DOINGWHATWORKS

SAMPLE MATERIAL

Using Visual Representations

RMC Denver Professional Development

Topic: Improving Mathematical Problem Solving in Grades 4 Through 8

Practice: Problem-Solving Instruction

Teachers can help students become effective at problem solving by teaching them to use visual representations. This involves selecting visuals appropriate for problems, discussing how to represent problems visually, and converting visually represented information into mathematical notation. The right type of representation helps a student understand a problem by identifying and organizing pieces of relevant mathematical information. Specifically, the visualization helps students summarize what key information is known and see what the problem is asking.

Tables, number lines, strip diagrams, percent bars, and schematic diagrams are among the most frequently used visuals. Some visuals are better suited for particular types of problems. Teachers can use these examples for ideas to help students create visual representations for different types of problems. Note that several different types of problems are represented with appropriate visuals. In addition to the visuals, several problems include examples of arithmetic and algebraic notation.

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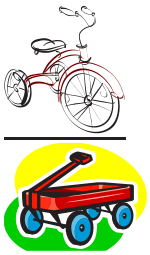
Using Visual Representations

Problem 1.

On the playground there are some tricycles and some wagons.
There are five more tricycles than wagons.
When you count the wheels on all the vehicles, there are exactly 36 wheels.
How many tricycles and how many wagons are on the playground?



Table

# of tricycles	# of wagons	Wheels on tricycles	Wheels on wagons	Total wheels
5	0	15	0	**15**
6	1	18	4	**22**
7	2	21	8	**29**
8	3	24	12	**36**

The table starts at 5 tricycles and 0 wagons because there are 5 more tricycles than wagons.

Pictorial

3 x 8 = 24

4 x 3 = 12

Total 36

Equations

Let t be the number of tricycles and w be the number of wagons. Then,

$$t = w + 5$$

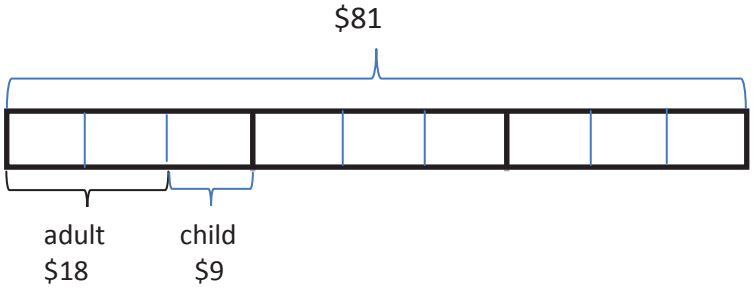
$$3t + 4w = 36$$

Problem 2.

A family of three adults and three children goes to an amusement park. Adult admission fare is twice as much as a child's. The family spends $81. How much is the adult admission fare? How much is the child admission fare?

Strip Diagram

Bar represents what the family spends. Divide by 3, so each part is for 1 adult and 1 child. Then each part is divided in thirds and twice as much is adult.



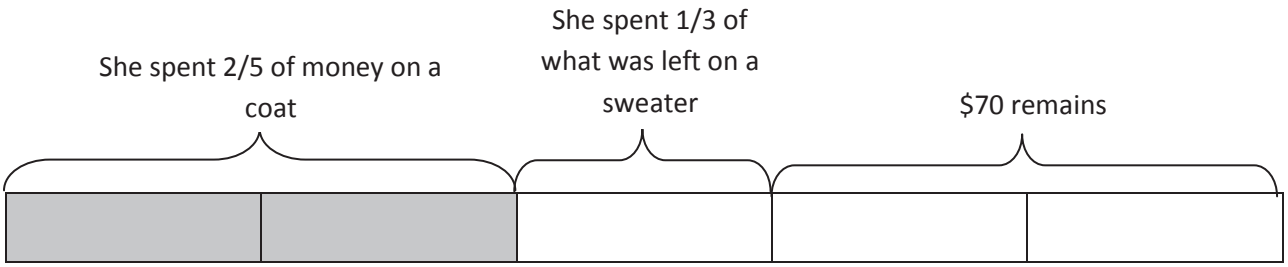
Equations

Let "a" be the cost of an adult fare and "c" be the cost of a child's fare. Then,

$$a = 2c \text{ and } 3a + 3c = \$81$$

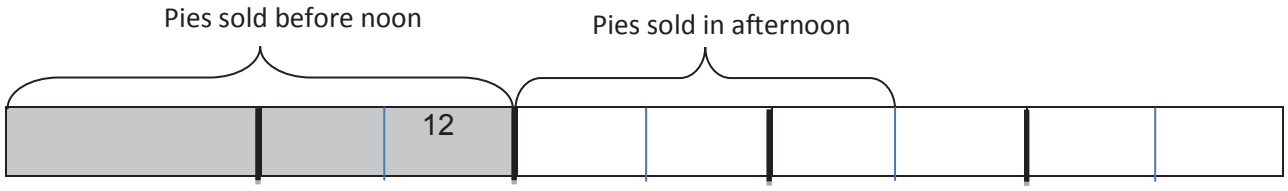
Problem 3. Eva spent 2/5 of the money she had on a coat, and then she spent 1/3 of what was left on a sweater. She had $70 remaining. How much did she start with?

Strip Diagram



Problem 4. Pies are very popular at the fair, so the baker made lots of pies early in the morning. He sold 2/5 of the pies before noon. Then he sold 1/2 of the remaining pies in the afternoon. 12 more pies were sold in the morning than in the afternoon. How many pies did the baker make?

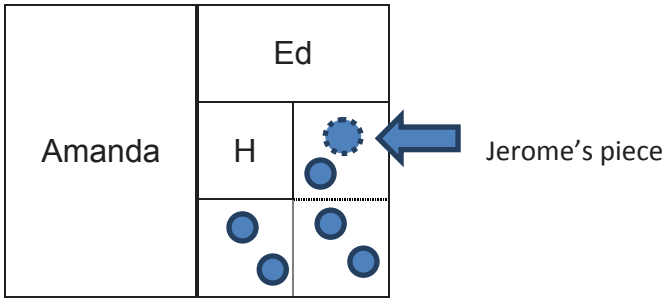
Strip Diagram



Pies sold is 10 x 12 = 120

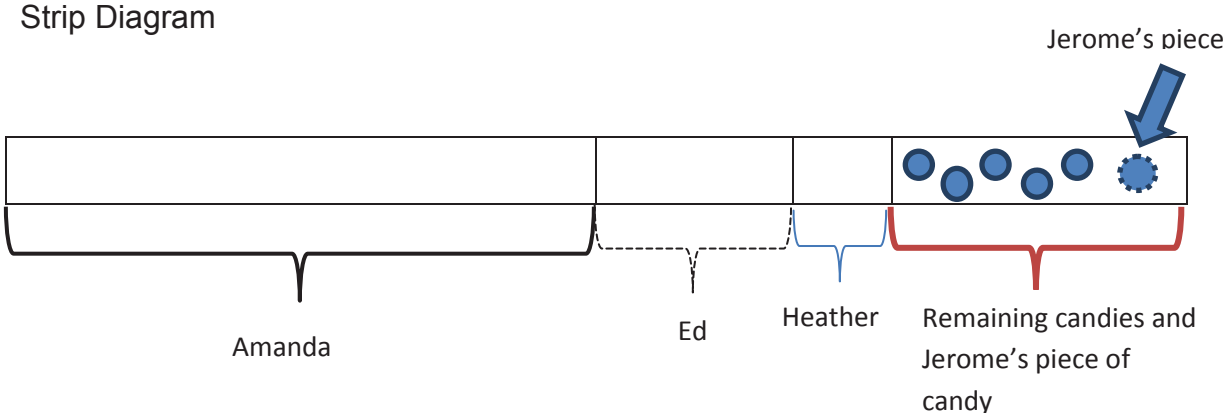
Problem 5. There was a candy bowl on the table. Amanda had a sweet tooth, so she ate half of the candies in the bowl. Ed came along and thought the candy looked good, so he ate a third of what was left. Heather came by and took a fourth of the remaining candies for a snack. Jerome came rushing by and took just one piece of candy. When Kristi looked into the candy bowl, she noticed there were five pieces of candy left. "How many candies were in the bowl to begin with?" Kristi asked.

Area Map



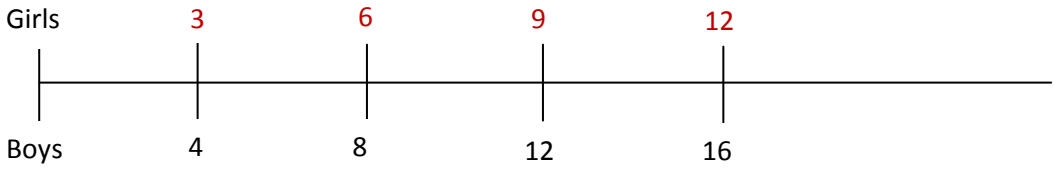
There were 24 pieces of candy in the bowl to start.

Strip Diagram

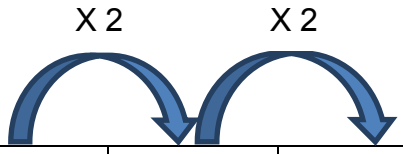


Problem 6. In Ms. Jacobs' class there are 3 girls for every 4 boys (the ratio of girls to boys is 3:4). There are 28 students in the class. How many boys and how many girls are in the class?

Double Number Line

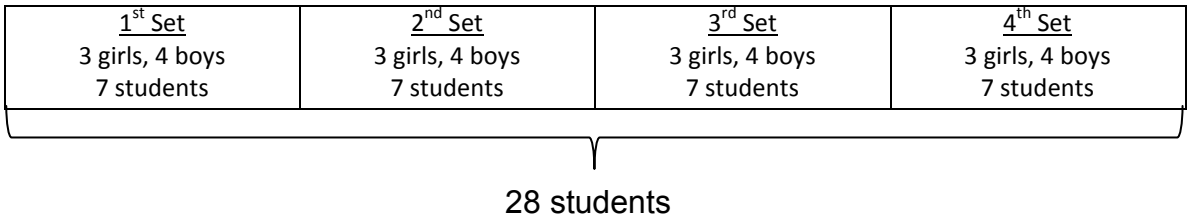


Ratio Table



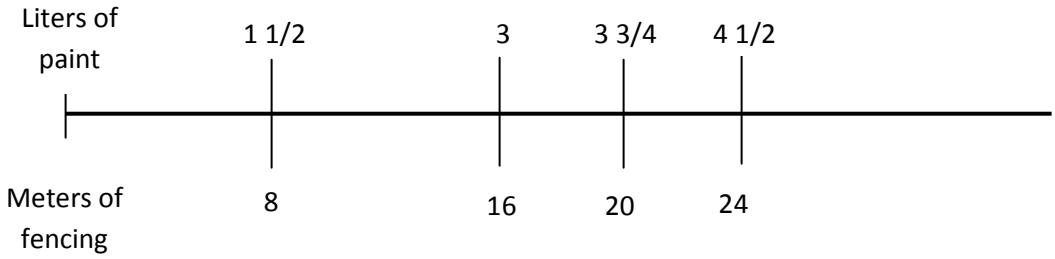
GIRLS	3	6	12	
BOYS	4	8	16	
TOTAL STUDENTS	7	14	28	

Strip Diagram

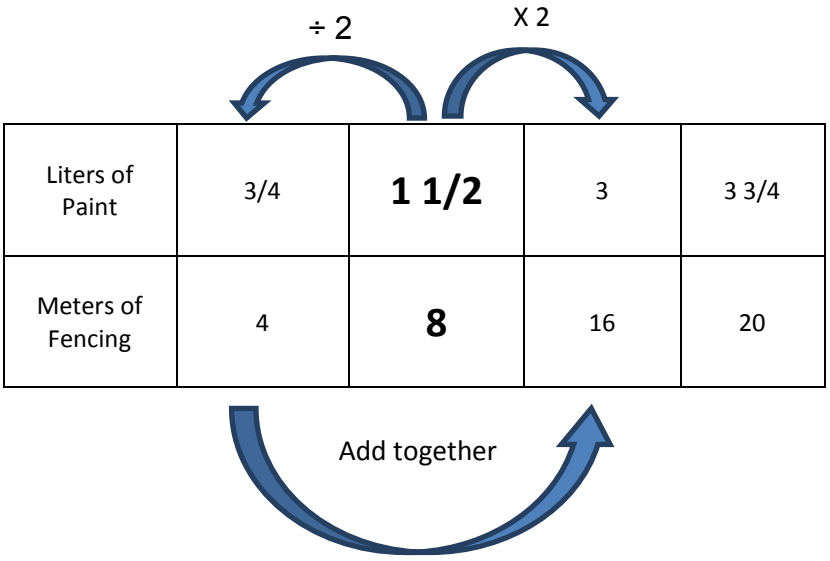


Problem 7. Paul says he uses 1 ½ liters of paint to paint a fence 8 meters long. He would like to know how much paint to get if the fence he needs to paint is 20 meters long.

Double Number Line



Ratio Table



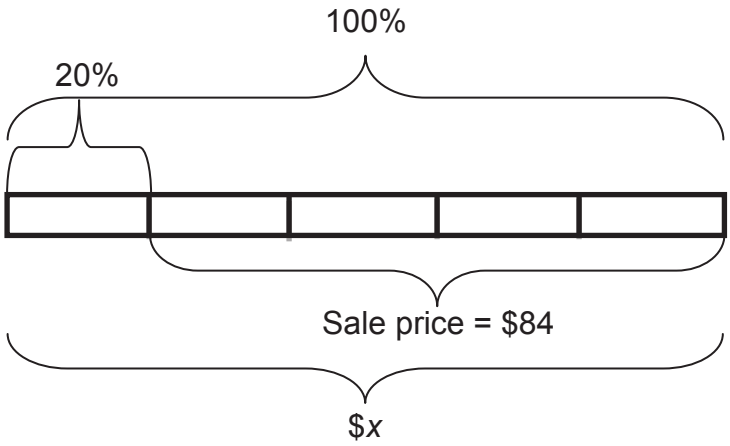
Strip Diagram

1 1/2 liters paint	1 1/2 liters paint	3/4 liter paint	3/4 liter paint
8 meters of fencing	8 meters of fencing	4 meters of fencing	4 meters of fencing
20 meters of fencing to paint			

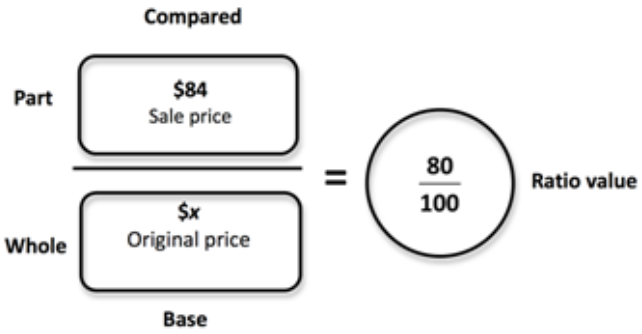
Problem 8. During a sale, prices were marked down by 20%. The sale price of an item was $84. What was the original price of the item before the discount?

Percent Bars

Strip Diagram

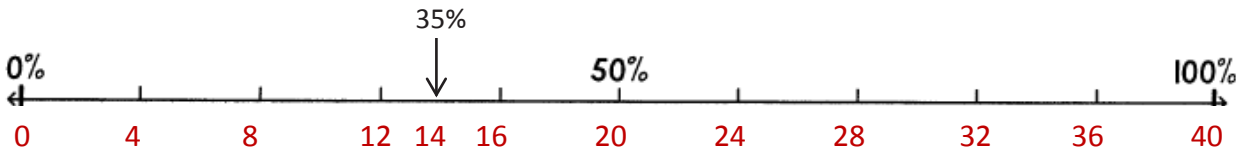


Schematic Diagram

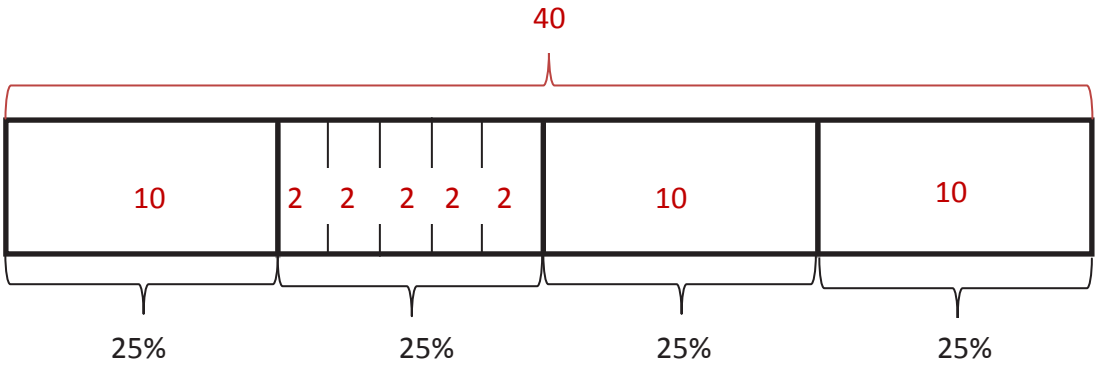


Problem 9. Ms. Thompson has 40 show dogs and 14 are Labradors. What percent of her show dogs are Labradors?

Double Number Line



Strip Diagram



Problem 10. John recently participated in a 5-mile run. He usually runs 2 miles in 30 minutes. Because it was a particularly warm day, he decided to take a 5-minute break after every mile to drink 4 ounces of water. How much time did it take him to complete the 5-mile run?

Schematic Diagram