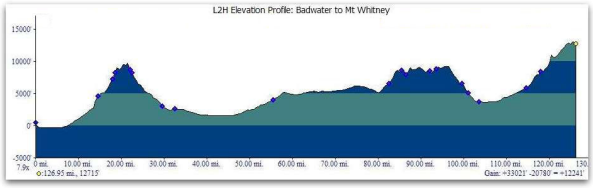
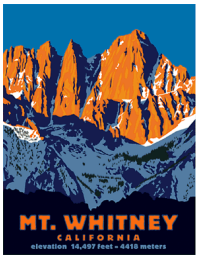
3.1 Introduction to Integers

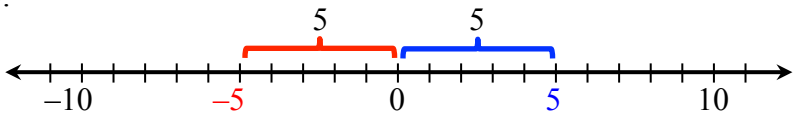
California can boast that it has the lowest point in North America, Badwater Basin in Death Valley as well as the highest point in the contiguous United States, Mt. Whitney, in the Sierra Nevada mountains. In mid-July, adventurous runners can compete in the grueling Badwater Ultramarathon, an 85-mile run beginning at Badwater in temperatures as high as 130º F and ending at Mt. Whitney with temperatures as low as 50º F.





The above photos and elevation profile of the terrain between Badwater Basin and Mt. Whitney show that we use the number, –282 feet to describe the elevation of Badwater Basin, and the number, 14,497 feet to describe the elevation of Mr. Whitney. Note that sea level is considered to be 0 feet.

These numbers are examples of integers. The set of ***integers*** is the set of whole numbers and their opposites, where ***opposites*** are numbers that have the same distance from the origin, 0, on a number line. For example, –5 is the opposite of 5, and, conversely, 5 is the opposite of –5.



Here are some other uses for integers:

	Symbol	Order	May be used to reference
Negative integers	–	Less than 0	• debt • depth below sea level • Celsius temperatures below freezing • investment loss
Positive integers	+	Greater than 0	• assets • height above sea level • Celsius temperatures above freezing • investment gain

Comparison of Numbers

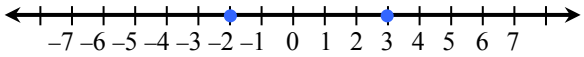
Vocabulary

The symbol "<" denotes *less than*.
The symbol ">" denotes *greater than*.

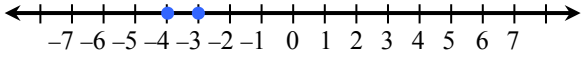
Think:
"<" is "<ess than" because < looks similar to an L, and ">" is "greater than" because > looks like the tail of a g.

A smaller number lies to the left of a larger on the number line.

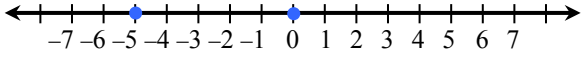
$-2 < 3$ and $3 > -2$



$-4 < -3$ and $-3 > -4$



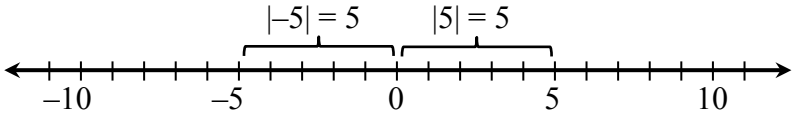
$-5 < 0$ and $0 > -5$



Demonstration Problems			***Practice Problems***		
Insert the correct symbol <, >, or =			Insert the correct symbol <, >, or =		
1. (a)	5	–3	**1. (b)**	–5	3
2. (a)	–3	5	**2. (b)**	3	–5
3. (a)	–8	–3	**3. (b)**	–9	–5
4. (a)	0	–10	**4. (b)**	0	–8
			Answers: **1. (b)** < ; **2. (b)** > ; **3 (b)** <; **4. (b)** >		

Absolute Value

The *absolute value* of a number is the distance from that number to the origin.
We denote the absolute value of x as $|x|$. Use the number line below to find the following absolute values.



Note: Since $|5| = 5$, then $-|5| = -5$ and
since $|-3| = 3$, then $-|-3| = -3$.

Demonstration Problems	*Practice Problems*
5. (a) $\lvert 8 \rvert =$	**5. (b)** $\lvert 4 \rvert$
6. (a) $\lvert -7 \rvert =$	**6. (b)** $\lvert -14 \rvert =$
7. (a) $-\lvert -7 \rvert =$	**7. (b)** $-\lvert -14 \rvert =$
8. (a) $-(-7) =$	**8. (b)** $-(-14) =$
	Answers: **5. (b)** 4; **6. (b)** 14; **7. (b)** –14; **8. (b)** 14;