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.

Problem Set

Use tape diagrams to solve each problem.

1. Dwayne scored 55 points in the last basketball game, which is 10 points more than his previous personal best. Lebron scored 15 points more than Chris in the same game. Lebron scored the same number of points as Dwayne's previous personal best. Let d represent the number of points Dwayne scored during his previous personal best and c represent the number of Chris's points.

    a. How many points did Chris score during the game?

    b. If these are the only three players who scored, what was the team's total number of points at the end of the game?

2. The number of customers at Yummy Smoothies varies throughout the day. During the lunch rush on Saturday, there were 120 customers at Yummy Smoothies. The number of customers at Yummy Smoothies during dinner time was 10 customers fewer than the number during breakfast. The number of customers at Yummy Smoothies during lunch was 3 times more than during breakfast. How many people were at Yummy Smoothies during breakfast? How many people were at Yummy Smoothies during dinner? Let d represent the number of customers at Yummy Smoothies during dinner and b represent the number of customers at Yummy Smoothies during breakfast.

3. Karter has 24 t-shirts. Karter has 8 fewer pairs of shoes than pairs of pants. If the number of t-shirts Karter has is double the number of pants he has, how many pairs of shoes does Karter have? Let p represent the number of pants Karter has and s represent the number of pairs of shoes he has.

4. Darnell completed 35 push-ups in one minute, which is 8 more than his previous personal best. Mia completed 6 more push-ups than Katie. If Mia completed the same amount of push-ups as Darnell completed during his previous personal best, how many push-ups did Katie complete? Let d represent the number of push-ups Darnell completed during his previous personal best and k represent the number of push-ups Katie completed.

5. Justine swims freestyle at a pace of 150 laps per hour. Justine swims breaststroke 20 laps per hour slower than she swims butterfly. If Justine's freestyle speed is three times faster than her butterfly speed, how fast does she swim breaststroke? Let b represent Justine's butterfly speed in laps per hour and r represent Justine's breaststroke speed in laps per hour.