

**DIRECTIONS:** Use the fundamental counting principle to answer #1-6.

1. How many ways can you make a sandwich if you can select from 4 kinds of bread, 3 types of meat, and 5 varieties of cheese?
2. How many three-digit positive integers can be written using the digits 2, 3, 4, 5, and 6?
3. How many odd three-digit positive integers can be written using the digits 2, 3, 4, 5, and 6?
4. How many even three-digit positive integers can be written using the digits 1, 2, 4, 7, and 8?
5. A student council has 5 seniors, 4 juniors, 3 sophomores, and 2 freshmen as members. In how many ways can a four-member committee be formed that includes one member of each class?
6. In how many ways can you select one dog, one gorilla, and one penguin from a collection of 7 different dogs, 6 different gorillas, and 3 different penguins?

**DIRECTIONS:** Evaluate the following problems (which use factorials).

7.  $8!$

8.  $3!$

9.  $10!$

10.  $\frac{8!}{3!}$

11.  $\frac{8!}{(8-3)!}$

12.  $\frac{8!}{3! \cdot 5!}$

**DIRECTIONS:** Find the number of permutations.

13.  ${}_5P_2$

14.  ${}_9P_4$

15.  ${}_7P_6$

16.  ${}_{12}P_3$

**DIRECTIONS:** Answer the following questions.

17. In how many ways can five different books be arranged on a shelf?

- 18.** In how many ways can eight people be lined up in a row for a photograph?
- 19.** In how many ways can three cards from a deck of 52 cards be laid face up in a row?
- 20.** In how many ways can four of seven different kinds of bushes be planted beside a barn?
- 21.** In how many ways can the letters of the word MONDAY be arranged using all six letters?
- 22.** In how many ways can the letters of the word TODAY be arranged using only three letters at a time?

DIRECTIONS: Find the number of distinguishable ways the letters of each word can be arranged.

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|--------------------|------------------------|----------------------|
| <b>23.</b> ADDEND  | <b>24.</b> BEEKEEPER   | <b>25.</b> ROTOR     |
| <b>26.</b> ALABAMA | <b>27.</b> MISSOURI    | <b>28.</b> FLORIDA   |
| <b>29.</b> TEXAS   | <b>30.</b> CONNECTICUT | <b>31.</b> WATERFALL |

DIRECTIONS: Answer the following questions.

- 32.** In how many ways can three red pens, four blue pens, and two green pens be distributed to nine students seated in a row if each student receives exactly one pen?
- 33.** In how many distinguishable ways can three identical emeralds, two identical diamonds, and two different opals be arranged in a row in a display case?
- 34.** In a dog show, how many ways can five Chihuahuas, five Labradors, four poodles, and three beagles line up in front of the judges if the dogs of the same breed are considered identical?