

# 10.1 EXERCISES

HOMEWORK  
KEY

○ = WORKED-OUT SOLUTIONS  
on p. WS1 for Exs. 13, 35, and 65  
★ = STANDARDIZED TEST PRACTICE  
Exs. 2, 17, 42, 55, 57, and 68

## SKILL PRACTICE

- VOCABULARY** What is a permutation of  $n$  objects?
- ★ **WRITING** Simplify the formula for  ${}_nP_r$  when  $r = 0$ . Explain why this result makes sense.

**EXAMPLE 1**  
on p. 682  
for Exs. 3-6

**TREE DIAGRAMS** An object has an attribute from each list. Make a tree diagram that shows the number of different objects that can be created.

3.

T-Shirts
Size: M, L, XL
Type: long-sleeved, short-sleeved

4.

Toast
Bread: white, wheat
Spread: jam, margarine

5.

Meal
Entrée: chicken, fish, pasta
Side: corn, green beans, potato

6.

Furniture
Wood: cherry, mahogany, oak, pine
Finish: stained, painted, unfinished

**EXAMPLE 2**  
on p. 683  
for Exs. 7-10

**FUNDAMENTAL COUNTING PRINCIPLE** Each event can occur in the given number of ways. Find the number of ways all of the events can occur.

- Event A: 2 ways; Event B: 4 ways
- Event A: 5 ways; Event B: 2 ways
- Event A: 4 ways; Event B: 3 ways; Event C: 5 ways
- Event A: 3 ways; Event B: 6 ways; Event C: 5 ways; Event D: 2 ways

**EXAMPLE 3**  
on p. 683  
for Exs. 11-17

**LICENSE PLATES** For the given configuration, determine how many different license plates are possible if (a) digits and letters can be repeated, and (b) digits and letters cannot be repeated.

- 4 letters followed by 3 digits
- 2 letters followed by 5 digits
- 4 letters followed by 2 digits
- 5 digits followed by 3 letters
- 1 digit followed by 5 letters
- 6 letters
- ★ **MULTIPLE CHOICE** How many different license plates with 2 letters followed by 4 digits are possible if digits and letters cannot be repeated?  
(A) 3,276,000 (B) 6,760,000 (C) 32,292,000 (D) 45,697,600

**EXAMPLES 4 and 5**  
on pp. 684-685  
for Exs. 18-41

**FACTORIALS** Evaluate the expression.

- $7!$
- $11!$
- $1!$
- $8!$
- $4!$
- $0!$
- $12!$
- $6!$
- $3! \cdot 4!$
- $3(4!)$
- $\frac{8!}{(8-5)!}$
- $\frac{9!}{4! \cdot 4!}$

**PERMUTATIONS** Find the number of permutations.

30.  ${}_4P_4$       31.  ${}_6P_2$       32.  ${}_{10}P_1$       33.  ${}_8P_7$   
 34.  ${}_7P_4$       35.  ${}_9P_2$       36.  ${}_{13}P_8$       37.  ${}_7P_7$   
 38.  ${}_5P_0$       39.  ${}_9P_4$       40.  ${}_{11}P_4$       41.  ${}_{15}P_0$

42. ★ **SHORT RESPONSE** Let  $n$  be a positive integer. Find the number of permutations of  $n$  objects taken  $n - 1$  at a time. Compare your answer with the number of permutations of all  $n$  objects. Does this make sense? Explain.

**EXAMPLE 6**  
 on p. 686  
 for Exs. 43–55



















**PERMUTATIONS WITH REPETITION** Find the number of distinguishable permutations of the letters in the word.


43. OFF      44. TREE      45. SKILL      46. YELLOW  
 47. GRAVEL      48. PANAMA      49. ARKANSAS      50. FACTORIAL  
 51. MAGNETIC      52. HONOLULU      53. CLEVELAND      54. MISSISSIPPI

## PROBLEM SOLVING


**EXAMPLE 2**  
 on p. 683  
 for Exs. 62–63

62. **CLASS RINGS** You want to purchase a class ring. The ring can be made from 3 different metals. You can choose from 6 different side designs and 12 different stones. How many different class rings are possible?

Metal	Side Design		Stone					
Auralite	Academics	Literature						
Gold	Art	Music						
Silver	Athletics	Technology						

 for problem solving help at [classzone.com](http://classzone.com)

63. **ENVIRONMENT** Since 1990, the Goldman Environmental Prize has been awarded annually to 6 grassroots environmentalists, one from each of 6 regions. The regions consist of 52 countries in Africa, 47 in Europe, 45 in Asia, 36 in island nations, 19 in South and Central America, and 3 in North America. How many different sets of 6 countries can be represented by the prize winners in a given year?

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**EXAMPLES**  
 4, 5, and 6  
 on pp. 684–686  
 for Exs. 64–66

64. **PHOTOGRAPHY** A photographer lines up the 15 members of a family in a single line in order to take a photograph. How many different ways can the photographer arrange the family members for the picture?

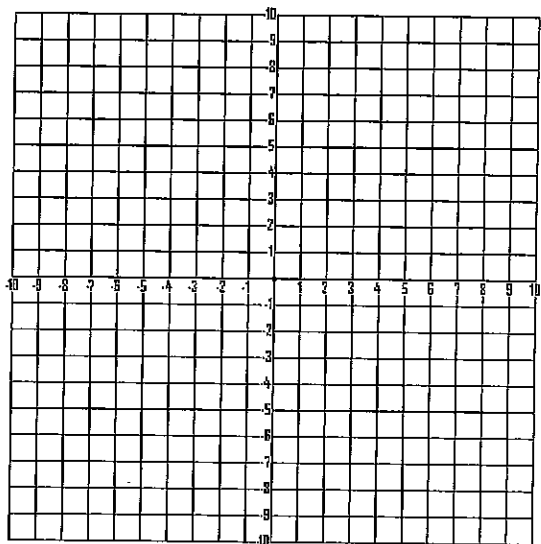
65. **SCHOOL CLUBS** A Spanish club is electing a president, vice president, and secretary. The club has 9 members who are eligible for these offices. How many different ways can the 3 offices be filled?

Review Questions:

Graph the following piecewise functions:

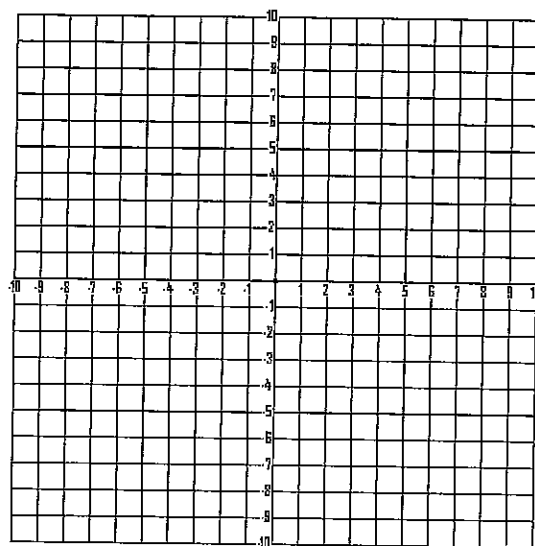
1.

$$h(x) = \begin{cases} -3x + 2, & x \leq 2 \\ \frac{1}{2}x - 4, & x > 2 \end{cases}$$



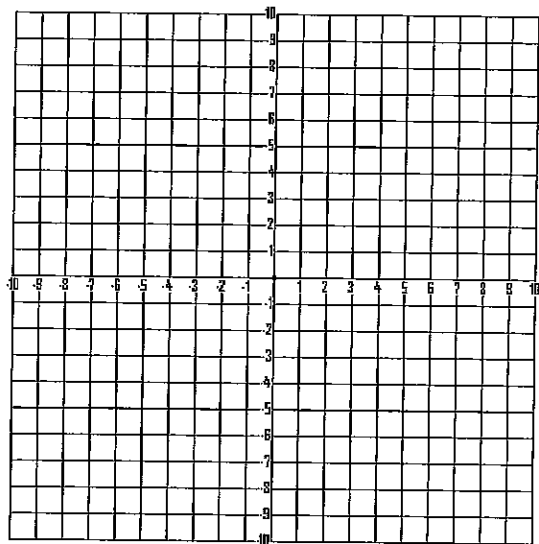
2.

$$f(x) = \begin{cases} 4, & x \leq -2 \\ x^2, & -2 < x < 2 \\ 4, & x \geq 2 \end{cases}$$



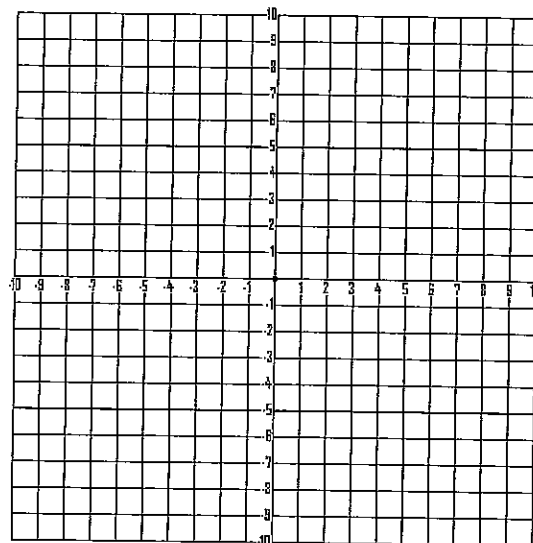
3.

$$f(x) = \begin{cases} 3x + 12, & x \leq -3 \\ |x|, & -3 < x < 3 \\ -3x + 12, & x \geq 3 \end{cases}$$



4.

$$h(x) = \begin{cases} x^2 - 4, & x \leq 3 \\ \frac{2}{3}x - 5, & x > 3 \end{cases}$$



Find the inverse.

5.  $f(x) = 4x - 9$

6.  $f(x) = x^2, x \geq 0$