**Invention of the Chocolate Chip Cookie**

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| In this lesson, students make sense of and solve a contextual division problem. Students interpret remainders and solidify their understanding of terminology associated with division: divisor, dividend, quotient, and remainder.  |

**NC Mathematics Standards:**

**Number and Operations in Base Ten**

**NC.4.NBT.6** Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division.

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

6. Attend to precision.

**Student Outcomes:**

* I can solve division problems using a variety of strategies.
* I can describe and compare strategies used to solve division problems.
* I can interpret the meaning of remainders.

**Math Language:**

* remainder
* divisor
* dividend
* quotient

**Materials:**

* slide presentation for lesson
* student handout – Cookie Invention (1 per student)
* manipulatives such as counters, blocks, base ten blocks, grid paper (if needed)

**Launch:**

1. Introduce Problem (5 minutes)

Begin by asking, “What is an invention?” Take a few responses and then show students several food inventions (cotton candy, Kool-Aid, marshmallows, Pepsi). Discuss how the chocolate chip cookie was invented (on slide).

Introduce the problem to students.

*Ruth's first batch of chocolate chip cookies contained 8 chocolate chips in each cookie. If her bag of chips contained 170 chocolate chips, how many cookies did she make?*

**Explore:**

1. Solving the Problem (15 – 20 minutes)

Give students time to work individually to solve the problem. As students work, observe students to see how they are solving the problem. Pair students up with a partner and encourage students to share their strategies with one another.

Observe:

* How are students interpreting and understanding the problem?
* How are students modeling and representing their thinking?
* How do students make sense of division?
* Do their representations show an understanding of division?
* What strategies do students use to solve the problem? (visual models including pictures, repeated subtraction, partial quotients, arrays, division algorithm, connection to multiplication—inverse relationship between multiplication and division)
* How are students interpreting the remainder?

Carefully select students to present to the class. Look for students who modeled the problem in different ways that demonstrate reasoning and understanding. Also look for students who can explain solutions or generate great discussion for others to build on and move toward a deeper understanding of division. Also look for examples of students who can prove their reasoning with visual models or drawings.

**Discuss:**

1. Discussion of Solutions (15 – 25 minutes)

Bring the group back together and have the selected students share their strategies for solving the first problem.

Possible points to address:

* Discuss how students are making sense of the problem and understanding the problem as a division problem.
* Discuss symbols, notations, and vocabulary (divisor, dividend, quotient) related to division (170 is the dividend, the number being divided; 8 is the divisor, the number by which they are dividing; and the answer is the quotient 21 R2).
* Discuss various strategies and representations.
* Compare different strategies, discussing similarities between the strategies.
* Discuss the meaning of the answer and how it relates to the problem. (21 represents the number of cookies that could be made with 8 chocolate chips in each cookie.)
* Discuss the meaning of the remainder and how it relates to the problem. What does the remainder of 2 represent? Two cookies or 2 chocolate chips? (2 represents the number chocolate chips left over. An additional cookie could not be made, because there were only 2 chocolate chips left over.)

Close the lesson by having the students explain to one another what they now understand about remainders. Clear up any misunderstandings or questions students have.

**Evaluation of Student Understanding:**

**Informal Evaluation:**

* Observe and monitor students as they solve the problem. How are they making sense of the division?

**Formal Evaluation/Exit Ticket:**

* At the end of the lesson, have students create their own story problems for 170 divided by 8. They should be able to reason why these are division situations.

**Meeting the Needs of the Range of Learners:**

**Interventions:**

* Suggest students use manipulatives to model the situation.

**Extensions:**

* Have students create their own story problems for 170 divided by 8 where the answer is 21, 22, 21 R2, and 21 1/4.

Cookie Invention



Ruth's first batch of chocolate chip cookies contained 8 chocolate chips in each cookie. If her bag of chips contained 170 chocolate chips, how many cookies did she make?