Bean Thirteen

It's dinner time at Ralph and Flora's house. Who will end up with the dreaded bean thirteen?

Topics: counting, cardinality, decomposing numbers, addition, comparison, prime numbers, division, factors, remainders

Bean Thirteen can be used to explore a variety of mathematical ideas, however the concepts of factors, composite numbers and prime numbers are a particularly strong theme throughout the story. A factor is a whole number that divides evenly into another number with no remainder. Some numbers, like 12 and 30 have many factors. Numbers with more than two factors are called composite numbers. Other numbers have very few factors. Prime numbers, like 2, 3, 5, 7, 11, and 13 have exactly two factors, the number itself and one.

Before you read *Bean Thirteen* with your child:

- Share that some people think that certain numbers can be unlucky. Have you ever heard of an unlucky number? If so, tell me about it.

While reading the book:

- Ask your child to explain why they think that Ralph dislikes the number thirteen.

- Ask your child how they would have solved the problem of the left over bean. How would they divide the beans each time a new guest is invited to dinner.

- Notice the number of beans that Ralph, Flora, and their four guests ate for dinner. Did each guest eat the same amount? How was this different than what Ralph and Flora expected? How did it solve the problem of the thirteenth bean?

When you have finished reading the story:

- Encourage your child to select several numbers between 5 and 25. Using objects to represent the numbers, find out whether the number can be divided equally among two, three, four, or five friends.

- Ready for a challenge? Learn about the Sieve of Eratosthenes with your child and then encourage your child to find all of the prime numbers between one and one hundred. Hint: there are 25 prime numbers between one and one hundred (2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97)

AUTHOR:
Matthew McElligott

Ralph and Flora pick thirteen beans and try to find a way to share them equally.

Ages: 4 to 12 years

Interest Level:
Preschool to 6th grade

ATOS Reading Level:
2.4

Lexile: 470L

ISBN: 9780399245350

Copyright: 2007

Early Math Project

Questions for Mathematical Thinking:

1. Do you think a number can be lucky or unlucky? Why or why not?

2. If you were Ralph, how would you have solved the problem?

3. How do you think this story would have been different if Flora had not picked the thirteenth bean? If Ralph and Flora divided twelve beans equally between themselves, how many beans would each of them get?

4. How could twelve beans be divided equally between Ralph, Flora, and April? How could twelve beans be divided equally between Ralph, Flora, April, and Joe?

5. Could twelve beans be divided equally between Ralph, Flora, April, Joe, and Meg? Explain why or why not.

6. Try to divide 11 beans equally between two, three, four, and five people. What happens? Is 11 more like 12 or 13? Try to divide 18 beans equally between two, three, four, and six people. What happens? Is 18 more like 12 or 13?

7. Why do you think that it wasn't possible to divide 11 and 13 by 2, 3, 4, 5, and 6?

Early Math Project Resources:

Visit Bean Thirteen Activities (www.earlymathca.org/bean-thirteen)

Follow this link or visit earlymathca.org/external-resources for

additional online resources

Vocabulary

Math words found in the story: fair, four, leftover, many, one, piles, six, thirteen, twelve, two

Related Math Words: cardinality, composite numbers, decomposing numbers, division, equal, factors, multiplication, prime numbers, remainders

Words to Build Reading Comprehension: admit, fuss, gasped, gather, panic, separated, shrugged, unlucky

Spanish Title: Not Available

Related Books: *The Doorbell Rang* by Pat Hutchins; *Divide and Ride* by Stuart J. Murphy

Click this link to the World Catalog or enter bit.ly/3Ddz7Sj to find *Bean Thirteen* in the public library.

Early Math Project

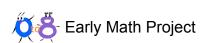**Math Connections:** *Bean Thirteen i*s a versatile story for introducing a variety of mathematical concepts.

With children who are just beginning to count, point to and count the beans and insects. Notice together how many eyes, legs, and antennae each insect has. Count and compare what you see. "Flora and Ralph look similar, but Ralph's vest is blue and Flora's is orange" or "The worm is the only one of the bugs that does not have antennae. Five bugs with antennae and one bug with no antennae."

Encourage your child to count what they see in the story. Reinforce the concept of cardinality, that the last number said when counting, is the total number. Ask your child "How many?" when they have counted the final object. Your child may recount the objects or if they understand the concept of cardinality they will answer your question with the last number they said. This is a complex idea and children need practice to be comfortable with it.

Throughout the story the number thirteen is broken down into smaller numbers. Notice together some of the different ways that thirteen can be broken down or decomposed. For example, four groups of three and a group of one or five groups of two and a group of three.

For children who are just beginning to add, the story can be used to explore number combinations that total thirteen. Help your child, only as needed, to write down several number sentences that show some of the different ways that numbers can be added together to equal thirteen, for example: $8 + 5 = 13$, $6 + 6 + 1 = 13$, and $2 + 1 + 2 + 3 + 3 + 2 = 13$. How are numbers added together to equal thirteen in the story?

The story is also a fun introduction to the concepts of factors, composite numbers, and prime numbers. Ask your child if they are familiar with the words factor, composite number, and prime number. If so, have them tell you what they already know. If not, talk to your child about factors. Use the number 8 as an example. The factors of 8 are all the combinations of two whole numbers that can be multiplied together to get the number eight. For example, $8 \times 1 = 8$ and $2 \times 4 = 8$. So we say 1, 2, 4, and 8 are the factors of 8. Notice with your child that all of the factors of 8 can be divided evenly into 8 with no remainder. The number 8 is called a composite number because it has more than two factors. Find other composite numbers with your child.
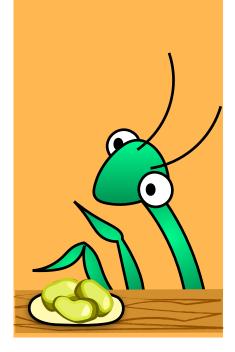
Some numbers that are greater than 1, only have whole number factors that include 1 and the number itself. These are considered prime numbers. The number 13 is a prime number because it only has the factors 1 and 13. This explains why Ralph and Flora were unable to divide the 13 beans evenly among themselves and between three, four, five, and six bugs. The first few prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, and 29. What is the next prime number?

When you've finished reading the story, ask your child how many bugs Flora and Ralph would have needed to invite to dinner for every bug (including Flora and Ralph) to have exactly the same number of whole beans.

Age Level	Related Preschool Foundations and CA State Standards
Preschool/ TK	**Number Sense 1.0** Children begin to understand numbers and quantities in their everyday environment.**1.2** Recognize and know the name of some written numerals. **1.5** Understand, when counting, that the number name of the last object counted represents the total number of objects in the group (i.e., cardinality). **2.2** Understand that adding to (or taking away) one or more objects from a group will increase (or decrease) the number of objects in the group. **Mathematical Reasoning 1.0** Children use mathematical thinking to solve problems that arise in their everyday environment.
Kindergarten	**Counting and Cardinality K.CC.4** Count to tell the number of objects. **Compare Numbers K.CC.6** Compare numbers.
Grade 1	**Operations and Algebraic Thinking 1.OA.1** Represent and solve problems involving addition and subtraction.
Grade 2	**Operations and Algebraic Thinking 2.OA.1** Represent and solve problems involving addition and subtraction. **2.OA.3** Work with equal groups of objects to gain foundations for multiplication.
Grade 3	**Operations and Algebraic Thinking 3.OA.2** Interpret whole-number quotients of whole numbers **3.OA.3** Represent and solve problems involving multiplication and division.

Early Math Project