (from 1 to 40, inclusive) is selected. How many different lock combinations are possible?

$${}^40P_3 = \frac{40!}{(40-3)!} = \frac{40!}{37!} = 40 \cdot 39 \cdot 38 \quad \boxed{59,280}$$

6. A student may answer any 10 questions from a total of 12 questions on an exam. How many different groups of questions can the student select to answer?

$${}_{12}C_{10} = \frac{12!}{10!(12-10)!} = \frac{12 \cdot 11}{2 \cdot 1} = 66$$

7. There are a 50 numbers in a particular state lottery. In how many ways can a player select six of the numbers? (The order of selection is not important.)

$${}_{50}C_6 = 15,890,700$$

8. How many (not necessarily unique) subsets of four elements can be formed from a set of 100 elements?

$${}_{100}C_4 = 3,921,225$$

9. A committee composed of three graduate students and two undergraduate students is to be selected from a group of eight graduates and five undergraduates. How many different committees can be formed?

$${}_{8 \text{ Graduates}}C_3 = 56 \quad {}_{5 \text{ undergrads}}C_2 = 10 \quad 56 \cdot 10 = 560$$

10. An employer interviews eight people for four openings in the company. Three of the eight people are women. If all eight are qualified, in how many ways could the employer fill the positions if exactly two are women?

$${}_{3 \text{ Women}}C_2 = 3 \quad {}_{5 \text{ Men}}C_2 = 10 \quad 3 \cdot 10 = 30$$

11. Four singers are to perform at a club. One of the singers insists on being the last performer of the evening. If the singer's request is granted, how many different ways are there to schedule the performances?

I insisted to be last so only 3 choices for 1st singer.

$$\frac{3}{1^{\text{st}}} \cdot \frac{2}{2^{\text{nd}}} \cdot \frac{1}{3^{\text{rd}}} \cdot \frac{1}{\text{Last}} = 6$$

12. There are 14 standbys who hope to get seats on a flight, but only six seats available on the plane. How many different sets of the six people can be selected?

$${}_{14}C_6 \quad \boxed{3003}$$

13. To win LOTTO in the state of Florida, one must correctly select 6 numbers from a collection of 53 numbers (1 – 53). The order in which the selection is made does not matter. How many different selections are possible?

$${}_{53}C_6 \quad \boxed{22,957,480}$$

14. You volunteer to help drive children at a charity event to the zoo, but you can only fit 8 of the 17 children present in your van. How many different groups of 8 children can you drive?

$${}_{17}C_8 \quad \boxed{24,310}$$

15. How many different 4-letter passwords can be formed from the letters if no repetition of letters is allowed?

$${}_{26}P_4 \quad \boxed{358,800}$$

← order matters for Passwords

26 letters in alphabet

16. Nine bands have volunteered to perform at a benefit concert, but there is only enough time for five of the bands to play. How many unique lineups are possible?

$${}_9P_5 \quad \boxed{15,120}$$

↑↑ order matters

