EXAMPLE 2 on p. 852 for Exs. 12–30

FACTORIALS AND PERMUTATIONS **Evaluate the expression.**

12. $1!$ **13.** $3!$ **14.** $0!$ **15.** $5!$

16. $8!$ **17.** $10!$ **18.** $12!$ **19.** $13!$

20. ${}_5P_2$ **21.** ${}_7P_3$ **22.** ${}_9P_1$ **23.** ${}_6P_5$

24. ${}_8P_8$ **25.** ${}_{12}P_0$ **26.** ${}_{30}P_2$ **27.** ${}_{25}P_5$

ERROR ANALYSIS ***Describe*** **and correct the error in evaluating the expression.**

28. ${}_{11}P_7 = \frac{11!}{(11-7)} = \frac{11!}{4} = 9{,}979{,}200$ ✗

29. ${}_5P_3 = \frac{5!}{3!} = \frac{5 \cdot 4 \cdot 3!}{3!} = 20$ ✗

30. **TAKS REASONING** The judges in an art contest award prizes for first, second, and third place out of 11 entries. Which expression gives the number of ways the judges can award first, second, and third place?

Ⓐ $\frac{3!}{11!}$ Ⓑ $\frac{8!}{11!}$ Ⓒ $\frac{11!}{8!}$ Ⓓ $\frac{11!}{3!}$

31. **CHALLENGE** Consider a set of 4 objects and a set of n objects.

a. Are there more permutations of all 4 of the objects or of 3 of the 4 objects? *Justify* your answer using an organized list.

b. In general, are there more permutations of n objects taken n at a time or of n objects taken $n - 1$ at a time? *Justify* your answer using the formula for the number of permutations.

PROBLEM SOLVING

EXAMPLE 2 on p. 852 for Exs. 32–33

32. **MOVIES** Six friends go to a movie theater. In how many different ways can they sit together in a row of 6 empty seats?

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33. **TAKS REASONING** You plan to visit 4 stores during a shopping trip. In how many orders can you visit these stores?

Ⓐ 4 Ⓑ 16 Ⓒ 24 Ⓓ 256

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EXAMPLE 3 on p. 853 for Exs. 34–38

34. **MULTIPLE REPRESENTATIONS** You and your friend are two of 4 servers working a shift in a restaurant. The host assigns tables of new diners to the servers in a particular order. This order remains the same, so that all servers are likely to wait on the same number of tables by the end of the shift.

a. **Making a List** List all the possible orders in which the host can assign tables to the servers.

b. **Using a Formula** Use the formula for permutations to find the number of ways in which the host can assign tables to the servers.

c. **Describe in Words** What is the likelihood that you and your friend are assigned the first 2 tables? *Explain* your answer using probability.

= WORKED-OUT SOLUTIONS on p. WS1 = TAKS PRACTICE AND REASONING = MULTIPLE REPRESENTATIONS