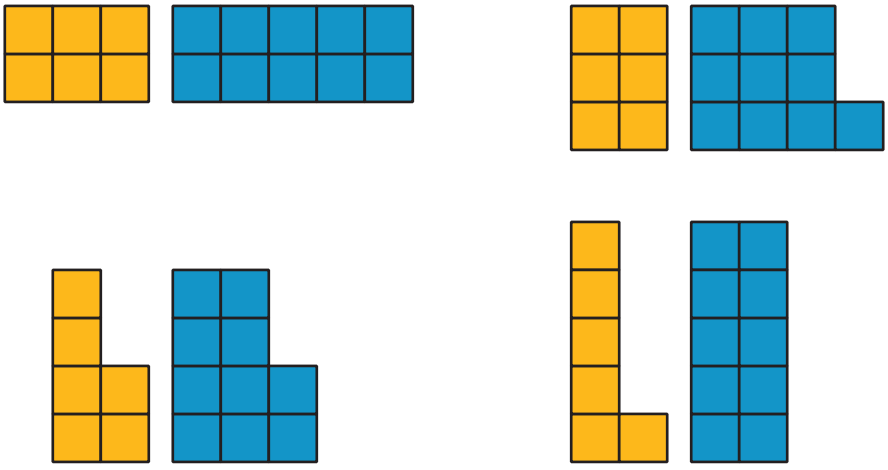
Unit 7, Lesson 16

Common Factors

Let's use factors to solve problems.

16.1 Figures Made of Squares

How are the pairs of figures alike? How are they different?



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16.2 Diego's Book Drive

Diego is organizing fiction and nonfiction books into boxes to deliver to different classrooms. He has 48 fiction books and 64 nonfiction books. He would like each classroom to receive the same number of each type of book. Organize your answer to each question so that it can be followed by others.

1. How many different ways can Diego box the 48 fiction books? List all the different ways including the number of boxes and the number of fiction books in each box.

2. How many different ways can Diego box the 64 nonfiction books? List all the different ways including the number of boxes and the number of nonfiction books in each box.

3. How many different ways can Diego package all the 48 fiction and 64 nonfiction books so that each box has the same combination of items? List the number of boxes he can make and the number of each type of book that will be in each box.

4. What is the largest number of combination boxes that Diego can make with no left over books? Explain to your partner how you know that it is the largest possible number of boxes.

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16.3 Greatest Common Factor

1. The **greatest common factor** of 30 and 18 is 6. What do you think the term "greatest common factor" means?

2. Find all of the factors of 21 and 6. Then, identify the greatest common factor of 21 and 6.

3. Find all of the factors of 28 and 12. Then, identify the greatest common factor of 28 and 12.

4. A rectangular bulletin board is 12 inches tall and 27 inches wide. Elena plans to cover it with squares of colored paper that are all the same size. The paper squares come in different sizes, but all of them have whole-number inches for their side lengths.

   a. What is the side length of the largest square that Elena could use to completely cover the bulletin board without gaps or overlaps? Explain or show your reasoning.

   b. How is the solution to this problem related to greatest common factor?

Are you ready for more?

A school has 1,000 lockers, all lined up in a hallway. Each locker is closed. Then . . .

- One student goes down the hall and opens each locker.
- A second student goes down the hall and closes every second locker: lockers 2, 4, 6, and so on.
- A third student goes down the hall and changes every third locker: If a locker is open, he closes it. If a locker is closed, he opens it.
- A fourth student goes down the hall and changes every fourth locker.

This process continues up to the thousandth student! At the end of the process, which lockers will be open? (Hint: you may want to try this problem with a smaller number of lockers first.)

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Lesson 16 Summary

A factor of a whole number is a whole number that divides evenly into that number, without a remainder. For example, 1, 2, 3, 4, 6, and 12 are all factors of 12 because each of them divides 12 evenly, without a remainder.

A **common factor** of two whole numbers is a factor that they have in common. For example, 1, 3, 5, and 15 are factors of 45. They are also factors of 60. We call 1, 3, 5, and 15 common factors of 45 and 60.

The **greatest common factor** (sometimes written as GCF) of two whole numbers is the greatest of all the common factors. For example, 15 is the greatest common factor for 45 and 60.

One way to find the greatest common factor of two whole numbers is to list all of the factors for each and then look for the greatest factor they have in common. To find the greatest common factor of 18 and 24, first list all the factors of each number.

- Factors of 18: **1**, **2**, **3**, **6**, 9, 18
- Factors of 24: **1**, **2**, **3**, 4, **6**, 8, 12, 24

The common factors are 1, 2, 3, and 6. Of these common factors, 6 is the greatest one, so 6 is the greatest common factor of 18 and 24.