Lesson 5: Solving Problems by Finding Equivalent Ratios

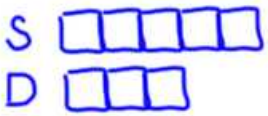
In this lesson, we learned how to solve two new types of equivalent ratio problems. First, we learned how to use a tape diagram to solve a problem where the TOTAL for the equivalent ratio is given.

Sammy and David were selling water bottles to raise money for new football uniforms. Sammy sold 5 water bottles for every 3 water bottles David sold. Together they sold 160 water bottles. How many did each boy sell?

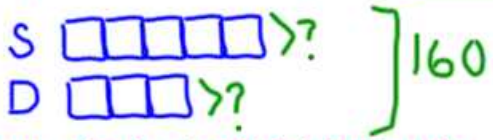
STEP 1: Read the problem.
STEP 2: STOP when you read the ratio and write it down!

5:3 - For every five water bottles Sammy sold, David sold three.

STEP 3: Draw a tape diagram.

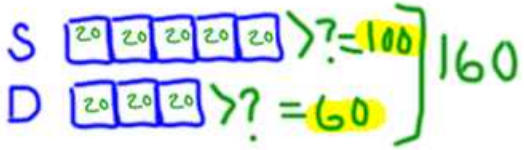


STEP 4: Label your tape diagram with ? marks for where the answer will go and quantities given in the problem. ***(Is the quantity given just for one of the ratio quantities, the total quantity, or the difference between the two quantities?)***



STEP 5: Divide to find the value of each unit and label all of the units.

STEP 6: Add or multiply to find the answer to the question.



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Lesson 5: Solving Problems by Finding Equivalent Ratios

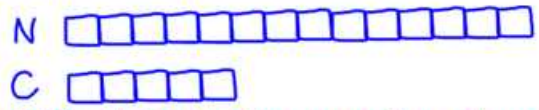
Second, we learned how to use a tape diagram to solve a problem where the DIFFERENCE BETWEEN for the equivalent ratio is given.

The Superintendent of Highways is further interested in the numbers of commercial vehicles that frequently use the county's highways. He obtains information from the Department of Motor Vehicles for the month of September and finds that for every 14 non-commercial vehicles, there were 5 commercial vehicles. If there were 108 more non-commercial vehicles than commercial vehicles, how many of each type of vehicle frequently use the county's highways during the month of September?

STEP 1: Read the problem.
STEP 2: STOP when you read the ratio and write it down!

14: 5 - For every 14 non-commercial vehicles there are 5 commercial vehicles.

STEP 3: Draw a tape diagram.



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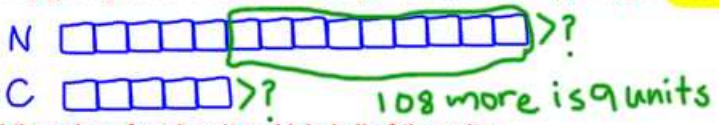

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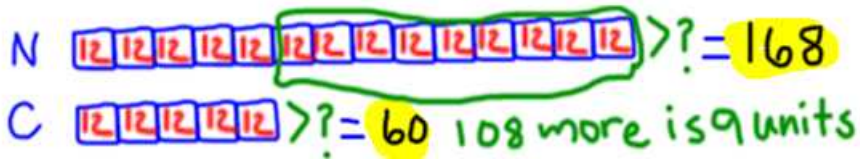

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Learning Targets

By the end of this lesson, you will be able to answer the following questions:

(1) How can tape diagrams be helpful in solving ratio word problems?

(2) How do you solve ratio problems when you are given the total of the two quantities?

(3) How do you solve ratio problems when you are given the difference between two quantities?

Learning Targets

Why do you need to know this?

Ratios can be used to solve all types of real world problems. We use ratios to decide what items have the best price when we shop, which cars get the best gas mileage, and many other real world problems.

Classwork

Example 1

A County Superintendent of Highways is interested in the numbers of different types of vehicles that regularly travel within his county. In the month of August, a total of 192 registrations were purchased for passenger cars and pickup trucks at the local Department of Motor Vehicles (DMV). The DMV reported that in the month of August, for every 5 passenger cars registered, there were 7 pickup trucks registered. How many of each type of vehicle were registered in the county in the month of August?

a. Using the information in the problem, write four ratios and describe the meaning of each.

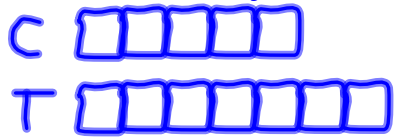
Think about the information given in the ratio like this:
CARS 5
TRUCKS 7
TOTAL 12

5:7 - For every five cars there are 7 trucks.
7:5 - For every seven trucks there are 5 cars.
5:12 - For every 5 cars there are 12 total vehicles.
12:7 - For every 12 total vehicles there are seven trucks.

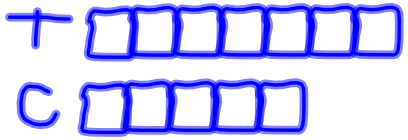
A County Superintendent of Highways is interested in the numbers of different types of vehicles that regularly travel within his county. In the month of August, a total of 192 registrations were purchased for passenger cars and pickup trucks at the local Department of Motor Vehicles (DMV). The DMV reported that in the month of August, for every 5 passenger cars registered, there were 7 pickup trucks registered. How many of each type of vehicle were registered in the county in the month of August?

b. Make a tape-diagram that represents the quantities in the ratios that you wrote.

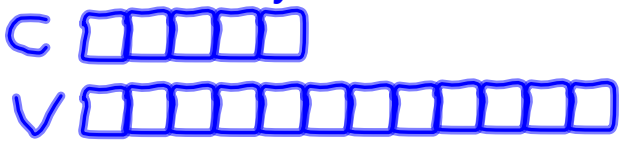
5:7 - For every five cars there are 7 trucks.



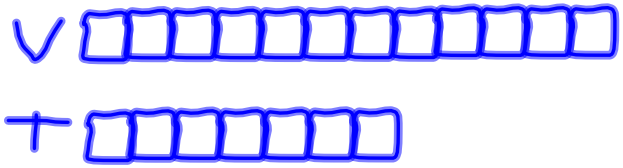
7:5 - For every seven trucks there are 5 cars.



5:12 - For every 5 cars there are 12 total vehicles.



12:7 - For every 12 total vehicles there are seven trucks.



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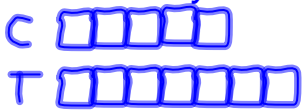
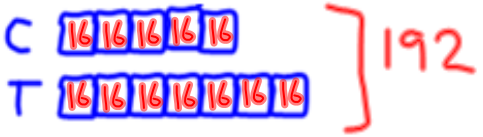


c. How many equal-sized parts does the tape diagram consist of? 12

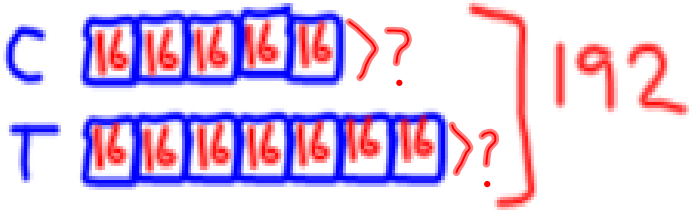
d. What total quantity does the tape diagram represent? 192

e. What value does each individual part of the tape diagram represent?



192 ÷ 12 = 16

f. How many of each type of vehicle were registered in August?



C = 16 × 5 = 80

T = 16 × 7 = 112

Example 2

The Superintendent of Highways is further interested in the numbers of commercial vehicles that frequently use the county's highways. He obtains information from the Department of Motor Vehicles for the month of September and finds that for every 14 non-commercial vehicles, there were 5 commercial vehicles. If there were 108 more non-commercial vehicles than commercial vehicles, how many of each type of vehicle frequently use the county's highways during the month of September?

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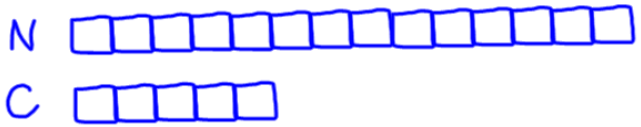
14: 5 - For every 14 non-commercial vehicles there are 5 commercial vehicles.

STEP 3: Draw a tape diagram.



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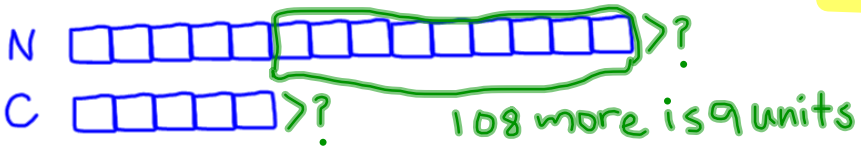
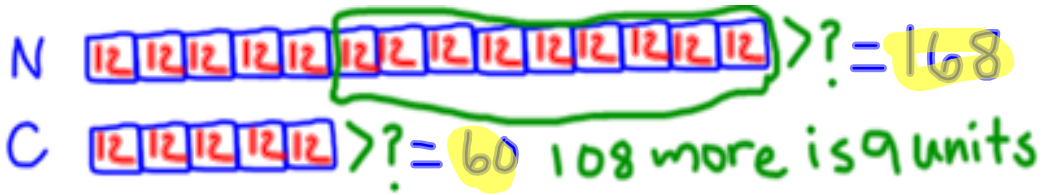


STEP 5: Divide to find the value of each unit and label all of the units.

STEP 6: Add or multiply to find the answer to the question.



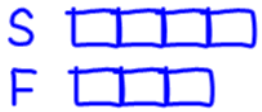
Exercises

1. The ratio of the number of people who own a smartphone to the number of people who own a flip phone is 4:3. If 500 more people own a smartphone than a flip phone, how many people own each type of phone?

STEP 1: Read the problem.
STEP 2: STOP when you read the ratio and write it down!

4:3 - For every four people who own a smartphone, 3 people own a flip phone.

STEP 3: Draw a tape diagram.



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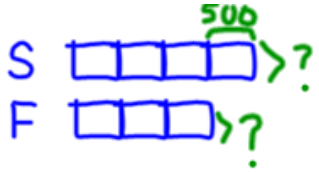

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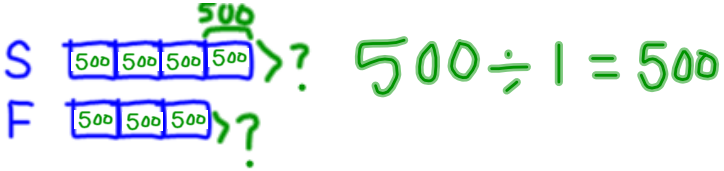
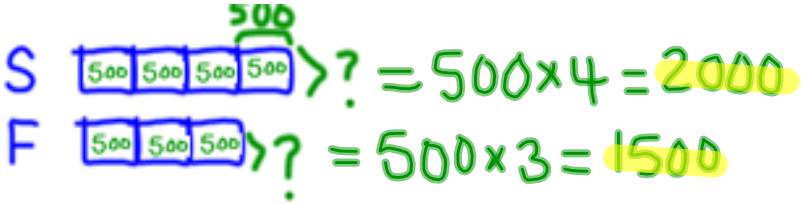


STEP 6: Add or multiply to find the answer to the question.

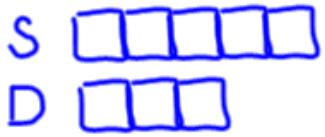


2. Sammy and David were selling water bottles to raise money for new football uniforms. Sammy sold 5 water bottles for every 3 water bottles David sold. Together they sold 160 water bottles. How many did each boy sell?

STEP 1: Read the problem.
STEP 2: STOP when you read the ratio and write it down!

5:3 - For every five water bottles Sammy sold, David sold three.

STEP 3: Draw a tape diagram.



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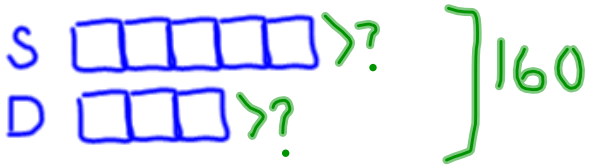

STEP 5: Divide to find the value of each unit and label all of the units.

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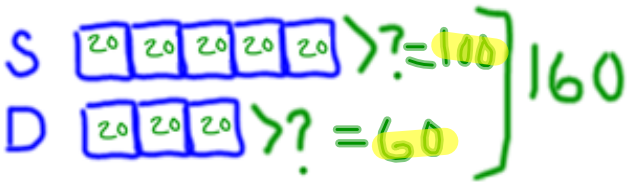
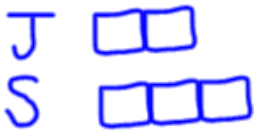


3. Ms. Johnson and Ms. Siple were folding report cards to send home to parents. The ratio of the number of report cards Ms. Johnson folded to the number of report cards Ms. Siple folded is 2:3. At the end of the day, Ms. Johnson and Ms. Siple folded a total of 300 report cards. How many did each person fold?

STEP 1: Read the problem.
STEP 2: STOP when you read the ratio and write it down!

2:3 - For every 2 report cards folded by Ms. Johnson, Ms. Siple folded 3.

STEP 3: Draw a tape diagram.



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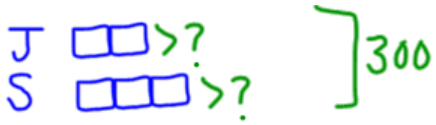

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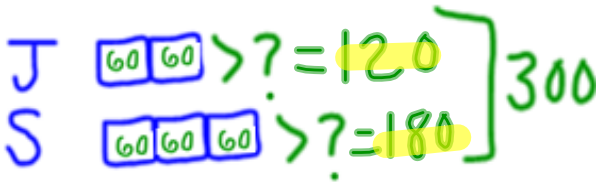
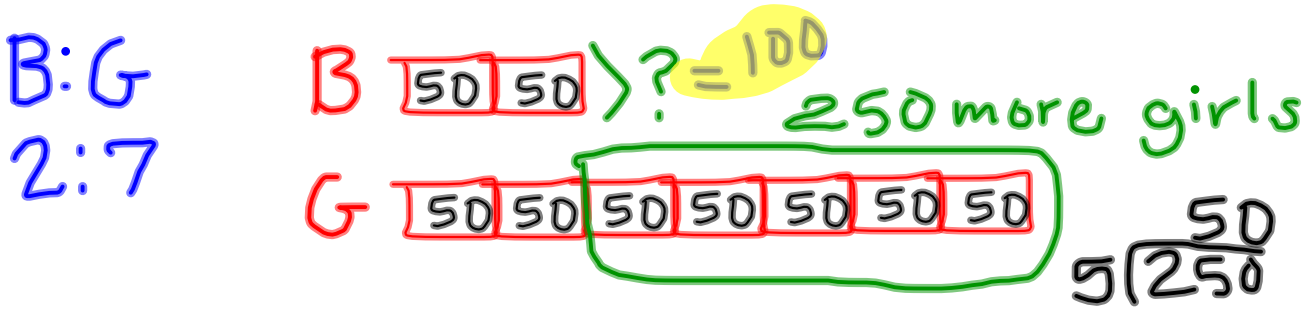


Exercises

4. At a country concert, the ratio of the number of boys to the number of girls is 2:7. If there are 250 more girls than boys, how many boys are at the concert?



Learning Targets

Answer the following questions:

(1) How can tape diagrams be helpful in solving ratio word problems?

When given a ratio and one quantity in an equivalent ratios, you can find the value of each unit in the tape diagram. This gives you all of the information you need to solve the problem.

(2) How do you solve ratio problems when you are given the total of the two quantities?

After you draw your tape diagram, you label the TOTAL of the equivalent ratio. If you divide the TOTAL number of units (boxes) into the TOTAL quantity in the equivalent ratio, you can find the answer to the question.

(3) How do you solve ratio problems when you are given the difference between two quantities?

After you draw your tape diagram, you label the DIFFERENCE between the two ratios in the equivalent ratio. If you divide the NUMBER of units that represent the difference in the tape diagram by the DIFFERENCE given in the equivalent ratio, you can find the answer to the question.

Homework

Problem Set Lesson 5

Aug 10-6:42 PM