Part-Whole Relations

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Summary	This class follows the discussion from the *Candy Boxes I* class. The challenge is to work with a visual representation of the relationships among the various quantities in the candy box problem and to relate the visual and numerical information contained in visual diagram(s) to verbal descriptions and to algorithms for finding unknown values.
Goals	1. To work from the total number of candies (both boxes plus the extra candies that Mary and John had) in order to determine how many each child had. 2. To develop a strategy and a notation for finding the total amount of candies from the amount of candies in each box. 3. To work implicitly with the function, $n \rightarrow (n \times 2) + 4$, [or $n \rightarrow (n + n) + 4$] where n refers to the number of candies in a box and $2n + 4$ refers to the total number of candies possessed by John and Mary. They also must deal with the inverse relation, namely, $n \rightarrow (n-4) \div 2$ [or $n \rightarrow (n \div 2) - 2$].
Materials	2 Opaque Boxes that hold up to 100 candies (Plastic Card File Boxes work) labeled with their owners' names (John, Maria), Individually Wrapped Hard Candy (i.e.: Jolly Ranchers), Rubber Bands (to help keep the boxes closed), Handouts, Overheads
Keywords	Contextualized Situations Full Class Discussion Interpretation of Stories Inverse Relations Small Group Work
Foci	Part-whole relations; Use of symbolic notation to represent John's and Mary's functions; Matching the expression $(2 \times n) + 1 + 3$ to the story.

Activity Plan:

Comparing the Boxes

1. Introduction of semi-iconic notation for part-whole relations. [Whole Class]

    Remind students of the information regarding the candy boxes problem: the two boxes, the extra candy on John's box, and the three extra candies on Mary's box.

    Show students how to represent how the diverse amounts are composed. First use specific numbers. Then introduce unknowns. See the overheads on pages 1-4.

    Begin with the overhead on page 1. Explain that the labels are for describing the amounts in the boxes. Try out values such as {5, 8, 0, *n*, *k*, *m*}. Ask students to infer the amount for John, for Mary, and for both together. Does it matter what letter we use?

    Superimpose the overhead on page 2 over page 1.

        What could these labels be used to show? Are they related to the other labels? Explain.

    Superimpose the overhead on page 3 over the other two.

        Why do we now have a new label? What could we use it to show?

    The overhead on page 4 shows the total number of candies.

    Move to the overhead on page 5 to avoid having to coordinate 3 overheads at once. Go through several problems in which the total is given or component values are given. Ask students to infer the other values and justify their answers.

2. From total of candies to amount in box [Group Work]

    State that, altogether, John and Mary have 12 candies and ask them to work in pairs and find out how many candies there are in each box using the handout and overhead on page 6.

    Observe their work and ask a few children to explain their solutions.

3. Discuss children's answers to the problem [Whole Class]

    Ask students to explain their answers. Discuss whether or not one should first subtract the extra candies from the total or first divide the total by 2.

If there is time, use the generic diagram (on page 7) to try out various other combinations of values. Start from the total. Start from John's amount. Start from the amount in a single box. In each case, write the different numbers with erasable ink.

If there is time, ask students: Could the total amount be:

10 candies? If so, how? How many would each one have?

4 candies? If so, how? How many would each one have?

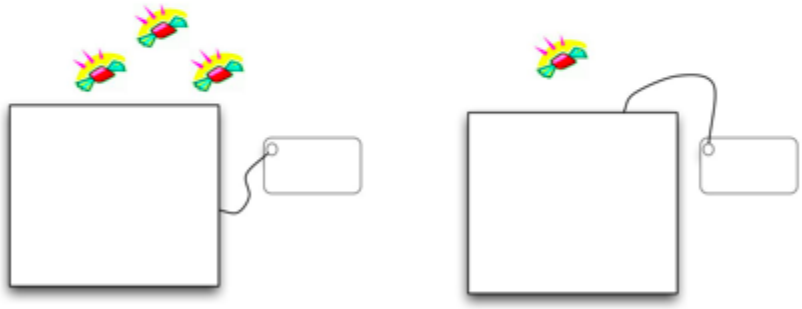
7 candies? How? Why not?

Ask whether they had heard about even and odd numbers and discuss why they couldn't have 7 candies altogether. Ask: Could the total amount ever be an odd number?

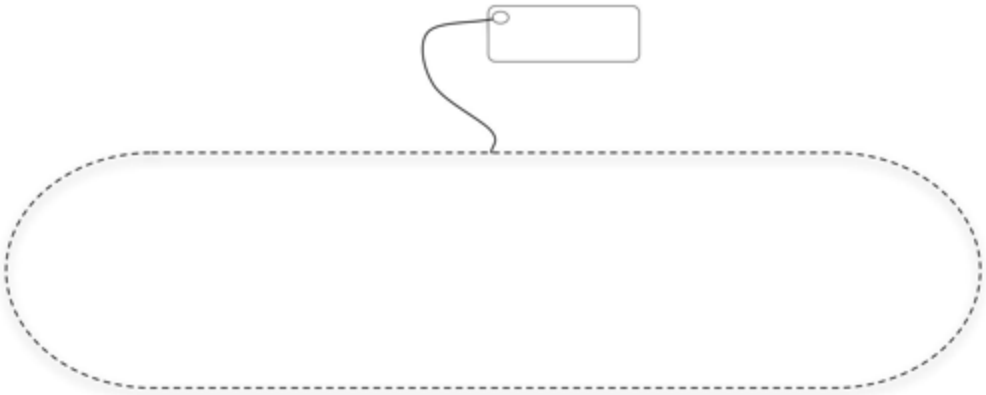
4. Homework (Page 8)

Show the overhead (on page 8) and explain the homework.

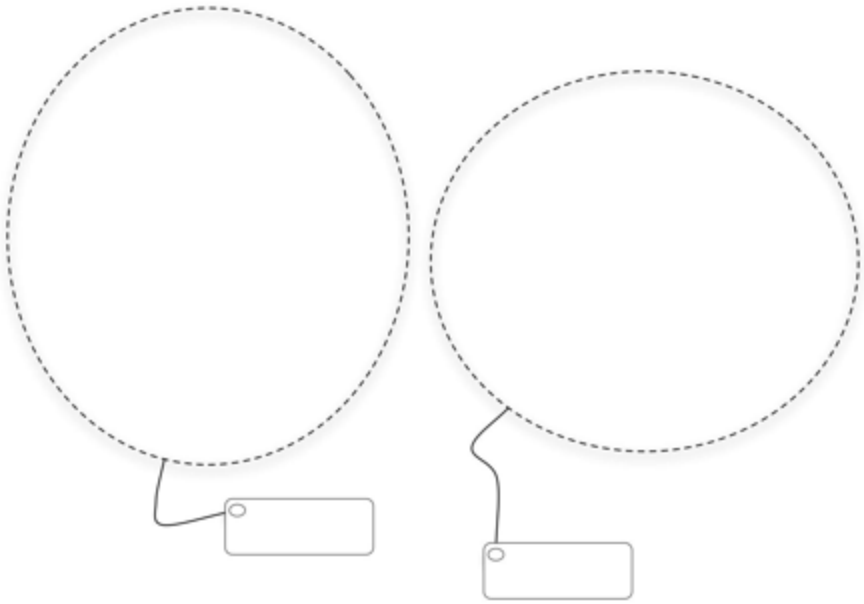
Overhead: Visualizing and Labeling Part-Whole Relations (Page 1)



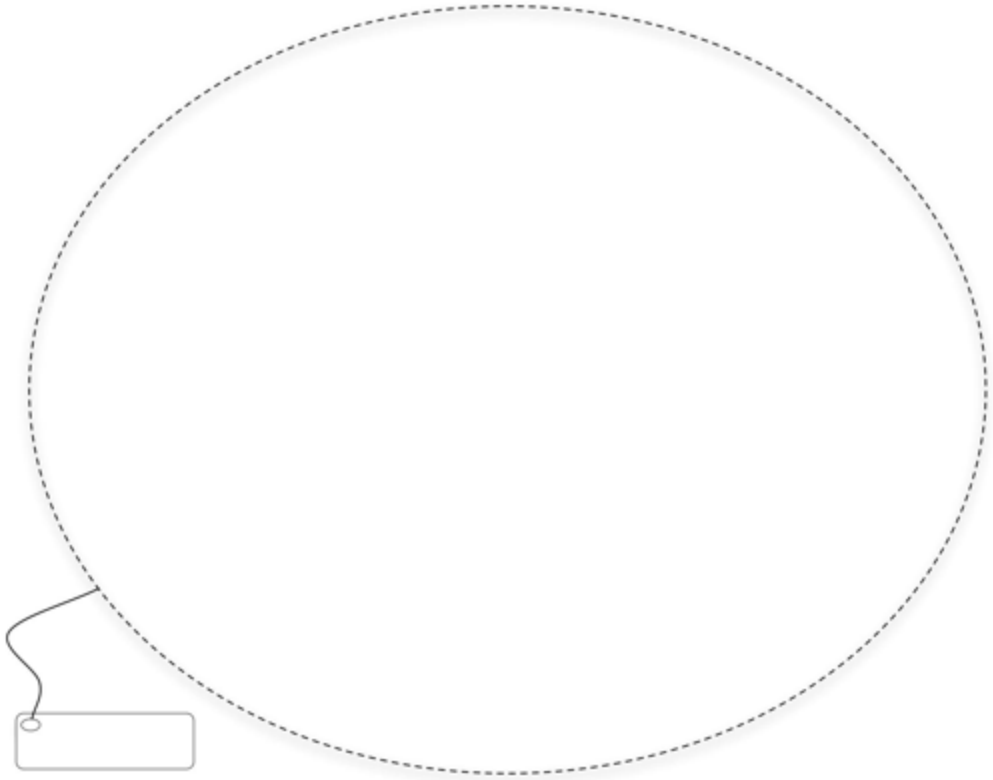
Overhead: Visualizing and Labeling Part-Whole Relations (Page 2)



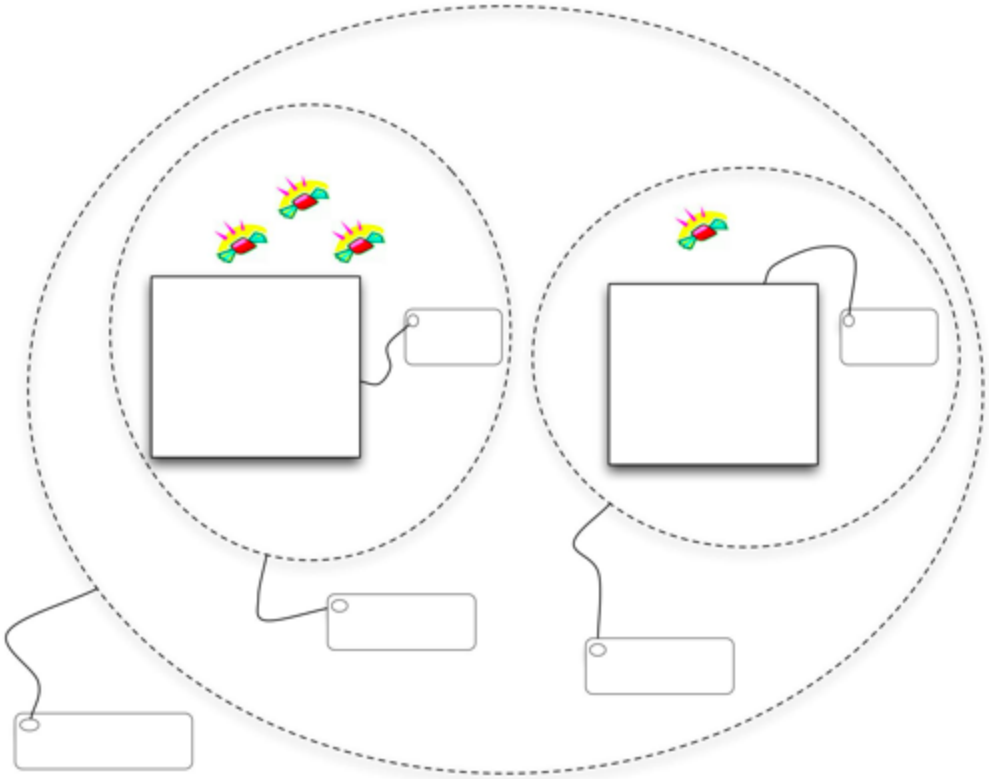
Overhead: Visualizing and Labeling Part-Whole Relations (Page 3)



Overhead: Visualizing and Labeling Part-Whole Relations (Page 4)



Overhead: Visualizing and Labeling Part-Whole Relations (Page 5)



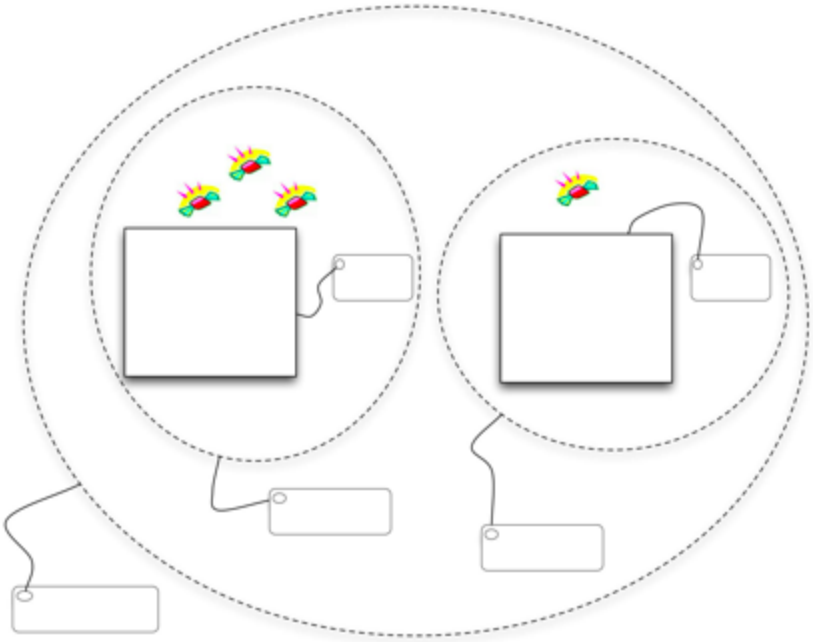
Overhead and Handout: Relationships Among Components **(Page 6)**

Name: _____ Date: _____

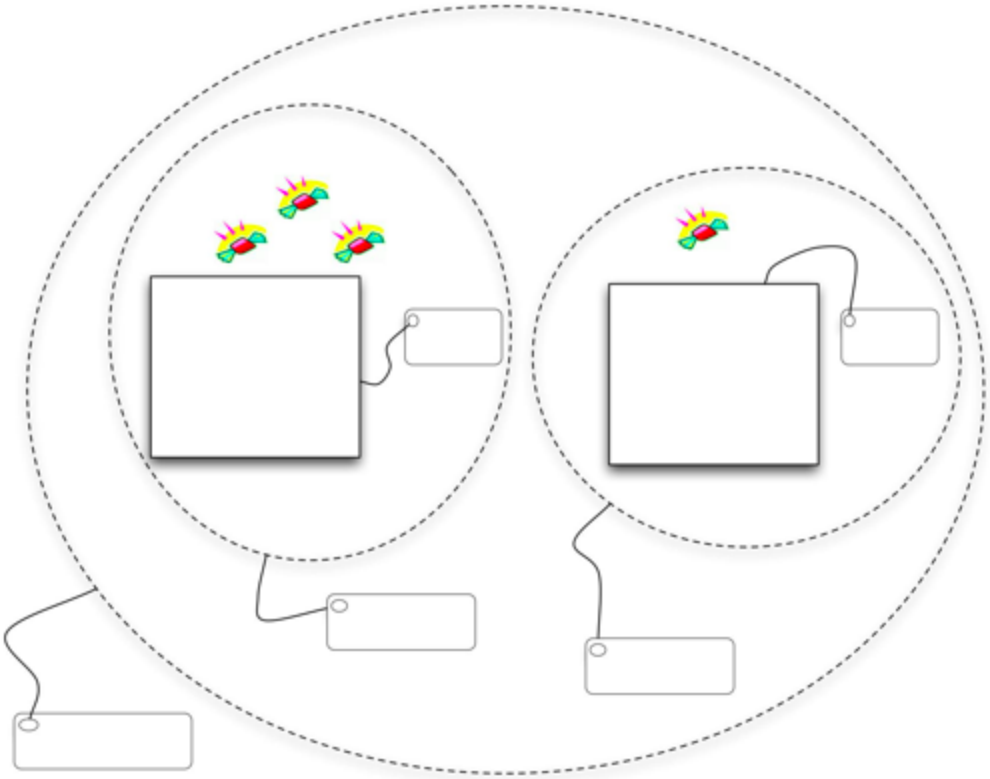
John and Maria each have a box of candies.

John has a box of candies and one extra candy on top of his.
Maria has a box of candies and three extra candies on top of hers.
The two boxes each have exactly the same number of candies in them.

Altogether, John and Mary have 24 candies. Write the number of candies that goes with each label.



Overhead: Generic Diagram **(Page 7)**



Overhead and Homework: A Problem About Money
(Page 8)

Name: _____ Date: _____

Sean and Jennifer had the same amount of money in their wallets. Sean then found 2 extra dollars in his pocket and Jennifer earned 3 dollars helping her mom.

Make a drawing with labels  to show:

- How much money Sean has altogether (after he found 2 dollars in his pocket).
- How much money Jennifer has altogether (after she earned 3 dollars).
- How much money Sean and Jennifer have altogether.