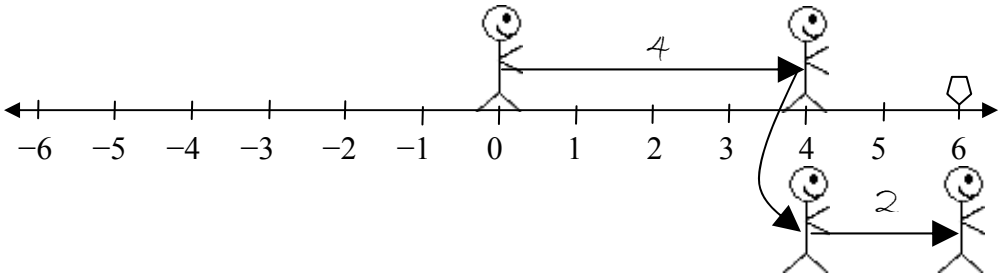
Operations on Integers Using the Number Line Model

Name _____
Group _____

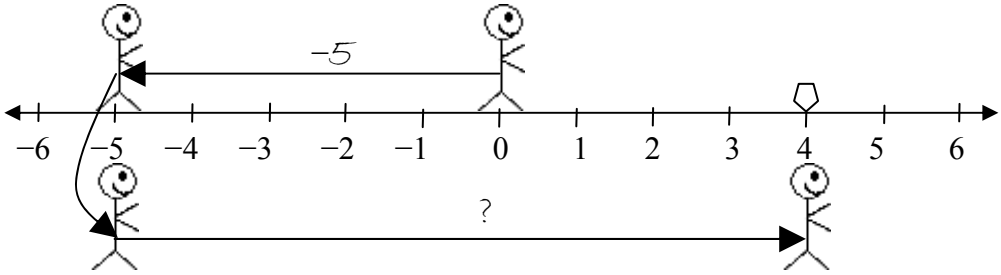
Addition

In the number line model below for addition, a person starts at 0 and "walks" on the number line.
The person walks forward for positive integers and backward for negative integers. (Ideally, children walk the description.)
The addition symbol (+) indicates combining the two walks. For example, to model the number sentence 4 + 2 = 6:



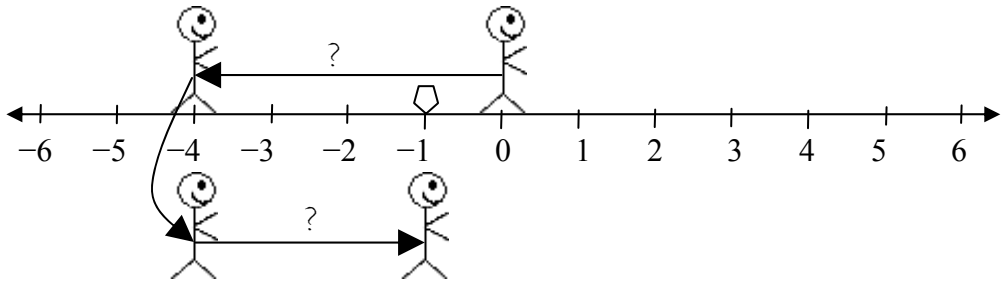
1. Start at 0, facing right
2. Walk 4 steps forward
3. Walk 2 steps forward
4. End at 6

1. A completed "number line walk" is sketched below. To the right is a four step description of the walk.
   a. Complete the blanks in the description to the right (Steps 3 and 4.).
   b. Write the correct number above the second arrow.
   c. Write the addition number sentence which is modeled. _____



1. Start at 0, facing right.
2. Walk 5 steps **backward.**
3. Walk ____ steps forward.
4. End at _____.

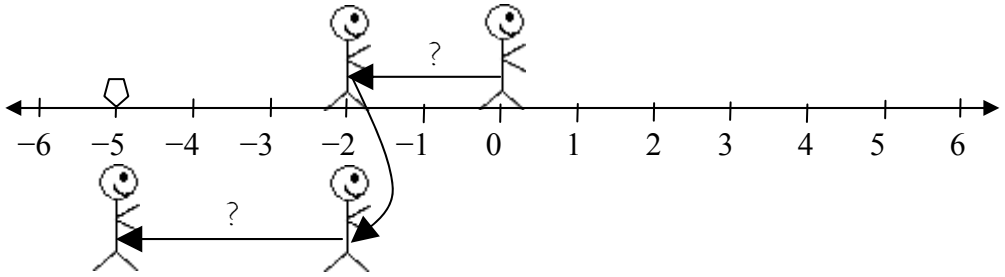
2. A completed "number line walk" is sketched below. To the right is a four step description of the walk.
   a. Complete the blanks in the description to the right (Steps 3 and 4.).
   b. Write the correct number above each arrow.
   c. Write the addition number sentence which is modeled. _____



1. Start at 0, facing right.
2. Walk ____ steps **backward.**
3. Walk ____ steps forward.
4. End at _____.

3. List any similarities and differences between the number line walks in Question 1 and 2.

4. A completed "number line walk" is sketched below. To the right is a four step description of the walk.
   a. Complete the blanks in the description to the right (Steps 2, 3 and 4.).
   b. Write the correct number above the each arrow.
   c. Write the addition number sentence which is modeled. _____

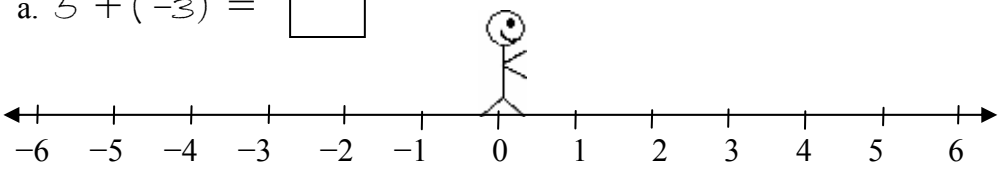


1. Start at 0, facing right.
2. Walk ___ steps **backward.**
3. Walk ____ steps **backward.**
4. End at _____.

5. List any similarities and differences between the number line walk in Question 4 with the example given for $4 + 2 = 6$.

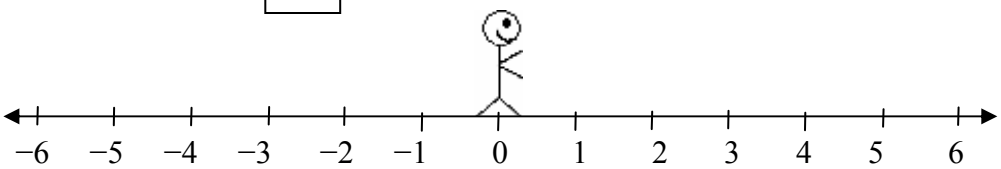
Practice:
Illustrate and find the following using the number line model, and give a 4 step description.

a. $5 + (-3) =$ ☐



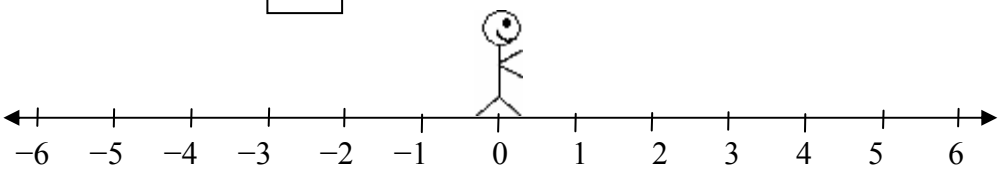
1. Start at 0, facing right.
2. Walk _____
3. Walk _____
4. End at _____.

b. $-5 + 3 =$ ☐



1. Start at 0, facing right.
2. Walk _____.
3. Walk _____.
4. End at _____.

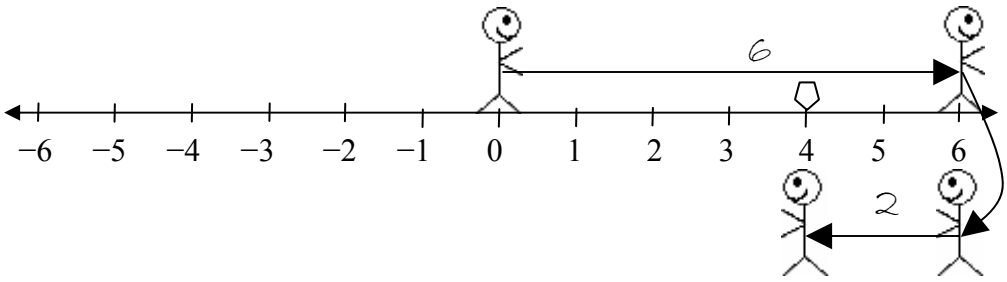
c. $-3 + 8 =$ ☐



1. Start at 0, facing right.
2. Walk _____
3. Walk _____
4. End at _____.

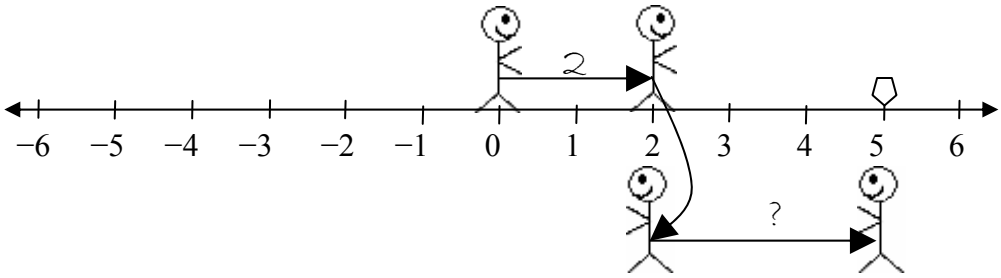
Subtraction

The number line may also be used to model subtraction of integers. As in addition, positive integers are modeled by the walker walking forward and negative integers are modeled by the walker walking backward. The subtraction model differs from the additional model only in modeling of the *operation symbol*. The subtraction symbol (−) is modeled by changing the direction the walker is facing. When modeling addition, the walker always faces right, but in subtraction, after the first walk, the walker turns to face left. For example, to model the subtraction number sentence 6 − 2 =4:



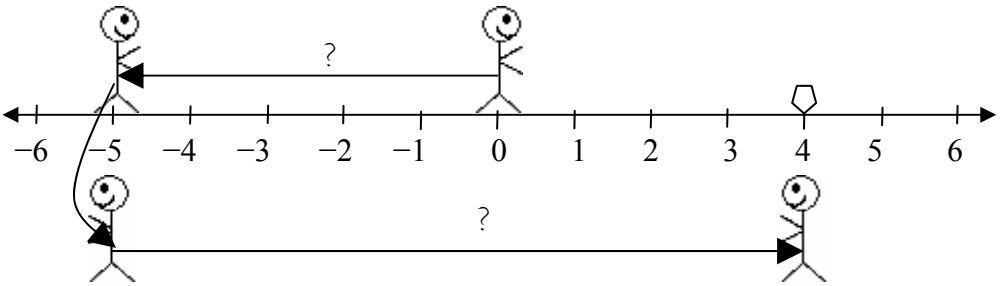
1. Start at 0, facing right.
2. Walk 6 steps forward.
3. Turn, face left.
4. Walk 2 steps forward.
5. End at 2.

6. A completed "number line walk" is sketched below. To the right is a five step description of the walk.
   a. Complete the blanks in the description to the right (Steps 4 and 5.).
   b. Write the correct number above the second arrow.
   c. Write the subtraction number sentence which is modeled. _____



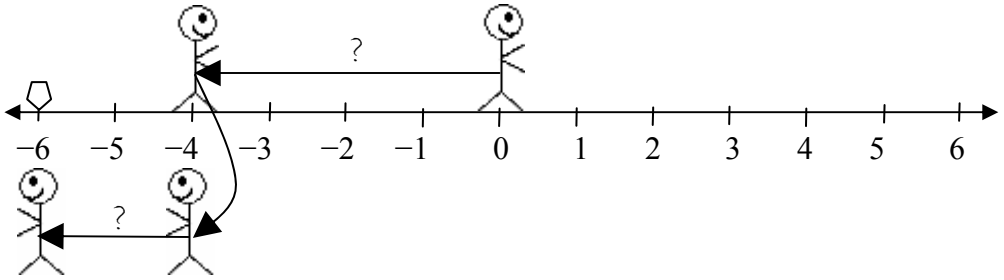
1. Start at 0, facing right.
2. Walk 2 steps forward
3. Turn, face left
4. Walk ____ steps **backward.**
5. End at _____.

7. A completed "number line walk" is sketched below. To the right is a four step description of the walk.
   a. Complete the blanks in the description to the right (Steps 2, 4 and 5.).
   b. Write the correct number above each arrow.
   c. Write the subtraction number sentence which is modeled. _____



1. Start at 0, facing right.
2. Walk ____ steps **backward.**
3. Turn, face left
4. Walk ____ steps **backward.**
5. End at _____.

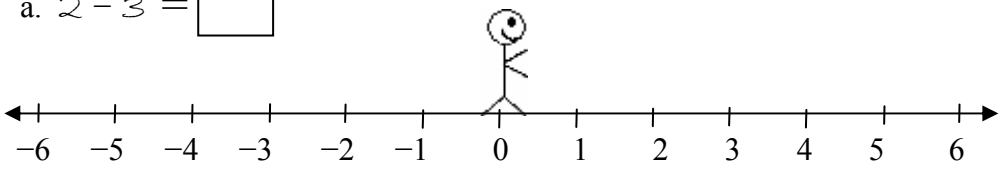
8. A completed "number line walk" is sketched below. To the right is a five step description of the walk.
   a. Complete the blanks in the description to the right (Steps 2, 4 and 5.).
   b. Write the correct number above each arrow.
   c. Write the subtraction number sentence which is modeled. _____



1. Start at 0, facing right.
2. Walk ____ steps **backward.**
3. Turn, face left
4. Walk ____ steps forward.
5. End at _____.

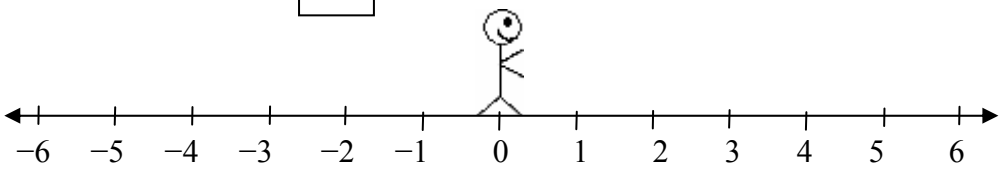
Practice:
Illustrate and find the following using the number line model, and give a 5 step description.

a. $2 - 3 =$ ☐



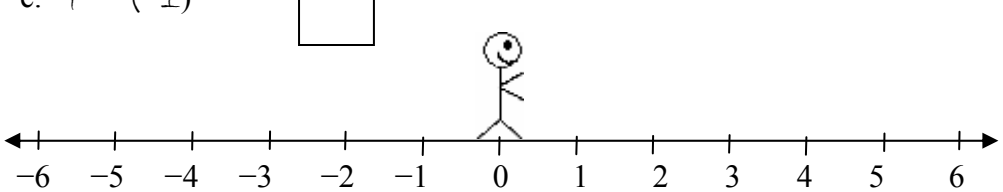
1. Start at 0, facing right.
2. _____
3. _____
4. _____
5. _____

b. $-4 - (-1) =$ ☐



1. Start at 0, facing right.
2. _____
3. _____
4. _____
5. _____

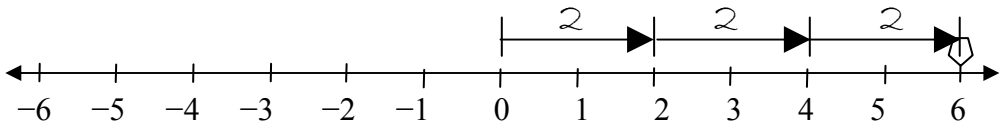
c. $4 - (-1) =$ ☐



1. Start at 0, facing right.
2. _____
3. _____
4. _____
5. _____

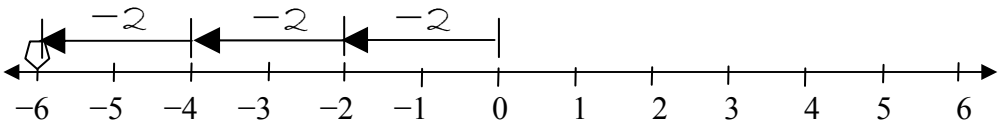
Multiplication

Just as we can represent $3 \times 2 = 6$ using the number line idea of repeated addition ($3 \times 2 = 2 + 2 + 2 = 6$),



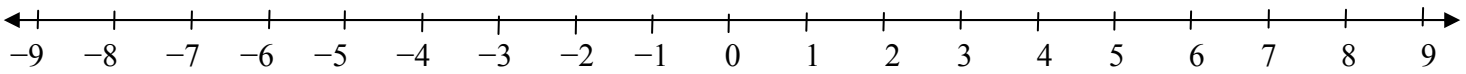
(Description: "Walk 2 steps forward for a total of 3 times. End at 6.")

we can represent $3 \times -2 = (-2) + (-2) + (-2) = -6$:



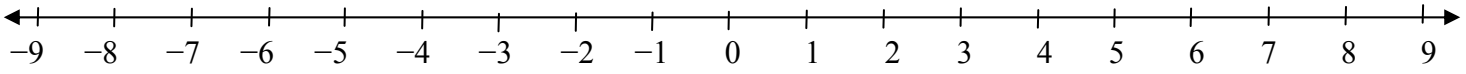
(Description: "Walk 2 steps backward for a total of 3 times. End at −6.")

9. Find and illustrate $2 \times -4 =$ ☐. Give a description of the walk. Stick figure is optional.



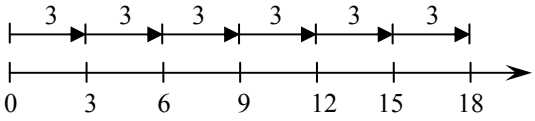
Description:_____

10. Find and illustrate $4 \times -2 =$ ☐. Give a description of the walk. Stick figure is optional.



Description:_____

11. Write the multiplication number sentence represented by the following number line model.



Division

12. Write the division number sentence represented by the following number line model.