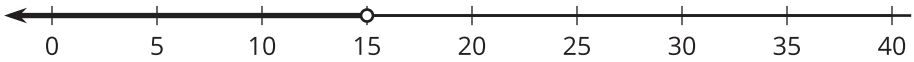
Solutions of Inequalities

Let's think about the solutions to inequalities.

13.1 Andre's Number Line

Andre drew this number line to represent $15 < n$.



Do you agree with Andre's number line? Explain your reasoning.

13.2 Amusement Park Rides

Priya finds these height requirements for some of the rides at an amusement park.

To ride the . . .	you must be . . .
High Bounce	between 55 and 72 inches tall
Climb-A-Thon	under 60 inches tall
Twirl-O-Coaster	58 inches minimum

1. Write equations and/or inequalities for the height requirements of each ride. Use h for the unknown height. Then, represent each height requirement on a number line.
   - High Bounce

   - Climb-A-Thon

   - Twirl-O-Coaster

2. Han's cousin is 55 inches tall. Han doesn't think she is tall enough to ride the High Bounce, but Kiran believes that she is tall enough. Do you agree with Han or Kiran? Be prepared to explain your reasoning.

3. Priya can ride the Climb-A-Thon, but she cannot ride the High Bounce or the Twirl-O-Coaster. Which of the following could be Priya's height? Be prepared to explain your reasoning.
    - 59 inches
    - 53 inches
    - 56 inches

4. Jada is 56 inches tall. Which rides can she go on?

5. Kiran is 60 inches tall. Which rides can he go on?

6. The inequalities $h < 75$ and $h > 64$ represent the height restrictions, in inches, of another ride. Write three values that are **solutions** to both of these inequalities.

Are you ready for more?

1. Represent the height restrictions for all three rides on a single number line, using a different color for each ride.

2. Which part of the number line is shaded with all 3 colors?

3. Name one possible height a person could be in order to go on all three rides.

13.3 The Roller Coaster

A sign next to a roller coaster says, "You must be at least 60 inches tall to ride." Noah is happy to know that he is tall enough to ride.

1. Noah is x inches tall. Which of the following can be true? Explain how you know.

   A. $x > 60$

   B. $x = 60$

   C. $x < 60$

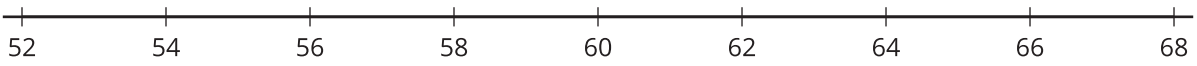
2. Noah's friend is 2 inches shorter than Noah. Can you tell if Noah's friend is tall enough to go on the ride? Explain or show your reasoning.

3. List a possible height for Noah that would mean:

   a. That his friend is tall enough to go on the ride.

   b. That his friend is not tall enough for the ride.

4. On the number line, show all the possible heights that Noah's friend could be.



5. Noah's friend is y inches tall. Use y and any of the symbols $<$, $=$, $>$ to express this height.

Lesson 13 Summary

Inequalities can be used to describe a range of numbers. Let's say a movie ticket costs less than \$15. If c represents the cost of a movie ticket, we can use $c < 15$ to express what we know about the cost of a ticket.

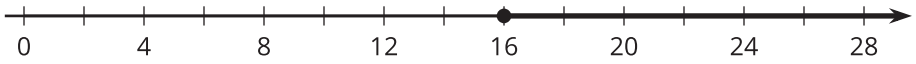
Any value of c that makes the inequality true is called a **solution to the inequality**.

For example, 5 is a solution to the inequality $c < 15$ because $5 < 15$ (or "5 is less than 15") is a true statement, but 17 is not a solution because $17 < 15$ ("17 is less than 15") is *not* a true statement.

The inequality $c < 15$ can be represented on a number line. The open circle at 15 shows that 15 is not a solution. The shading and arrow pointing left from 15 shows that all numbers less than 15 are solutions.

Here's another example. In many places, people are eligible to get a driver's license when they are at least 16 years old. If h is the age of a person, then we can check if they are eligible to get a driver's license by checking if their age makes the inequality $h > 16$ (they are older than 16) or the equation $h = 16$ (they are 16) true. The symbol $\geq$, pronounced "greater than or equal to," combines these two cases and we can just check if $h \geq 16$ (their age is greater than or equal to 16).

The inequality $h \geq 16$ can be represented on a number line. The closed, or filled in, circle at 16 shows that 16 is a solution. The shading and arrow pointing right from 16 shows that all numbers greater than 16 are also solutions.



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