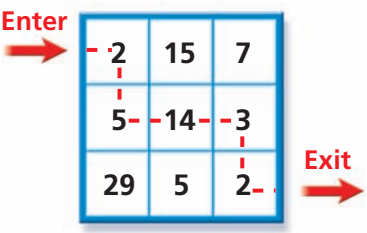
Applications Connections Extensions ACE

Applications

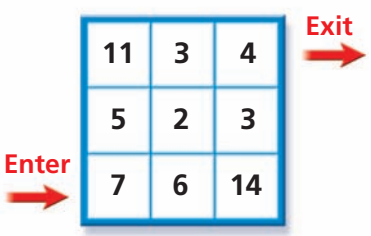
To solve a multiplication maze, you must find a path of numbers from the entrance to the exit so that the product of the numbers in the path equals the puzzle number. No diagonal moves are allowed. Below is the solution of a multiplication maze for 840.

Multiplication Maze 840

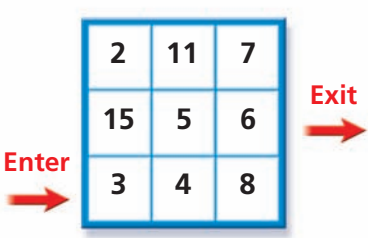


Solve each multiplication maze. Hint: It may help to find the longest factor string of the puzzle number.

1. Multiplication Maze 840



2. Multiplication Maze 360



3. Make a multiplication maze for 720. Be sure to record your solution.

For Exercises 4–11, find the prime factorization of each number.

4. 36 **5.** 180 **6.** 525 **7.** 165

8. 293 **9.** 760 **10.** 216 **11.** 231

12. Use exponents to rewrite the prime factorizations you found in Exercises 4–11.

13. To indicate multiplication, you can use a raised dot symbol. For example, $3 \times 5 = 3 \cdot 5$. Find the prime factorization of 312 using raised dot symbols.

14. **Multiple Choice** What is the prime factorization of 240?

A. $10 \cdot 24$ **B.** $2 \cdot 3 \cdot 5$

C. $2^3 \cdot 3 \cdot 5$ **D.** $2^4 \cdot 3 \cdot 5$

15. Jill and Jamahl are comparing their special numbers. Jill's number has a prime factorization with six prime numbers. Jamahl's number has a prime factorization with only three numbers. Jill says this means her number is greater than Jamahl's. Jamahl says that is not necessarily true. Who is right?

16. Find all the numbers less than 100 that have at least one 2 and at least one 5 in their prime factorization. What do you notice about these numbers?

17. **Multiple Choice** Choose the number that is the product of exactly three different prime numbers.

F. 15 **G.** 20 **H.** 30 **J.** 57

18. Find all the numbers less than 100 that are the product of exactly three different prime numbers.

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For Exercises 19–24, find the greatest common factor and the least common multiple for each pair of numbers.

19. 36 and 45 **20.** 30 and 75 **21.** 78 and 104

22. 15 and 60 **23.** 32 and 45 **24.** 37 and 12

Connections

25. Mr. Rawlings has 60 cookies. He wants to give each of his 16 grandchildren the same number of cookies for a snack. What is the greatest number of cookies he can give each child? After he gives his grandchildren their cookies, how many cookies will he have left for himself?

26. Mr. and Mrs. Fisk have 8 children. Each of those children has 8 children. How many grandchildren do Mr. and Mrs. Fisk have? If each grandchild has 8 children, how many great-grandchildren do Mr. and Mrs. Fisk have?

27. Rosa claims the longest string of prime factors for 30 is $2 \times 3 \times 5$. Tyee claims there is a longer string, $1 \times 2 \times 1 \times 3 \times 1 \times 5$. Who is correct? Why?

28. The number 1 is not prime. Why do you think mathematicians decided not to call 1 a prime number?

29. **a.** Find the multiples of 9 that are less than 100.

b. Find the multiples of 21 that are less than 100.

c. Find the common multiples of 9 and 21 that are less than 100.

d. What is the next common multiple of 9 and 21?

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30. For each part below, use your birth year or the birth year of one of your family members as your number.

a. Find the prime factorization of your number.

b. Describe your number to a friend, giving your friend as much information as you can about the number. Here are some ideas to include: Is the number square, prime, even, or odd? How many factors does it have? Is it a multiple of some other number?

31. Tomas and Sharlina work on weekends and holidays doing odd jobs around the neighborhood. They are paid by the day, not the hour. They each earn the same whole number of dollars per day. Last month Tomas earned \$184 and Sharlina earned \$207. How many days did each person work? What is their daily pay?

32. What is my number?

Clue 1 My number is a multiple of 2 and 7.

Clue 2 My number is less than 100 but greater than 50.

Clue 3 My number is the product of three different prime numbers.

33. What is my number?

Clue 1 My number is a perfect square.

Clue 2 The only prime number in its prime factorization is 2.

Clue 3 My number is a factor of 32.

Clue 4 The sum of its digits is odd.

Extensions

34. Most years contain 365 days, but certain years, called *leap years*, contain 366 days. Leap years occur in years divisible by four, with some exceptions. Years divisible by 100 are *not* leap years—unless they are divisible by 400. So 1896 was a leap year, but 1900 wasn't. Both 1996 and 2000 were leap years. A week has 7 days.

a. How many weeks are in each type of year?

b. January 1, 2004, fell on a Thursday. On what dates did the next three Thursdays of 2004 occur?

c. The year 2004 was a leap year. It had 366 days. What day of the week was January 1, 2005?

d. What is the pattern, over several years, for the days on which your birthday will fall?

35. The Fundamental Theorem of Arithmetic was first stated by the Greek mathematician Euclid. He wrote: "If a number is the least that is measured by prime numbers, it will not be measured by any prime except those originally measuring it." After studying prime factorizations in this Investigation, what do you suppose Euclid meant?

36. Mr. Barkley has a box of books. He says the number of books in the box is divisible by 2, 3, 4, 5, and 6. How many books could be in the box? Add another factor so that there is only one possible solution.

Did You Know?

If you were born on any day other than February 29, leap day, it takes at least 5 years for your birthday to come around to the same day of the week. It follows a pattern of 5 years, then 6 years, then 11 years, and then 6 years (or some variation of that pattern), to fall on the same day of the week. If you were born on February 29, it takes 28 years for your birthday to fall on the same day of the week!