Find the number of ways you can arrange (a) all of the letters in the given word and (b) 2 of the letters in the word.

  1. TACK   **2.** MAR   **3.** GAMER

Write the meaning of the notation in words.

  4. $_{14}P_3$ **5.** $_{24}P_{10}$ **6.** $_{30}P_{20}$

Evaluate the expression.

  7. $6!$ **8.** $9!$ **9.** $11!$

  10. $\dfrac{8!}{3!}$ **11.** $\dfrac{12!}{9!}$ **12.** $\dfrac{15!}{14!}$

  13. $_6P_3$ **14.** $_4P_4$ **15.** $_{15}P_3$

  16. $_8P_7$ **17.** $_{10}P_6$ **18.** $_5P_0$

Complete the statement using >, <, or =.

  19. $_6P_4 \underline{\ \ ?\ \ } {_4}P_1$ **20.** $_8P_6 \underline{\ \ ?\ \ } {_{10}}P_8$ **21.** $_3P_0 \underline{\ \ ?\ \ } {_6}P_5$

  22. $_6P_3 \underline{\ \ ?\ \ } {_4}P_1$ **23.** $_{24}P_1 \underline{\ \ ?\ \ } {_4}P_4$ **24.** $_7P_5 \underline{\ \ ?\ \ } {_{12}}P_3$

  25. **Summer Reading List** At the beginning of the summer, you have 6 books to read. In how many orders can you read the books?

  26. **Air Conditioning Repair** An air conditioner repair person has repairs to make at 7 different homes. In how many orders can the repairs be made?

  27. **Multiple Representations** You and 3 friends are bike messengers working for a delivery company. The supervisor assigns new deliveries to the messengers in a particular order. This order remains the same, so that all messengers are likely to have the same number of deliveries by the end of the day.

    a. **Making a List** List all the possible orders in which the supervisor can assign deliveries to the messengers.

    b. **Using a Formula** Use the formula for permutations to find the number of ways in which the supervisor can assign deliveries to the messengers.

    c. **Describing in Words** What is the likelihood that you are assigned the first delivery? *Explain* your answer using probability.

  28. **Math Exam** On an exam, you are asked to list the 6 steps to solving a particular kind of problem in order. You guess the order of the steps at random. What is the probability that you choose the correct order?

Find the number of ways you can arrange (a) all of the letters in the given word and (b) 3 of the letters in the word.

   1. VIDEO   **2.** TARP   **3.** MASTER

   4. *Describe* a real-world situation where the number of possibilities is given by $_6P_2$.

Evaluate the expression.

   5. $_7P_4$ **6.** $_{10}P_{10}$ **7.** $_8P_2$

   8. $_{13}P_0$ **9.** $_5P_1$ **10.** $_{20}P_3$

  11. $_{14}P_6$ **12.** $_{12}P_5$ **13.** $_{25}P_5$

  14. $2\left(_8P_5\right)$ **15.** $\dfrac{1}{4}\left(_{10}P_4\right)$ **16.** $\dfrac{3}{5}\left(_7P_3\right)$

  17. $_4P_2 + \,_2P_1$ **18.** $_{15}P_4 - \,_7P_5$ **19.** $\dfrac{_6P_5}{_3P_3}$

Complete the statement using >, <, or =.

  20. $_6P_4 \underline{\;\;?\;\;} \,_8P_6$ **21.** $_{110}P_1 \underline{\;\;?\;\;} \,_{11}P_2$ **22.** $_4P_4 \underline{\;\;?\;\;} \,_5P_2$

  23. **Roofing** A roofing company has 8 roofing jobs to complete so far in the upcoming season. In how many orders can the jobs be completed?

  24. **Soapbox Racing** You are in a soapbox racing competition. In each heat, 7 cars race and the positions of the cars are randomly assigned.

     a. In how many ways can the positions be assigned?

     b. What is the probability that you are chosen to be in the last position? *Explain* how you found your answer.

     c. What is the probability that you are chosen to be in the first or second position of the heat in which you are racing? *Explain* how you found your answer.

     d. What is the probability that you are chosen to be in the second or third position of the heat in which you are racing? *Compare* your answer with your answer to part (c).

  25. **Battle of the Bands** Your band is one of 12 bands competing in a battle of the bands. The order of the performances is determined at random. The first 6 performances are on a Friday night and the next 6 performances are on the following night.

     a. What is the probability that your band gives the last performance on Friday night and your rival band performs immediately before you?

     b. What is the probability that your band does not give the last performance?