

## Lesson 28: Two-Step Problems—All Operations

### Classwork

#### Mathematical Modeling Exercise

Juan has gained 20 lb. since last year. He now weighs 120 lb. Rashod is 15 lb. heavier than Diego. If Rashod and Juan weighed the same amount last year, how much does Diego weigh? Let  $j$  represent Juan's weight last year in pounds, and let  $d$  represent Diego's weight in pounds.

Draw a tape diagram to represent Juan's weight.

Draw a tape diagram to represent Rashod's weight.

Draw a tape diagram to represent Diego's weight.

What would combining all three tape diagrams look like?

Write an equation to represent Juan's tape diagram.

Write an equation to represent Rashod's tape diagram.

How can we use the final tape diagram or the equations above to answer the question presented?

Calculate Diego's weight.

We can use identities to defend our thought that  $d + 35 - 35 = d$ .

Does your answer make sense?

### Example 1

Marissa has twice as much money as Frank. Christina has \$20 more than Marissa. If Christina has \$100, how much money does Frank have? Let  $f$  represent the amount of money Frank has in dollars and  $m$  represent the amount of money Marissa has in dollars.

Draw a tape diagram to represent the amount of money Frank has.

Draw a tape diagram to represent the amount of money Marissa has.

Draw a tape diagram to represent the amount of money Christina has.

Which tape diagram provides enough information to determine the value of the variable  $m$ ?

Write and solve the equation.

The identities we have discussed throughout the module solidify that  $m + 20 - 20 = m$ .

What does the 80 represent?

Now that we know Marissa has \$80, how can we use this information to find out how much money Frank has?

Write an equation.

Solve the equation.

Once again, the identities we have used throughout the module can solidify that  $2f \div 2 = f$ .

What does the 40 represent?

Does 40 make sense in the problem?

**Station One: Use tape diagrams to solve the problem.**

Raeana is twice as old as Madeline, and Laura is 10 years older than Raeana. If Laura is 50 years old, how old is Madeline? Let  $m$  represent Madeline's age in years, and let  $r$  represent Raeana's age in years.

**Station Two: Use tape diagrams to solve the problem.**

Carli has 90 apps on her phone. Braylen has half the amount of apps as Theiss. If Carli has three times the amount of apps as Theiss, how many apps does Braylen have? Let  $b$  represent the number of Braylen's apps and  $t$  represent the number of Theiss's apps.

**Station Three: Use tape diagrams to solve the problem.**

Reggie ran for 180 yards during the last football game, which is 40 more yards than his previous personal best. Monte ran 50 more yards than Adrian during the same game. If Monte ran the same amount of yards Reggie ran in one game for his previous personal best, how many yards did Adrian run? Let  $r$  represent the number of yards Reggie ran during his previous personal best and  $a$  represent the number of yards Adrian ran.

**Station Four: Use tape diagrams to solve the problem.**

Lance rides his bike downhill at a pace of 60 miles per hour. When Lance is riding uphill, he rides 8 miles per hour slower than on flat roads. If Lance's downhill speed is 4 times faster than his flat road speed, how fast does he travel uphill? Let  $f$  represent Lance's pace on flat roads in miles per hour and  $u$  represent Lance's pace uphill in miles per hour.