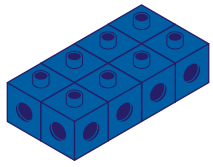
Grab Bag Math

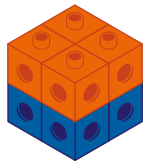
ON THEIR OWN

Can you figure out all the ways to build one-layer rectangular boxes with Snap Cubes?

1. Work with a partner. Pick a grab bag from the box.
2. Using the Snap Cubes in the bag, build all the rectangular boxes possible for that number of cubes. Make sure that each rectangular box has only one layer.
3. Copy each rectangle onto grid paper and cut it out.
4. Label each rectangle with its dimensions.
5. Choose another grab bag and repeat the activity.
6. Continue until there are no grab bags remaining.



Okay
(1 layer)



Not okay
(2 layers)

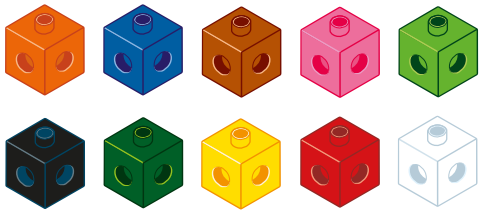
Loose Caboose

OBJECTIVE

Children will experience division as creating sets of equal size, practice using division, as well as look for patterns in division problems.

WHAT YOU WILL NEED

Snap Cubes, 27 per pair



Dice, 1 die per pair

OVERVIEW

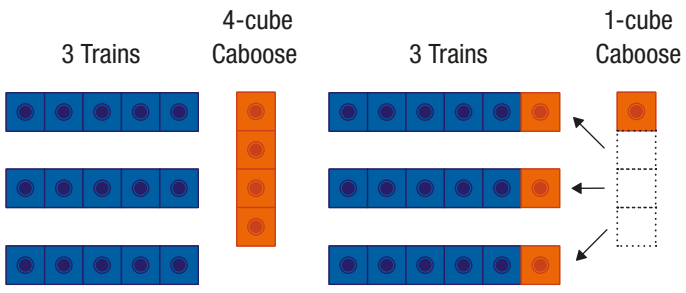
In this activity, children play a game in which they roll a die to determine how many trains of equal length to build from a pile of 27 Snap Cubes. They write a division sentence to describe what happens during each turn.

THE BIG IDEA

This activity provides an introduction to the concept of division as the partitioning of a set into equal-sized groups. It also conveys the meaning of the remainder. Multiplication facts are reinforced when the children start the next round of play and have to determine how many Snap Cubes are left so they can begin their division problem.

Loose Caboose, page 92

Children are likely to note that 1 is a divisor of every number; in other words, dividing by 1 always leaves a remainder of 0. Children are also likely to point out that the remainder (the number of cubes in the loose caboose) is always less than the divisor (the number of trains). Children can verify this by examining the trains and the number of caboose cubes. If the number of cubes in the loose caboose is equal to or greater than the number of trains, then each of the trains can be made longer.



Children will notice that the numbers 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, and 26 can be made into two trains of equal length with no remainders. They will recognize these numbers as even numbers and perhaps supply their own definition of even numbers as "the doubles" or "numbers that make equal trains with no leftovers when you roll a 2."

When they look at the numbers that have 3 as a divisor and no remainder—namely 3, 6, 9, 12, 15, 18, 21, 24, and 27—children will be reminded of the multiplication table for 3. They may notice that this list includes every third number from the list of even numbers and has an odd-even pattern.

Four is a divisor for 4, 8, 12, 16, 20, and 24. These numbers are made up of every other number from the even list. As the size of the divisor increases, the list of numbers shortens. By the time children get to the numbers that have 5 as a divisor, there are only five: 5, 10, 15, 20, and 25. The list for 6 is even shorter with only four numbers: 6, 12, 18, and 24.

Children are apt to report that 12 and 24 are the numbers they got "stuck on" in the game. By this, they mean that any roll of the die, except 5, resulted in trains with an equal number of cars and no leftover cabooses; so play went back and forth between the two players with no one winning any loose caboose cubes until a 5 was rolled.

When the children look for numbers that always give loose caboose cubes (unless a 1 is rolled), they will find 7, 11, 13, 17, 19, and 23. Later, children will learn that these numbers are part of the set called prime numbers, which have exactly two divisors: the number itself and 1. The prime numbers 2, 3, and 5 would not belong on the children's list because these numbers have no leftovers when the numbers themselves (2, 3, or 5) are rolled.

By a lucky roll of the die or if the children have played the game enough to be able to compile exhaustive lists of data, they will see that the numbers 11, 17, and 23 hold the potential for rolling a 6 on the die and netting the largest number (5) of loose caboose cubes possible for this game.

In analyzing the parts of their division problems—namely the dividend, divisor, quotient, and remainder—children get their first taste of the study of number theory and a foundation for dealing with division in an algebraic context.

1 INTRODUCTION

- Show children a pile of 17 Snap Cubes. On the chalkboard, write $\overline{)17}$.
- Ask a volunteer to roll a die. Use the number that comes up to determine how many trains of equal length to build. Build that number of trains and set aside the remaining cubes, or the "loose caboose." For example, if the volunteer rolls a 3, form three trains of 5 cubes each and set aside the 2 leftover cubes.
- On the chalkboard, finish the division problem $3\overline{)17}$ R2. Identify 3 as the number of trains, 5 as the number of Snap Cubes in each train, and 2 as the remaining number of Snap Cubes, or the loose caboose.
- Now set aside the 2 loose caboose cubes and use the Snap Cubes that are left to write a new division problem: $\overline{)15}$. Have another volunteer roll the die and repeat the activity.

2 ON THEIR OWN

Children will complete the On Their Own. During this time, the teacher's role is to:

- ask probing questions to guide and extend
- record student thinking
- record student conversation that promotes collaboration

Use the information gathered to inform the Math Talk.

3 MATH TALK

Use prompts such as these to promote class discussion:

- What patterns did you notice?
- Which numbers could you make into two trains with no leftover cubes? Into three trains? four trains? five trains? six trains?
- What happened when you rolled a 1?
- Which numbers always had leftover cubes unless a 1 was rolled?
- Which numbers had the greatest number of ways to get a remainder of zero? What happened in the game when these numbers came up?
- Which numbers and roll of the die would give you the greatest number of loose caboose cubes in one turn?

4 EXTENSION

Have children play the game with one of these variations:

- Use an eight-sided or ten-sided die.
- Use a standard die labeled with larger numbers.
- Start with a different number of Snap Cubes.

Loose Caboose

ON THEIR OWN

Play Loose Caboose! | Players: 2

Game Rules:

1. Start with a pile of 27 Snap Cubes. Decide who goes first.

2. The first player writes the beginning of a division problem, $\overline{)27}$, and rolls the die to find out how many trains of equal length to build from the 27 cubes.

3. The first player builds the trains and keeps any "loose caboose" cubes that are left after the trains are built. Each of the trains should be as long as possible.

4. The first player completes the division problem. For example, if a 4 is rolled:

   6 ← Number of cubes in each train

   Number of trains → $4\overline{)27}$ R3 ← Number of loose caboose cubes

5. If there are no loose caboose cubes, the player still completes the division.

6. The second player begins his or her turn using the cubes that are left. In the example above, there are 3 loose caboose cubes, so the second player would begin with 24 cubes and write $\overline{)24}$.

7. Players take turns until there are no Snap Cubes left.

   Play at least two full games of *Loose Caboose*.

FOLD

FOLD

LOOSE CABOOSE

B

FOLD / FOLD

LOOSE CABOOSE

A

Play Loose Caboose! | Players: 2

Game rules:

1. Start with a pile of 27 Snap Cubes. Decide who goes first.
2. The first player writes the beginning of a division problem, $\overline{)27}$, and rolls the die to find out how many trains of equal length to build from the 27 cubes.
3. The first player builds the trains and keeps any "loose caboose" cubes that are left after the trains are built. Each of the trains should be as long as possible.
4. The first player completes the division problem. For example, if a 4 is rolled:

6 ← Number of cubes in each train

Number of trains → $4\overline{)27}$ R3 ← Number of loose caboose cubes

5. If there are no loose caboose cubes, the player still completes the division.
6. The second player begins his or her turn using the cubes that are left. In the example above, there are 3 loose caboose cubes, so the second player would begin with 24 cubes and write 24.
7. Players take turns until there are no Snap Cubes left.

Play at least two full games of *Loose Caboose*.

FOLD