Fundamental Counting Principle and Permutations Practice

Use fundamental counting principle to solve each problem.

1. A company manufactures sneakers in 3 colors, 2 styles, and 8 sizes. How many different sneakers are made?

   48

2. A quiz consists of 10 true/false questions. If a student guesses all of the answers, in how many different ways can she complete the quiz?

   $2^{10} = 1024$

3. Harry is selecting new uniforms for his team. Pants come in 3 styles, shirts in 2 styles, and hats in 4 styles. In how many different ways can a 3-piece uniform be selected?

   $3 \cdot 2 \cdot 4 = 24$

4. A store makes custom paints using a base, a texture, and a pigment. If the store has 3 different bases, 2 textures, and 50 pigments, how many different custom paints can be mixed?

   $3 \cdot 2 \cdot 50 = 300$

5. There are 12 questions on a true/false test. If all questions are answered, in how many different ways can the test be completed?

   $2^{12} = 4096$

6. Each of the 8 questions on a multiple choice test has 3 possible answers. If all questions are answered, in how many ways can the test be completed?

   $3^8 = 6561$

7. A company is setting up phone numbers for a new town. Each number must have 7 digits and cannot start with 0. How many different numbers are possible? (Repetition is allowed.) $9 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 9{,}000{,}000$

8. A 7-digit phone number is to be chosen so that the first and last digits are not 0 and the last digit is even. How many different numbers can be chosen? (Repetition of a digit is allowed.) $9 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 4 =$ $3{,}600{,}000$

9. On a 15 item test, the first five items have 4 choices each, the next five have 3 choices each, and the last five are true or false. If Joe answers items 2, 7, and 10 correctly and guesses all the others, how many different ways can he complete the test? $4 \cdot 1 \cdot 4 \cdot 4 \cdot 4 \cdot 3 \cdot 1 \cdot 3 \cdot 3 \cdot 1 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ $= 331{,}184$

10. A code is constructed so that each word has exactly 5 letters. A word cannot start with a vowel or end with a consonant. If the letters q, x, and z are excluded, how many different code words can be formed?

    $18 \cdot 23 \cdot 23 \cdot 23 \cdot 5 = 1{,}095{,}030$

11. How many different 6 digit license plates can be made if the first digit can not be a 0 and no digits may be repeated? $9 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 = 136,080$

12. How many different 6 digit license plates can be made if the first digit must not be 0, but digits may be repeated? $9 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$
$900,000$

13. The manager of a baseball team wants the best hitter up fifth. If the lineup consists of 9 players, how many different lineups are possible?
$8 \cdot 7 \cdot 6 \cdot 5 \cdot 1 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 40,320$

14. An insurance company is giving each customer a 9-digit code number. Each number is odd and does not start with 0. Repetition of digits is not allowed. How many code numbers are possible? $9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 5$
$1,612,800$

Permutations

Evaluate.

15. ${}_5P_5$ 120
16. ${}_7P_4$ 840
17. ${}_9P_8$ 362,880
18. ${}_6P_2$ 30
19. ${}_8P_6$ 20,160
20. ${}_{10}P_7$ 604,800

Find the number of permutations of the elements in each set.

21. {C A R B O N} $6! = 720$

22. {1, 2, 3, 4, 5} $5! = 120$

23. In how many different ways can 9 baseball players' names be listed in a column on the roster? $9! = 362,880$

24. Six people volunteer to help put out a fire. In how many different ways can they be lined up in a row to hold the hose? $6! = 720$

25. How many ways can 8 different books be arranged on a shelf? $8! = 40,320$

26. How many ways can 10 students be seated in a row? $10! = 3,628,800$

27. How many 3-letter code words can be made from the letters b, c, d, e, and f, if repetition of a letter is allowed? $5 \cdot 5 \cdot 5 = 125$

28. How many 2-letter code words can be made from the letters b, c, d, e, and f, if repetition of a letter is not allowed? $5 \cdot 4 = 20$

29. How many 4-digit permutations of the 10 digits are there, if no digit may be repeated?

$_{10}P_4$ $\quad 10 \cdot 9 \cdot 8 \cdot 7 = 5040$

30. How many 3-digit permutations of the 10 digits are there if any digit may be repeated?

$10 \cdot 10 \cdot 10 = 1000$

31. How many permutations of the letters of the word BABBLING are there?

$\frac{8!}{3!} = 6720$

32. How many permutations of the letters of the word CARICATURE are there?

$\frac{10!}{2!2!2!} = 453{,}600$

33. How many permutations of the letters in the word DAZZLED are there?

$\frac{7!}{2!2!} = 1260$

34. How many permutations of the letters in the word REARRANGEMENT are there?

$\frac{13!}{3!3!2!2!} = 43{,}243{,}200$