Two-Step Problems—All Operations

Use tape diagrams and equations to solve the problem with visual models and algebraic methods.

Alyssa is twice as old as Brittany, and Jazmyn is 15 years older than Alyssa. If Jazmyn is 35 years old, how old is Brittany? Let a represent Alyssa's age in years and b represent Brittany's age in years.
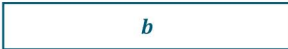
Use tape diagrams to solve each problem.

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.

Use tape diagrams and equations to solve the problem with visual models and algebraic methods.

Alyssa is twice as old as Brittany, and Jazmyn is 15 years older than Alyssa. If Jazmyn is 35 years old, how old is Brittany? Let a represent Alyssa's age in years and b represent Brittany's age in years.
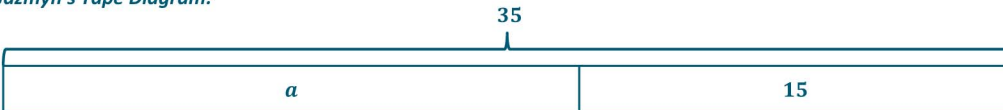
Brittany's Tape Diagram:

b

Alyssa's Tape Diagram:

b	b

Jazmyn's Tape Diagram:

35

a	15

Equation for Jazmyn's Tape Diagram:

$$a + 15 = 35$$
$$a + 15 - 15 = 35 - 15$$
$$a = 20$$

Now that we know Alyssa is 20 years old, we can use this information and Alyssa's tape diagram to determine Brittany's age.

$$2b = 20$$
$$2b \div 2 = 20 \div 2$$
$$b = 10$$

Therefore, Brittany is 10 years old.

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?

		55		
Dwayne		d		10
Lebron	c		15	10
	c		25	

Equation for Dwayne's Tape Diagram: $d + 10 = 55$

Equation for Lebron's Tape Diagram:

$$c + 15 + 10 = 55$$
$$c + 25 = 55$$
$$c + 25 - 25 = 55 - 25$$
$$c = 30$$

*Therefore, Chris scored 30 points in 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?

*Dwayne scored 55 points. Chris scored 30 points. Lebron scored 45 points (answer to Dwayne's equation). Therefore, the total number of points scored is $55 + 30 + 45 = 130$.*

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.

Tape Diagrams for Lunch:

120

b	b	b

Tape Diagram for Dinner:

b

d	10
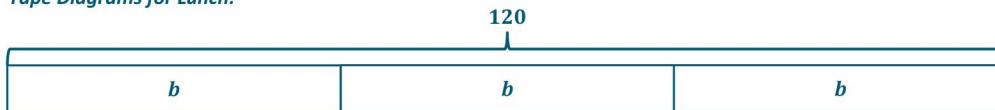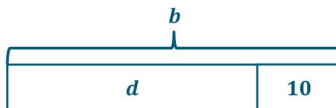
Equation for Lunch's Tape Diagram:

$$3b = 120$$
$$3b \div 3 = 120 \div 3$$
$$b = 40$$

Now that we know 40 customers were at Yummy Smoothies for breakfast, we can use this information and the tape diagram for dinner to determine how many customers were at Yummy Smoothies during dinner.

$$d + 10 = 40$$
$$d + 10 - 10 = 40 - 10$$
$$d = 30$$

Therefore, 30 customers were at Yummy Smoothies during dinner and 40 customers 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.

Tape Diagram for T-Shirts:

24

p	p

Tape Diagram for Shoes:

p

s	8
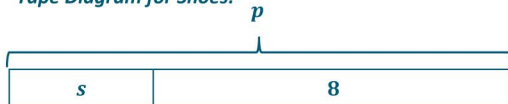
Equation for T-Shirts Tape Diagram:

$$2p = 24$$
$$2p \div 2 = 24 \div 2$$
$$p = 12$$

Equation for Shoes Tape Diagram:

$$s + 8 = 12$$
$$s + 8 - 8 = 12 - 8$$
$$s = 4$$

Karter has 4 pairs of shoes.

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.

35		
d		8
k	6	8
k	14	

$d + 8 = 35$

$$k + 6 + 8 = 35$$
$$k + 14 = 35$$
$$k + 14 - 14 = 35 - 14$$
$$k = 21$$

Katie completed 21 push-ups.

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.

Tape Diagram for Breaststroke:

b	
r	20

Tape Diagram for Freestyle:

150		
b	b	b

$$3b = 150$$
$$3b \div 3 = 150 \div 3$$
$$b = 50$$

Therefore, Justine swims butterfly at a pace of 50 laps per hour.

$$r + 20 = 50$$
$$r + 20 - 20 = 50 - 20$$
$$r = 30$$

Therefore, Justine swims breaststroke at a pace of 30 laps per hour.