6.7 Solve Problems by Working Backward

YOU WILL NEED
- a number line
- red and blue counters

GOAL

Solve problems using the strategy of working backward.

LEARN ABOUT the Math

Nayana showed a number trick to Nestor.
She told him to follow these steps:

1. Think of a number. →	**2.** Add +1. →	**3.** Subtract −3. →	**4.** Add −5. →	**5.** Name the result.

Nestor said that his result was −2.
Nayana said, "I think your starting number was −1."

How did Nayana know Nestor's starting number?

1 Understand the Problem

Nestor wants to know how Nayana determined his number from his result.

2 Make a Plan

Nestor realizes that he needs to start with the result and work backward through the steps to figure out the original number.

3 Carry Out the Plan

Nestor completes the original steps in order.
Then he works backward from the result.

Original Steps

1. Think of a number. →	**2.** Add +1. →	**3.** Subtract −3. →	**4.** Add −5. →	**5.** Name the result.
?	+(+1)	−(−3)	+(−5)	= (−2)

Working Backward

5. The result is -2.	→	**4.** Subtract -5.	→	**3.** Add -3.	→	**2.** Subtract $+1$.	→	**1.** The number I thought of is -1.
(-2)		$-(-5)$		$+(-3)$		$-(+1)$		$=(-1)$

It works!

Reflecting

A. How does working backward help Nestor solve Nayana's number trick?

WORK WITH the Math

Example | Working backward

Bill played three rounds in a golf tournament. His second-round score was 6 lower than his first-round score. His third-round score was 2 higher than his second-round score. His score for the third round was -3. What was his first-round score?

Nayana's Solution

1 Understand the Problem

I need to determine the first-round score. I already have the score for the third round. I also know how he did in the second round.

2 Make a Plan

I will draw boxes to show each step. Then I will work backward.

3 Carry Out the Plan

Each box represents one step.

First-round score → Add -6. → Second-round score → Add $+2$. → Third-round score is -3.

I can work backward from the result.

Third-round score is -3. → Subtract $+2$. → Second-round score → Subtract -6. → First-round score

$(-3) - (+2) = (-5)$
His second-round score was -5.

$(-5) - (-6) = (+1)$
His first round score was $+1$.

A Checking

1. Try Nayana's trick using another number. Is there a quick way to figure out the original number? If so, explain how it works.

2. John did this number trick.
   - Think of a number.
   - Add +2.
   - Subtract −1.
   - Add −2.
   - The result is +4.

   What was the original number? State the steps, in order, that you used.

B Practising

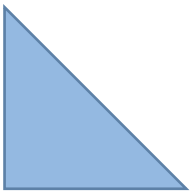
3. Jane did this calculation.
   - Add −12.
   - Subtract −9.
   - Add +8.
   - Subtract −2.
   - The result is +5.

   What was the original number? State the steps, in order, that you used.

4. Make up a number trick that gives you the original number as the result. Your trick must have at least four steps. The last step must be subtract +3.

5. Lloyd is lifting weights over a nine-week training period. Every week, he lifts 2 kg more than he lifted the previous week. During the ninth week, he lifts 80 kg. How much was he lifting during his first week?

6. During a clothing sale, the price goes down by half each day an item is not sold. If an item costs $2.50 after eight days, what was the original price?



7. Ramona takes a shape and cuts away half of it five times. The triangle at the left is what remains. Draw the original shape.

8. Make up a problem you can solve by working backward. Show how to solve it.