

9.8

Solve Problems Using Logical Reasoning

GOAL

Solve problems that involve equations using logical reasoning.

LEARN ABOUT the Math



? How can Holly use logical reasoning to determine Angèle's target heart rates?

Determine Angèle’s minimum and maximum target heart rates.

Holly’s Solution

1. Understand the Problem

I know Angèle’s resting heart rate. I can use that to determine the other rates.

2. Make a Plan

I will relate each pair of heart rates with equations and then solve them.

3. Carry Out the Plan

$$r + 39 = m$$

I wrote an equation to express Angèle’s minimum target heart rate, m , in relation to her resting target heart rate, r .

$$60 + 39 = 99$$

Angèle’s *minimum* target heart rate is 99 beats per minute.

I substituted her resting heart rate to evaluate her minimum target heart rate.

$$2m - 36 = x$$

I wrote an equation to relate the maximum rate, x , to the minimum rate.

$$2(99) - 36 = x$$

$$198 - 36 = x$$

$$162 = x$$

Angèle’s *maximum* target heart rate is 162 beats per minute.

I substituted her minimum target heart rate to solve for her maximum heart rate.

4. Look Back

Angèle’s *minimum* heart rate is 39 more than her resting rate.

$$60 + 39 = 99$$

Angèle’s *maximum* heart rate is 36 beats less than twice her *minimum* rate.

$$2 \times 99 - 36 = 162$$

I verified my answers.

My answers matched what it said in the problem.

Reflecting

A. How did Holly use logical reasoning to solve the problem?

WORK WITH the Math

Example 2 Using logical reasoning and equations

A senior admission at the Royal Tyrrell Museum is \$2 less than an adult admission. A youth admission is \$2 more than $\frac{1}{2}$ a senior admission. The youth admission is \$6. What are the senior and adult admissions?

Holly's Solution

1. Understand the Problem

I know the youth admission. I can use that to determine the senior admission. Then I can use the senior admission to determine the adult admission.

2. Make a Plan

I will relate each pair of admissions with equations and then solve them.

3. Carry Out the Plan

$$\frac{s}{2} + 2 = y$$

I wrote an equation to express the youth admission, y , in relation to the senior admission, s .

$$\frac{s}{2} + 2 = 6$$

I substituted the youth admission to solve for the senior admission.

$$\frac{s}{2} + 2 - 2 = 6 - 2$$

$$\frac{s}{2} = 4$$

$$s = 8$$

The senior admission is \$8.

$$a - 2 = s$$

I wrote an equation to express the adult admission, a , in relation to the senior admission, s .

$$a - 2 = 8$$

$$a - 2 + 2 = 8 + 2$$

$$a = \$10$$

I substituted the senior admission to solve for the adult admission.

The adult admission is \$10.

4. Look Back

The senior admission is \$8. Half of that is \$4.

I verified my answers.

The youth admission should be \$2 more, or \$6.

My answers matched what it said in the problem.

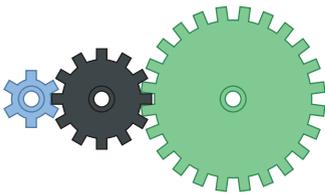
The adult admission is \$10. The senior admission is \$2 less, or \$8. ✓

A Checking

1. Solve this problem using logical reasoning and an equation. Jie has \$36 in the bank. She deposits the same amount of money each week. Three weeks later, she has \$162. How much money did she deposit each week?

B Practising

2. Vanessa is a Winnipegger who is planning a vacation to Los Angeles. The return fare on Airline A is \$65 more than the bus fare. The bus fare is \$177 more than one-half of the fare on Airline B. The air fare on Airline A is \$464. Determine the Airline B fare and the bus fare.
3. Jasper put together a set of gears in science class. The circumference of the green gear is 24 cm. The circumference of the black gear is 4 cm more than one-third of the green gear. The circumference of the blue gear is half of the black gear. Determine the circumference of the black gear and blue gear.
4. Alexis likes whitewater rafting. A two-day rafting trip on the Elaho and Squamish rivers near Whistler, BC, is \$300, while the cost of a one-day trip on the Tatshenshini River in the Yukon is \$125.
 - a) Write a problem about the cost of the two trips.
 - b) Exchange your problem with a classmate. Have your classmate solve your problem to see if it is set up correctly.
5. The students in Mr. Hegel's math class are trying to guess his age. He tells them that his daughter is four years younger than one-third of his age. When asked about his daughter, he tells the class that she is two years older than half of Meg's age. Meg, a student in the class, is 14. How old is Mr. Hegel? Explain your answer.
6. How can using equations make it easier for you to solve problems logically?



Reading Strategy

Inferring

What clues in the text help you better understand the problem?