

Problem Solving: Simplify the Problem

What is it?

Simplifying a mathematics problem is a strategy that often is used along with other problem-solving strategies. When a problem is too complex to solve in one step, it often helps to divide it into simpler problems and solve each one separately. Creating a simpler problem from a more complex one may involve rewording the problem; using smaller, simpler numbers; or using a more familiar scenario to understand the problem and find the solution.

For example, consider the problem:

A soccer team won 24 of 36 games in the first season. If the team had the same ratio of wins to games in the second season, and they won 16 games, how many games did they play in the second season?

The answer can be found by simplifying the ratio of 24:36 to 2:3, and then cross-multiplying to find the total number of games in the second season, 24 games.

Why is it important?

This is a problem-solving strategy that can be used with difficult concepts such as manipulating ratios or fractions. If a problem is confusing, the numbers can be rounded, or simpler numbers can be used to help make a plan to solve it.

How can you make it happen?

Introduce a problem to students that is complex and might be easier to solve if it were simplified.

For example:

On your way to visit a friend, you leave your house at 2:45 P.M. and travel $1\frac{3}{4}$ miles to the train, $12\frac{1}{2}$ miles on the train, and $\frac{3}{4}$ mile to your friend's house from the train station. If you get there at 4:15 P.M., how many miles per hour did you travel?

1. Understand the problem

Demonstrate that the first step is understanding the problem. This involves identifying the key pieces of information needed to find the answer. Students may need to read the problem several times and/or put the problem into their own words.

I know I left at a certain time, arrived at a certain time, and travelled a certain distance. I need to find how many miles per hour I travelled.

2. Choose a strategy

For this problem, it might be helpful for students to use simpler numbers to learn the steps they need to follow to solve it. Have students change the problem to: I left the house 13:00, travelled 12 miles, and arrived at 16:00. How many miles per hour did I travel?

3. Solve the problem

First, have students solve the problem using simpler numbers.

I left the house 13:00, travelled 12 miles, and arrived at 16:00. How many miles per hour did I travel?

I travelled 12 miles.

It took 3 hours.

To find the miles per hour, I divide 12 by 3 to get 4 miles per hour.

Next, have them write down the steps they used to solve the problem.

- Find the distance travelled.
- Find the time spent.
- Divide to find the miles per hour.

4. Then, have them use the actual numbers from the problem and follow the same steps.

- Find the distance travelled.
 $1 \frac{3}{4} + 12 \frac{1}{2} + \frac{3}{4} = 15$ miles
- Find the time spent.
The time from 2:45 to 4:15 is 1 hour and 30 minutes, or $1 \frac{1}{2}$ hours.
- Divide to find the miles per hour.
15 divided by $1 \frac{1}{2} = 10$ miles per hour

5. Check your answer

Students should read the problem again to be sure the question was answered.
Yes, I found the miles per hour.

Then, they should check the math to be sure it is correct.

$1 \frac{3}{4} + 12 \frac{1}{2} + \frac{3}{4} = 15$ miles
2:45 to 4:15 is 1 hour and 30 minutes
15 divided by $1 \frac{1}{2} = 10$ miles per hour

Students should determine if they chose the best strategy for this problem or if there was a better way to solve it. Simplifying this problem was a good strategy.

6. Explain

Students should explain their answer and the process they went through to reach it. Because this strategy involves logic, it is important for students to talk or write about their thinking.

On your way to visit a friend, you leave your house at 2:45 P.M. and travel $1 \frac{3}{4}$ miles to the train, $12 \frac{1}{2}$ miles on the train, and $\frac{3}{4}$ mile to your friend's house from the train station. If you get there at 4:15 P.M., how many miles per hour did you travel?

This was a confusing problem, so I simplified the numbers and solved the simpler

problem to figure out the steps. The simpler numbers I used were:

You left the house 13:00, travelled 12 miles, and arrived at 16:00. How many miles per hour did you travel?

Then I figured out the answer. I travelled 12 miles, and it took 3 hours. To find my miles per hour, I divided 12 by 3 to get 4 miles per hour.

I wrote down the steps to solving the problem:

- Find the distance travelled.
- Find the time spent.
- Divide to find the miles per hour.

7. Then I used the real numbers from the actual problem to find the solution.

- Find the distance travelled.
 $1 \frac{3}{4} + 12 \frac{1}{2} + \frac{3}{4} = 15$ miles
- Find the time spent.
From 2:45 to 4:15 is 1 hour and 30 minutes, or
 $1 \frac{1}{2}$ hours.
- Divide to find the miles per hour.
 15 divided by $1 \frac{1}{2} = 10$ miles per hour

8. I checked my calculations, and my answer is 10 miles per hour.

9. Guided practice.

Have students try solving one of the following problems by simplifying it.

- A new movie theatre sells 6,783 tickets in the first year, 5,697 tickets in the second year, and in its third year, sells 634 fewer tickets than in its second year. How many tickets are sold in 3 years?

Or

A tiger eats 730.29 pounds of meat in 10 weeks and $4 \frac{1}{2}$ cans of meat in a month. How much food does he eat in a year?

- 10. Have students work in pairs, in groups, or individually to solve this problem.** They should be able to tell or write about how they found the answer and justify their reasoning.

How can you stretch students' thinking?

Math problems can be simplified in a variety of ways. Modelling and working through many different problems will help students become flexible and creative in their problem-solving strategies. Students should work through problems by simplifying the numbers, rewording the problem, or by using a more familiar scenario. Have students find other ways to simplify problems. Record these strategies on a chart in the classroom, adding new strategies as students find them.

Source:

