

## Lesson 29: Multi-Step Problems—All Operations

### Classwork

#### Example 1

$$4r + 2r + r = 1,400$$

$$7r = 1,400$$

$$r \cdot \cancel{7} \div 7 = 1,400 \div 7$$

$$r = 200$$

The school librarian, Mr. Marker, knows the library has 1,400 books, but wants to reorganize how the books are displayed on the shelves. Mr. Marker needs to know how many fiction, nonfiction, and resource books are in the library. He knows that the library has four times as many fiction books as resource books and half as many nonfiction books as fiction books. If these are the only types of books in the library, how many of each type of book are in the library?

Draw a tape diagram to represent the total number of books in the library.

$$\begin{aligned} \text{Res} &= 200 \\ \text{NF} &= 400 \\ \text{F} &= 800 \end{aligned}$$

$$\begin{array}{r} 800 \\ 400 \\ +200 \\ \hline 1,400 \end{array}$$

$$\begin{aligned} 4r &= \text{Fict.} \\ 2r &= \text{NF} \\ r &= \text{Res.} \end{aligned}$$

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Draw two tape diagrams, one to represent the number of fictions books in the library and one to represent the number of resource books in the library.

▪ Resource Books:

▪ Fiction Books:

What variable should we use throughout the problem?

Write the relationship between resource books and fiction books algebraically.

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~~Draw a tape diagram to represent the number of nonfiction books.~~

~~How did you decide how many sections this tape diagram would have?~~

~~Represent the number of nonfiction books in the library algebraically.~~

~~Use the tape diagrams we drew to solve the problem.~~

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Write an equation that represents the tape diagram.

~~Determine the value of  $r$ .~~

How many fiction books are in the library?

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How many nonfiction books are in the library?

Set up a table with four columns and label each column.

Fict.	NF	Res(r)	Total
$4r$	$2r$	$r$	$7r$
12	6	3	<del>1,400</del>
800	400	200	1,400

How many fiction books are in the library?

How many nonfiction books are in the library?

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How many resource books are in the library?

Does the library have four times as many fiction books as resource books?

Does the library have half as many nonfiction books as fiction books?

Does the library have 1,400 books?

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Exercises

Solve each problem below. Then check your answer with the word problem.

$$7s = 434$$

$$s \cdot 7 \div 7 = 434 \div 7$$

$$s = 62$$

- Indian Ridge Middle School wanted to add a new school sport, so they surveyed the students to determine which sport is most popular. Students were able to choose between soccer, football, lacrosse, or swimming. The same number of students chose lacrosse and swimming. The number of students who chose soccer was double the number of students who chose lacrosse. The number of students who chose football was triple the number of students who chose swimming. If 434 students completed the survey, how many students chose each sport?

Soc.	Foot.	Lac.	Swim	Total
2s	3s	s	s	7s / 434
40	60	20	20	434
124	186	62	62	434

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- At Prairie Elementary School, students are asked to pick their lunch ahead of time so the kitchen staff will know what to prepare. On Monday, 6 times as many students chose hamburgers as chose salads. The number of students who chose lasagna was one third the number of students who chose hamburgers. If 225 students ordered lunch, how many students chose each option if hamburger, salad, and lasagna were the only three options?

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3. The art teacher, Mr. Gonzalez, is preparing for a project. In order for students to have the correct supplies, Mr. Gonzalez needs 10 times more markers than pieces of construction paper. He needs the same number of bottles of glue as pieces of construction paper. The number of scissors required for the project is half the number of piece of construction paper. If Mr. Gonzalez collected 400 items for the project, how many of each supply did he collect?

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4. The math teacher, Ms. Zentz, is buying appropriate math tools to use throughout the year. She is planning on buying twice as many rulers as protractors. The number of calculators Ms. Zentz is planning on buying is one quarter of the number of protractors. If Ms. Zentz buys 65 items, how many protractors does Ms. Zentz buy?

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**Problem Set**

Solve the problems and then check your answers with the word problem.

1. On average, a baby uses three times the number of large diapers as small diapers, and double the number of medium diapers as small diapers.
  - a. If the average baby uses 2,940 diapers size large and smaller, how many of each size would be used?
  - b. Support your answer with equations.
  
2. Tom has three times as many pencils as pens, but has a total of 100 writing utensils.
  - a. How many pencils does Tom have?
  - b. How many more pencils than pens does Tom have?
  
3. Serena's mom is planning her birthday party. She bought balloons, plates, and cups. Serena's mom bought twice as many plates as cups. The number of balloons Serena's mom bought was half the number of cups.
  - a. If Serena's mom bought 84 items, how many of each item did she buy?
  - b. Tammy brought 12 balloons to the party. How many total balloons were at Serena's birthday party?
  - c. If half the plates and all but four cups were used during the party, how many plates and cups were used?

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4. Elizabeth has a lot of jewelry. She has four times as many earrings as watches, but half the number of necklaces as earrings. Elizabeth has the same number of necklaces as bracelets.
  - a. If Elizabeth has 117 pieces of jewelry, how many earrings does she have?
  - b. Support your answers with an equation.
  
5. Claudia was cooking breakfast for her entire family. She made double the amount of chocolate chip pancakes as she did regular pancakes. She only made half as many blueberry pancakes as she did regular pancakes. Claudia also knows her family loves sausage, so she made triple the amount of sausage as blueberry pancakes.
  - a. How many of each breakfast item did Claudia make if she cooked 90 items in total?
  - b. After everyone ate breakfast, there were 4 chocolate chip pancakes, 5 regular pancakes, 1 blueberry pancake, and no sausage left. How many of each item did the family eat?
  
6. During a basketball game, Jeremy scored triple the number of points as Donovan. Kolby scored double the number of points as Donovan.
  - a. If the three boys scored 36 points, how many points did each boy score?
  - b. Support your answer with an equation.

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### Exit Ticket

Solve the problem using tables and equations and then check your answer with the word problem. Try to find the answer only using two rows of numbers on your table.

A pet store owner, Byron, needs to determine how much food he needs to feed the animals. Byron knows that he needs to order the same amount of bird food as hamster food. He needs four times as much dog food as bird food, and needs half the amount of cat food as dog food. If Byron orders 600 packages of animal food, how much dog food does he buy? Let  $b$  represent the amount of bird food.

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