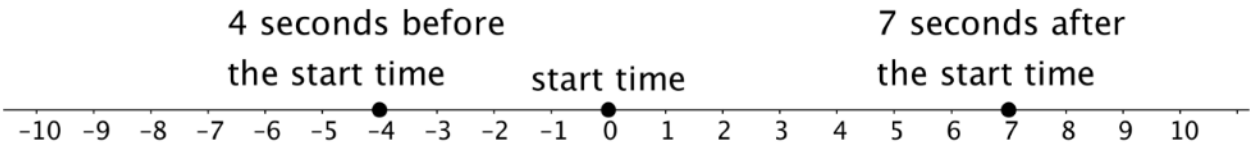
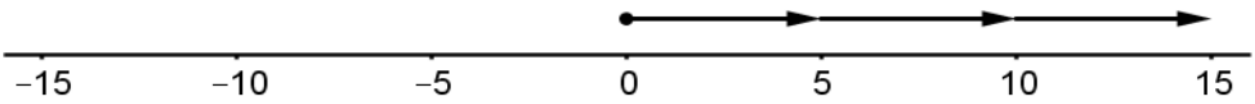
NAME DATE PERIOD

Lesson 9 Summary

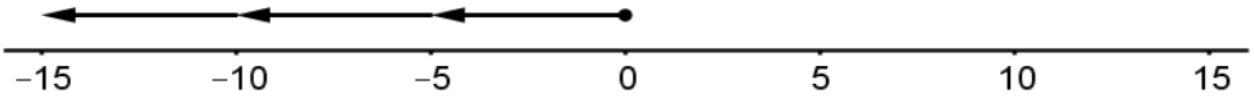
We can use signed numbers to represent time relative to a chosen point in time. We can think of this as starting a stopwatch. The positive times are after the watch starts, and negative times are times before the watch starts.



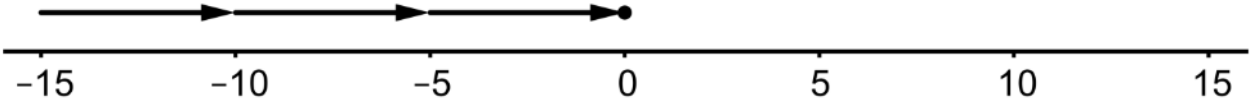
If a car is at position 0 and is moving in a positive direction, then for times after that (positive times), it will have a positive position. A positive times a positive is positive.



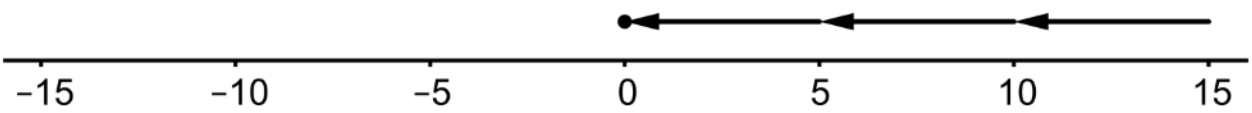
If a car is at position 0 and is moving in a negative direction, then for times after that (positive times), it will have a negative position. A negative times a positive is negative.



If a car is at position 0 and is moving in a positive direction, then for times *before* that (negative times), it must have had a negative position. A positive times a negative is negative.



If a car is at position 0 and is moving in a negative direction, then for times *before* that (negative times), it must have had a positive position. A negative times a negative is positive.



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Here is another way of seeing this:

We can think of $3 \cdot 5$ as $5 + 5 + 5$, which has a value of 15.

We can think of $3 \cdot (-5)$ as $(-5) + (-5) + (-5)$, which has a value of -15.

We can multiply positive numbers in any order:

$$3 \cdot 5 = 5 \cdot 3$$

If we can multiply signed numbers in any order, then $-5 \cdot 3 = -15$.

We can find $-5 \cdot (3 + (-3))$ two ways:

- $-5 \cdot 0 = 0$
- $-5 \cdot 3 + (-5) \cdot (-3)$ (this is the distributive property)

That means that

$$-5 \cdot 3 + (-5) \cdot (-3) = 0$$

Which is the same as

$$-15 + (-5) \cdot (-3) = 0$$

So

$$-5 \cdot (-3) = 15$$

There was nothing special about these particular numbers. This always works!

- A positive times a positive is always positive
- A negative times a positive or a positive times a negative is always negative
- A negative times a negative is always positive