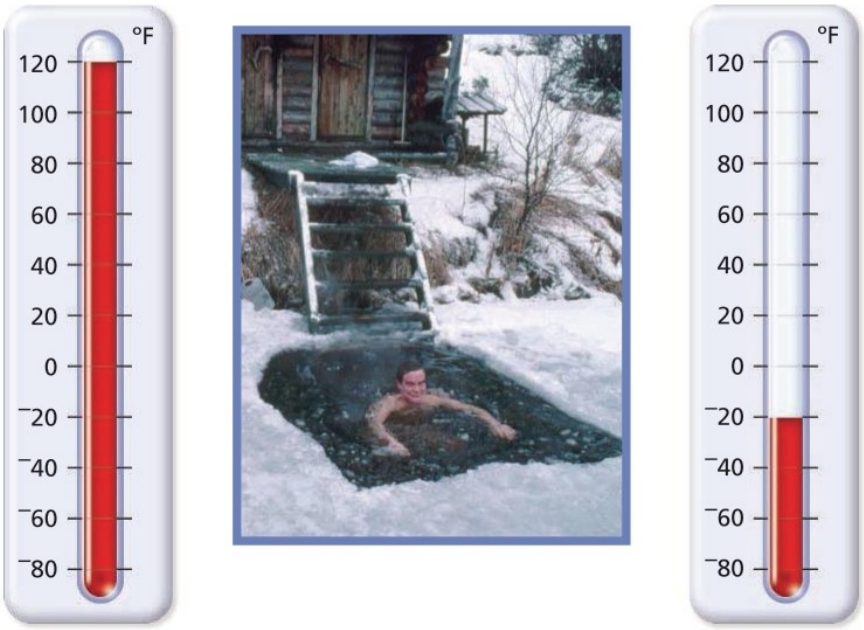
1.3 From Sauna to Snowbank

Using a Number Line

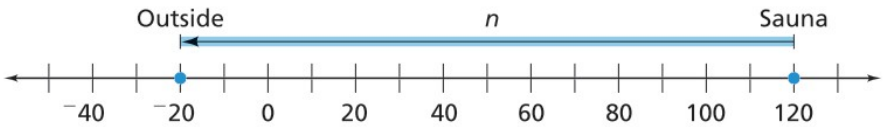
In Finland, people sit for a short time in sauna houses that are heated up to temperatures as high as 120°F. Then they go outside, where the temperature may be as low as ⁻20°F, to cool off.

The two thermometers shown are similar to vertical number lines. On a thermometer, a move down shows a decrease in value. The temperatures get colder. A move up shows an increase in value. The temperatures get hotter.

Inside the Sauna **Outside in Snow**



One horizontal number line can show the same information as the two thermometers.

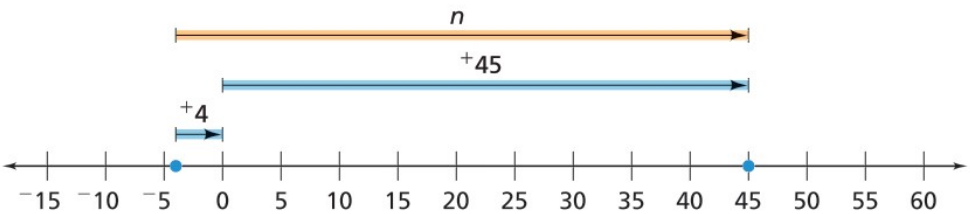


- What does n represent?
- What does the number sentence $120 + n = {}^{-}20$ tell you?
- What does the number sentence ${}^{-}20 + n = 120$ tell you?

On a number line, a move to the left is a move in a negative direction. The numbers decrease in value. A move to the right is a move in a positive direction. The numbers increase in value.

The National Weather Service keeps records of temperature changes. The world record for the fastest rise in outside air temperature occurred in Spearfish, South Dakota, on January 22, 1943. The temperature rose from $^{-}4$°F to 45°F in two minutes.

- What was the temperature change over those two minutes?
- How could you show this change, n, on the number line?



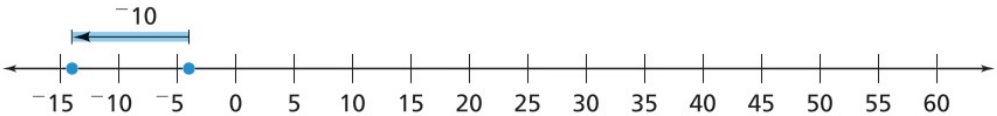
From $^{-}4$°F to 0°F is a change of $^{+}4$°F. From 0°F to 45°F is a change of $^{+}45$°F. The total change is $^{+}49$°F. The following number sentences show this.

$$^{-}4 + n = {}^{+}45$$

$$^{-}4 + {}^{+}49 = {}^{+}45$$

The sign of the change in temperature shows the direction of the change. In this case, $^{+}49$ means the temperature increased 49°F.

If the temperature had instead dropped 10°F from $^{-}4$°F, you would write the change as $^{-}10$°F. The final temperature would be $^{-}14$°F.



$$^{-}4 + {}^{-}10 = n$$

$$^{-}4 + {}^{-}10 = {}^{-}14$$

- If the current temperature is 5°F, what change in temperature would result in a final temperature of $^{-}25$°F?

Problem 1.3

Sketch number lines for Questions A–D. Write number sentences for Questions A–E.

A A person goes from a sauna at 115°F to an outside temperature of $^{-}30$°F. What is the change in temperature?

B The temperature reading on a thermometer is 25°F at noon. During the afternoon, the temperature changes. What is the new reading for each temperature change?

1. rises 10°F
2. falls 2°F
3. falls 30°F

C The temperature reading on a thermometer is $^{-}15$°F. What is the new reading for each temperature change?

1. $^{+}3$°F
2. $^{-}10$°F
3. $^{+}40$°F

D What is the change in temperature when the thermometer reading moves from the first temperature to the second temperature?

1. 20°F to $^{-}10$°F
2. $^{-}20$°F to $^{-}10$°F
3. $^{-}20$°F to 10°F
4. $^{-}10$°F to $^{-}20$°F
5. 20°F to 10°F
6. 10°F to 20°F
7. Describe a strategy for finding the difference of two temperatures.

E

1. The temperature was $^{-}5$°F when Sally went to school on Monday. The temperature rose 20°F during the day, but fell 25°F during the night. A heat wave increased the temperature 40°F on Tuesday, but then an arctic wind overnight decreased the temperature 70°F! What was the temperature on Wednesday? Explain how you found your answer.
2. Sally's work for finding Monday's temperature changes in part (1) is shown below. Do you agree with Sally's computation? Explain your reasoning.

$$\begin{aligned} {}^{-}5 + 20 + {}^{-}25 &= {}^{+}15 + {}^{-}25 \\ &= {}^{+}15 - 25 \\ &= {}^{-}10 \end{aligned}$$

ACE Homework starts on page 20.