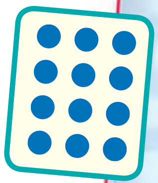
Chapter

2 Multiplication Situations

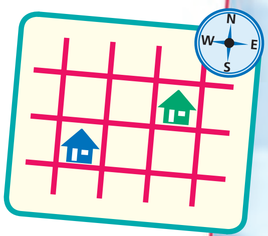
Dear Student,

Do you know what situations use multiplication instead of addition? Here are some examples:

Imagine a rectangle made of dots. There are four rows of dots and three dots in each row. How many dots in all?



Imagine a tiny town. It has four streets that run north-south and three streets that run east-west. Every north-south street crosses every east-west street. How many intersections are there?

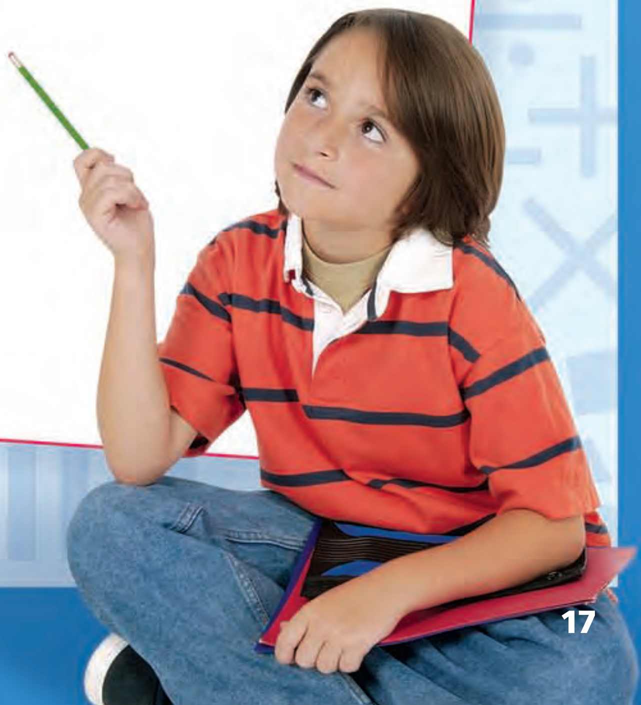


Imagine that you work in a sandwich shop. There are four kinds of sandwich fillings. There are three kinds of bread. How many "one filling-one kind of bread sandwiches" can you make?

Fillings	Bread
Tuna	White
Turkey	Wheat
Ham	Rye
Cheese	

In this chapter, you will see different ways to picture and think about multiplication as you start to learn multiplication facts.

Mathematically yours,
The authors of ***Think Math!***



THE WORLD ALMANAC FOR KIDS

Rocks in Rows

FACT • ACTIVITY 1

There are three different types of rocks: igneous, sedimentary, and metamorphic. Suppose you collect rocks and have an equal number of igneous, sedimentary, and metamorphic rocks in your collection.

Use models to help you with the following problems.

1. Suppose you have 3 rocks of each type. How many rocks do you have in your collection?
2. Suppose you have 4 rocks of each type. How many rocks do you have in your collection?
3. Suppose you have 24 rocks in all. Show how you might arrange the rocks so that each row has the same number of rocks. Show four different arrays.

Ayers Rock in Australia

FACT·ACTIVITY 2

Rocks can be grouped into many different classifications including size, shape, color, and texture (how it feels). You decide to group your rocks by their color and texture.

Colors	Textures
White	Fine
Brown	Intermediate
Black	Coarse
	Glassy
	Frothy

1. You have white, brown, and black rocks. You have rocks in 5 different textures: fine, intermediate, coarse, glassy, and frothy. Make a list to show all possible combinations of color and texture for your collection of rocks.
2. Write a multiplication sentence that shows the total number of possible combinations of colors and textures.

CHAPTER PROJECT

Materials: grid paper for each student

Plan a display of 2 rock collections. One has 40 igneous rocks. The other has 60 sedimentary rocks.

- Use grid paper to show 3 possible ways to display the igneous rocks so that the same number of rocks are in each row.
- Write a multiplication sentence to represent each igneous rock display.
- Use grid paper to show 3 possible ways to display the sedimentary rocks so that the same number of rocks are in each row.
- Write a multiplication sentence to represent each sedimentary rock display.
- Use a 10×10 array. Show how you might arrange 40 igneous rocks and 60 sedimentary rocks together in one display.

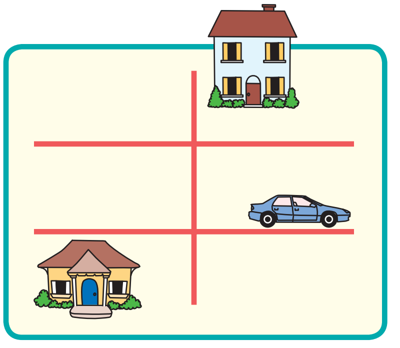
ALMANAC Fact

Ayers Rock is one of the largest rocks in the world. It is located in central Australia, where the native (Aboriginal) people call it Uluru. It is more than 986 feet high and 5 miles around.

Chapter 2
Lesson 3

EXPLORE
Exploring Lines and Intersections

1 The map shows all the streets of a tiny town.



A How many streets are in this town?

B How many streets are shown as horizontal?

C How many streets are vertical?

D How many intersections are there?

---

2 Draw a new map with 6 streets.
All streets must be horizontal or vertical.

A How many horizontal streets are there?

B How many vertical streets are there?

C How many intersections are there?

---

3 Draw a map with 4 streets for each problem below.
Write the number intersections.

A 0 vertical streets

B 1 vertical street

C 2 vertical streets

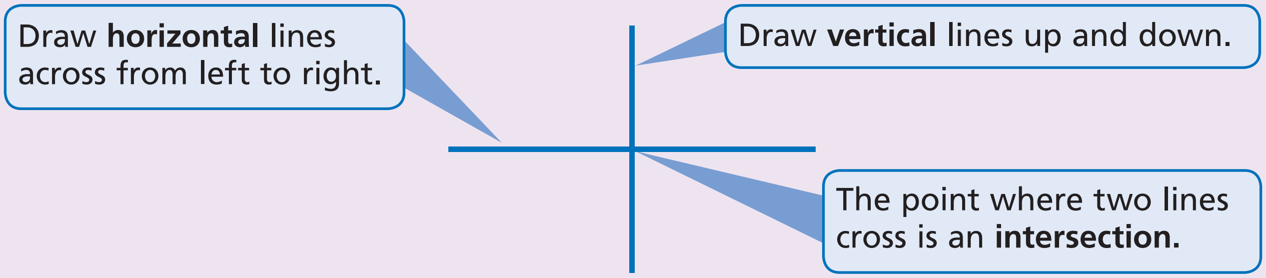
D 3 vertical streets

E 4 vertical streets

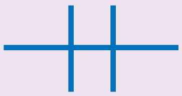
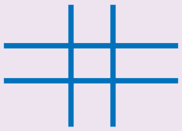
Chapter 2
Lesson 3

REVIEW MODEL
Intersections

You can make a drawing to show a vertical line crossing a horizontal line. The point where the lines cross is called an intersection.



Examples **Find the number of intersections**

2 vertical lines crossing 1 horizontal line	2 vertical lines crossing 2 horizontal lines	0 vertical lines crossing 4 horizontal lines
		
2 intersections	4 intersections	0 intersections

Check for Understanding

On a separate sheet of paper make a drawing for each problem. Write the number of intersections or the number of lines.

1. 3 vertical lines crossing 1 horizontal line

   ■ intersections

2. 3 vertical lines crossing 3 horizontal lines

   ■ intersections

3. 5 vertical lines crossing 2 horizontal lines

   ■ intersections

4. 6 vertical lines crossing 0 horizontal lines

   ■ intersections

5. 3 vertical lines crossing ■ horizontal lines

   15 intersections

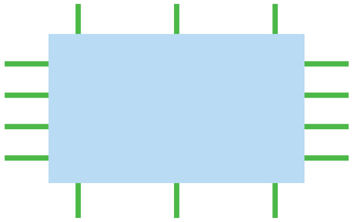
6. ■ vertical lines crossing ■ horizontal lines

   12 intersections

Chapter 2
Lesson 5

EXPLORE
Exploring Hidden Intersections

1 All the intersections are covered on this map.



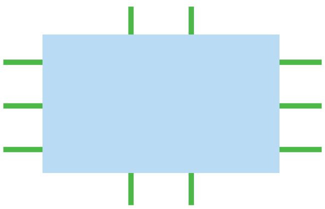
A How many horizontal streets are there?

B How many vertical streets are there?

C How many intersections are there?

How many intersections are hidden under the card?

2



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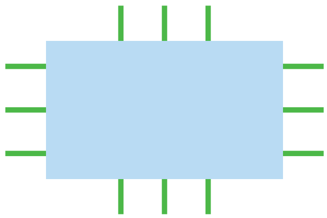

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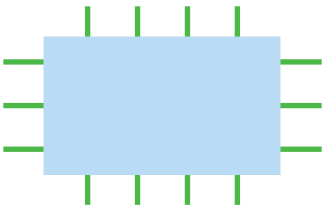

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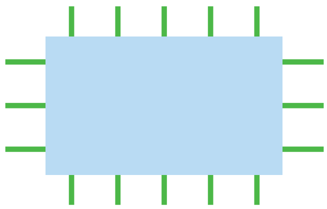
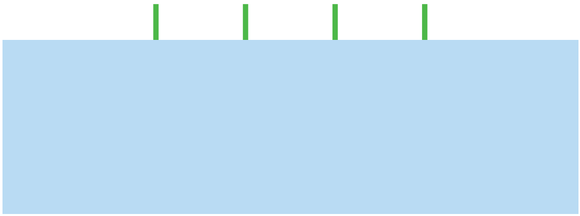


6 How many intersections are hidden under this card?



Chapter 2

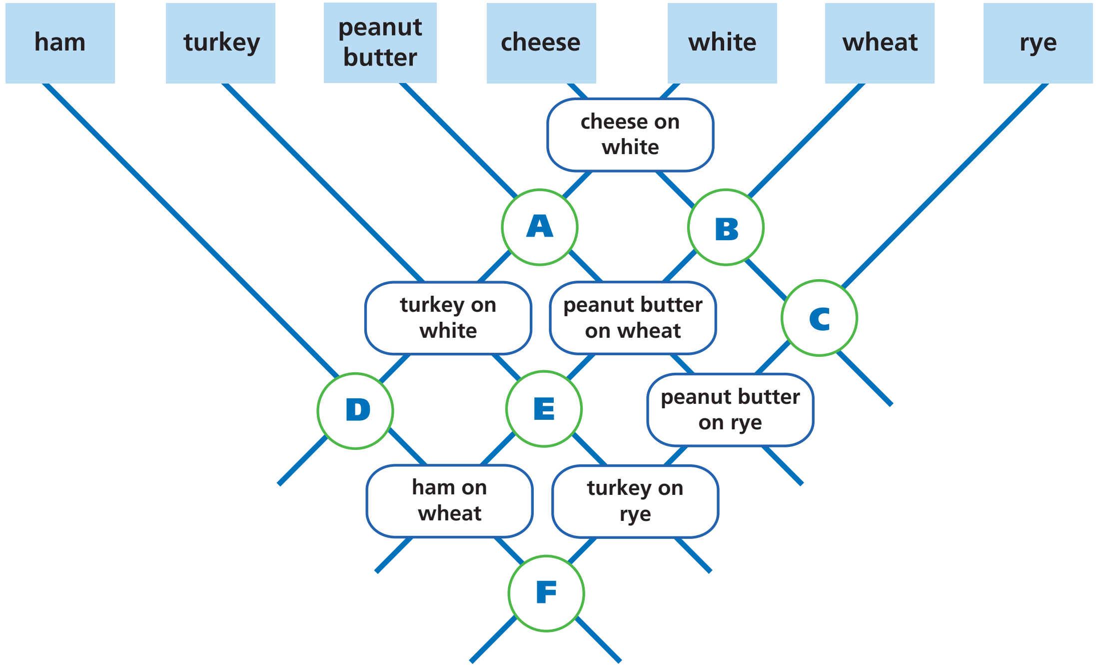
Lesson 6

EXPLORE
Exploring Pairs of Objects

At the sandwich shop, there are 4 sandwich fillings to choose from. There are 3 kinds of bread to choose from.

Fillings	Bread
Ham	White
Peanut Butter	Wheat
Turkey	Rye
Cheese	

1 Choose one filling and one kind of bread.
How many different sandwiches can you make?



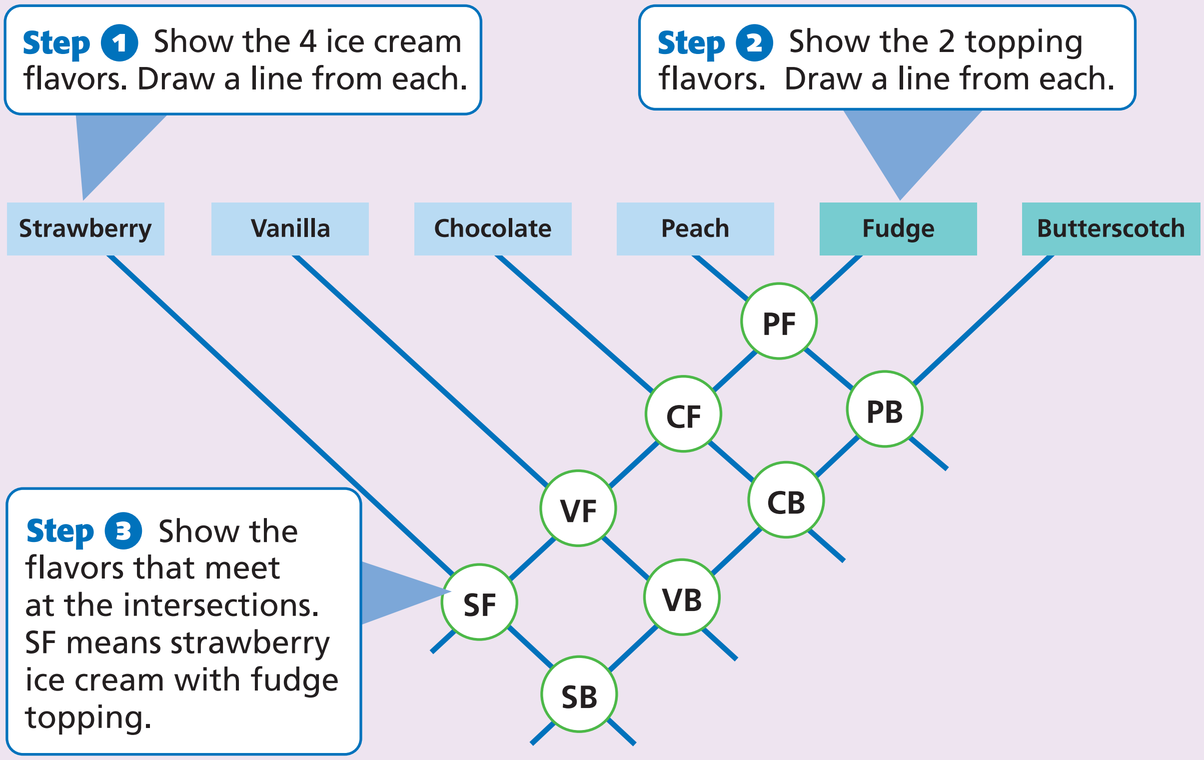
2 What sandwich names are missing from the labeled intersections?

3 The sandwich shop ran out of turkey and rye bread.
How many different sandwiches can you make now?

REVIEW MODEL
Pairing Diagrams

You can use diagrams to show all the ways you can pair items from two different groups.

This diagram shows the pairing of ice cream flavors with topping flavors.



The lines for the ice cream flavors and the lines for the topping flavors intersect at 8 points. So, there are 8 pairings.

Check for Understanding

Make a drawing to show the number of pairings.

1. How many pairings of 1 kind of bread and 1 sandwich filling can you make?

   Bread: white, wheat, rye

   Fillings: tuna, cheese, peanut butter

2. How many pairings of 1 snack and 1 drink can you make?

   Snacks: crackers, muffins, pretzels, fruit, vegetables

   Drinks: juice, water, milk

REVIEW MODEL
Listing Combinations

You can make an organized list to show all the combinations you can make from the choices in two different groups.

This list shows all the possible combinations for one sport and one time.

Soccer in the **morning**
Soccer in the **afternoon**
Baseball in the **morning**
Baseball in the **afternoon**
Hockey in the **morning**
Hockey in the **afternoon**
Swimming in the **morning**
Swimming in the **afternoon**

Keep the list organized. One way to organize the list is to list both times for each sport in order. This will help you find all the possible combinations.

To check your work, you can multiply to find the total number of combinations.

$\boxed{4} \times \boxed{2} = \boxed{8}$

- 4: Number of different sports
- 2: Number of different times
- 8: Total number of combinations

The list shows 8 combinations. The multiplication sentence also shows that there should be 8 combinations possible.

Check for Understanding

Make a list of all the combinations. Then write a multiplication sentence to check.

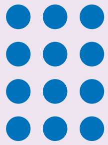
1. Clothes Choices
   Pants: black, tan, green
   Shirts: red, white

2. Music Lesson Choices
   Instrument: piano, guitar, drums, violin
   Days: Mon., Tue., Thu., Fri.

REVIEW MODEL
Writing Multiplication Sentences

You can write multiplication sentences to describe rectangular arrays.

A There are 4 rows and 3 columns.



4	×	3	=	12
rows		columns		dots

or

3	×	4	=	12
columns		rows		dots

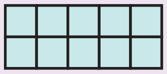
B There is 1 row and 9 columns.

1	×	9	=	9
row		columns		dots

or

9	×	1	=	9
columns		row		dots

C There are 2 rows and 5 columns.

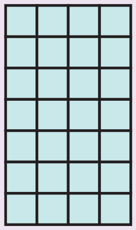


2	×	5	=	10
rows		columns		tiles

or

5	×	2	=	10
columns		rows		tiles

D There are 7 rows and 4 columns.



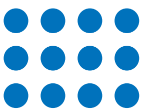
7	×	4	=	28
rows		columns		tiles

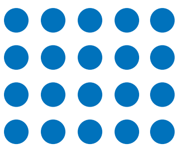
or

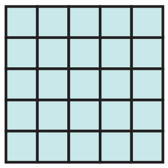
4	×	7	=	28
columns		rows		dots

Check for Understanding

Write a multiplication sentence to describe each array.

1. 

2. 

3. 

Chapter 2

Lesson 10

EXPLORE
Exploring Factors

1 Think about maps that have 3 streets.

A Draw all the 3-street maps.

B For each 3-street map, you can write an addition sentence like this:

$$\underset{\text{horizontal}}{\blacksquare} + \underset{\text{vertical}}{\blacksquare} = 3$$

Write an addition sentence for each of your 3-street maps.

---

2 Think about maps that have 6 intersections.

A Draw all the 6-intersection maps.

B For each 6-intersection map, you can write a multiplication sentence like this:

$$\underset{\text{horizontal}}{\blacksquare} \times \underset{\text{vertical}}{\blacksquare} = 6$$

Write a multiplication sentence for each of your 6-intersection maps.

C Could there be a 6-intersection map with 0 horizontal streets? Draw a map or explain.

D Could there be a 6-intersection map with more than 6 horizontal streets? Draw a map or explain.

E Could there be a 6-intersection map with 4 horizontal streets? Draw a map or explain.

REVIEW MODEL
Problem Solving Strategy
Draw a Picture

Carl is planning a garden. He wants to plant 48 seeds in 8 rows. How many seeds will be in each row?

Strategy: Draw a Picture

Read to Understand

What do you know from reading the problem?

Carl is planting 48 seeds in 8 rows.

Plan

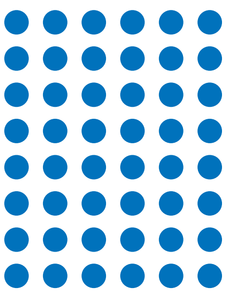
How can you solve the problem?

You can draw a picture to find the number of seeds in each row.

Solve

How can you draw a picture of the problem?

You can draw an array using dots to represent the seeds. Draw a column of 8 dots, one dot for each row of seeds. Add 1 dot to each row until you have drawn a total of 48 dots. If you count the number of dots in each row, you will find 6 dots. So, there will be 6 seeds in each row.



Check

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?

Problem Solving Practice

Draw a picture **to solve.**

1 Jack has ten blocks numbered from 1 to 10. How many combinations of one odd-numbered block and one even-numbered block can he make?

2 The art teacher gives each student a piece of paper that is in the shape of a square. What figures can the students make if they draw a single, straight line that cuts the square in half?

Problem Solving Strategies

- ✔ Act It Out
- ✔ **Draw a Picture**
- ✔ Guess and Check
- ✔ Look for a Pattern
- ✔ Make a Graph
- ✔ Make a Model
- ✔ Make an Organized List
- ✔ Make a Table
- ✔ Solve a Simpler Problem
- ✔ Use Logical Reasoning
- ✔ Work Backward
- ✔ Write a Number Sentence

Mixed Strategy Practice

Use any strategy to solve. Explain.

3 Mia wants to buy a small toy that costs 35¢. The toy is sold from a machine that only accepts quarters, dimes, and nickels. What combinations could Mia use to buy the toy?

4 Three girls stand in line at the ticket counter. Twice as many boys stand in line. How many children stand in line in all?

5 A total of 65 third and fourth graders attended this month's Math Club meeting. There were 15 more third graders than fourth graders at the meeting. How many third graders and how many fourth graders attended the meeting?

6 Daryl is ordering pizza. His topping choices are onions, extra cheese, or peppers. He can choose either a thin crust or a thick crust. How many choices does Daryl have?

Chapter 2 Vocabulary

Choose the best vocabulary term from Word List A for each sentence.

1. The directions on a map are north, south, __?__ and west.
2. A(n) __?__ line is one that goes from top to bottom.
3. A(n) __?__ has both horizontal and vertical lines in it.
4. A(n) __?__ is where two lines cross.
5. When you read 3×8, you say "three __?__ eight."
6. Dots arranged in columns and rows form a(n) __?__.

Word List A

- array
- column
- east
- grid
- horizontal
- intersection
- north
- row
- separation
- south
- times
- vertical
- west

Complete each analogy using the best term from Word List B.

7. Addend is to addition as __?__ is to multiplication.
8. Sum is to addition as __?__ is to multiplication.

Word List B

- factor
- multiple
- product

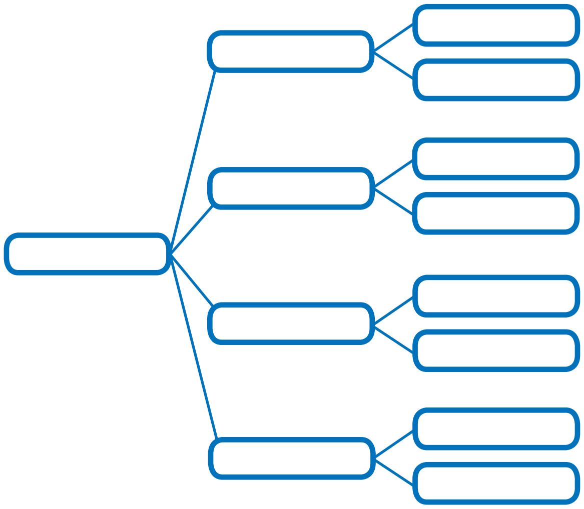
Talk Math

Discuss with a partner what you have learned about modeling multiplication. Use the vocabulary terms *factor, multiple,* and *product*.

9. How can you use an array to model multiplication?
10. How can you use intersecting lines to model multiplication?
11. How can you use multiplication to check that you have listed all possible combinations?

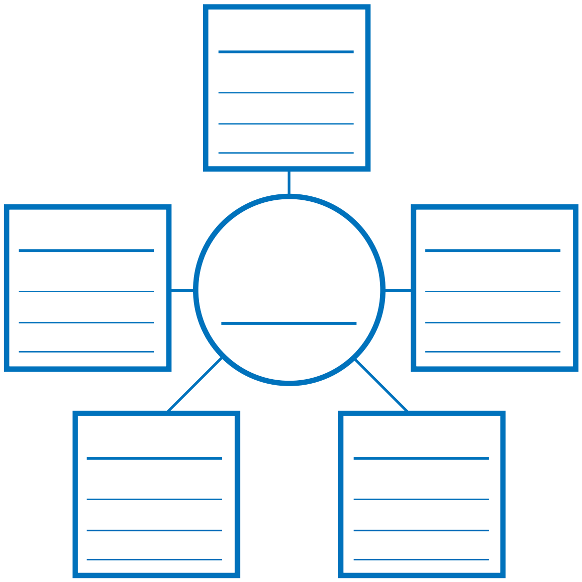
Tree Diagram

12 **Create a tree diagram for the term *multiply.* Use the terms *column, row, array, intersection, grid, horizontal,* and *vertical.***



Concept Map

13 **Create a concept map for *Multiplication Situations.* Use the terms *combinations, array,* and *intersections.* Describe what each represents.**



What's in a Word?

COMBINATION The word *combination* is used in different ways. The *combination* for a lock is often made up of numbers in a particular order. Suppose the *combination* to a lock is 1-2-3. The lock will not open if you try 2-3-1 or 1-3-2. In math, the order of the items does not matter. For example, blue shirt with black pants is the same *combination* as black pants with blue shirt.

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GAME

FIT!

Game Purpose

To form rectangular arrays

Materials

- crayons or markers
- 2 number cubes (numbered 1–6)
- about 40 beans or other objects
- Activity Master 19: *Fit!* gameboard

How to Play the Game

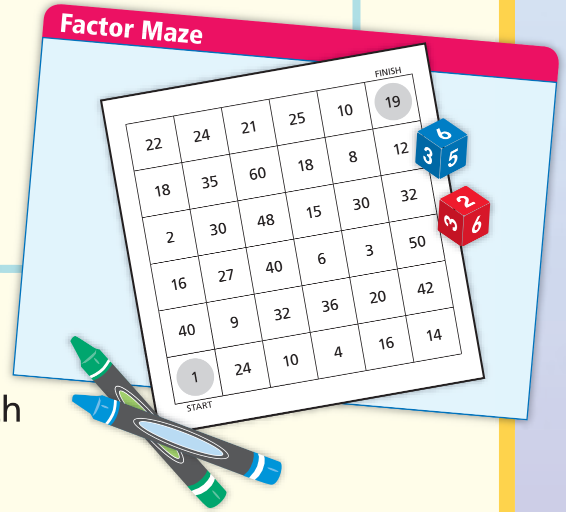
1. Two people can play the game. Each person chooses a different color of marker or crayon. Toss one of the number cubes. The player with the larger number goes first.
2. Start by tossing both number cubes. Use the numbers to create an array on the *Fit!* gameboard:
   - Count the number of rows using one number. Then count the number of columns using the other number.
   - Use the beans to make an array. Color the array.
   - Label your array with the total number of tiles.
   - If you can't draw an array, check off a strike box.
3. Take turns until both players have three strikes, or the gameboard is full.
   - If one player gets three strikes, the other play may continue until they get three strikes or fill the board.
4. The player with more arrays is the winner.

GAME

Factor Maze

Game Purpose
To identify products with factors from 1 to 6

Materials
- number cube
- 2 different colors of crayons or markers
- Activity Masters 23 and 24



How to Play the Game

1. Toss the number cube. The player with the larger number goes first.

2. Start by tossing the number cube. Write the **Toss** number on the *Factor Maze* Recording Sheet.

3. Draw your move on the *Factor Maze* gameboard.
   - You may move one square horizontally or vertically (but not diagonally) to any square that your number is a factor of.

   For example, if you toss a 4, you can move to any square with a product that has 4 as a factor, such as 4, 8, 12, 16, 20, 24, 28, 32, 36, and so on. But you may not move to a space marked 2, because 4 is not a factor of 2.
   - Write your **Moved To** number on the *Factor Maze* Recording Sheet.

4. If the toss is not a factor of any of the numbers in adjacent squares, write an *X* in one of the strike boxes at the bottom of the gameboard.

5. The first player to reach the Finish square is the winner, or the first player with three strikes loses.

CHALLENGE

Each circle has all the numbers you need to make several multiplication sentences. Can you find all the multiplication sentences for each circle? You must use all the numbers in the circle. You can use each number only once.

Good luck!

1

8 3
1 4 16
6 6
2 12

One multiplication sentence in this circle is **2 × 8 = 16**. Can you find two others?

2

9 2
9 24 3
18 3
3 8

Find 3 multiplication sentences in this circle.

3

8 4 8
6 24 12
48 8 32
2 8 64

Find 4 multiplication sentences in this circle.

4

7 8 9
21 3 63
7 35 7
56 5 7

How many multiplication sentences can you find in this circle?