Indicator 11 Class Notes by Mrs. Joshi

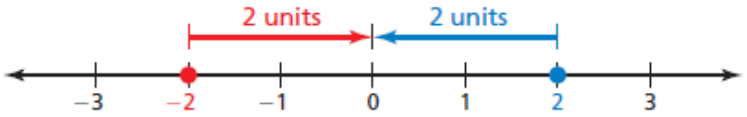
Absolute Value
and
Comparing Numbers

Key Idea

Absolute Value

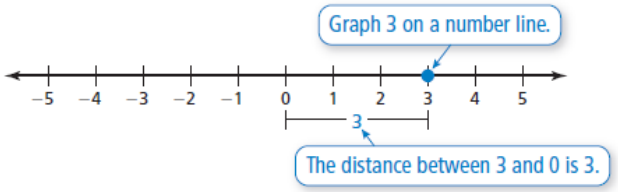
Words The **absolute value** of a number is the distance between the number and 0 on a number line. The absolute value of a number a is written as $|a|$.

Numbers $|-2| = 2$ $|2| = 2$



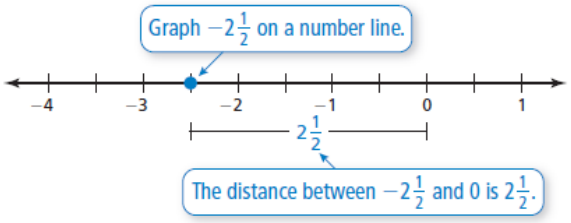
EXAMPLE 1 Finding Absolute Value

a. Find the absolute value of 3.



∴ So, $|3| = 3$.

b. Find the absolute value of $-2\frac{1}{2}$.



∴ So, $\left|-2\frac{1}{2}\right| = 2\frac{1}{2}$.

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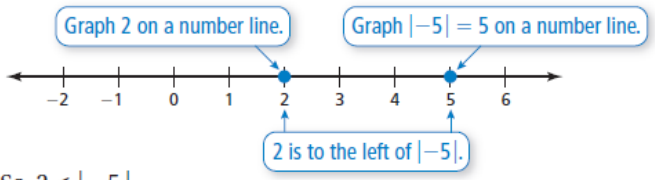
EXAMPLE 2 Comparing Values

Compare 2 and $|-5|$.



∴ So, $2 < |-5|$.

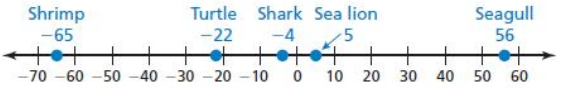
EXAMPLE 3 Real-Life Application

Animal	Elevation (ft)
Shark	−4
Sea lion	5
Seagull	56
Shrimp	−65
Turtle	−22

The table shows the elevations of several animals.

a. Which animal is the deepest? Explain.

Graph each elevation.



The lowest elevation represents the animal that is the deepest. The integer farthest to the left on the number line is −65.

∴ So, the shrimp is the deepest.

b. Is the shark or the sea lion closer to sea level?

Because sea level is at 0 feet, use absolute values.

Shark: $|-4| = 4$ **Sea lion:** $|5| = 5$

The shark is 4 feet from sea level and the sea lion is 5 feet from sea level.

∴ Because 4 is less than 5, the shark is closer to sea level than the sea lion.

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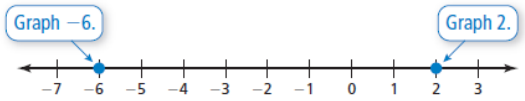
On a number line, numbers to the left are less than numbers to the right. Numbers to the right are greater than numbers to the left.

EXAMPLE 1 Comparing Integers

Remember

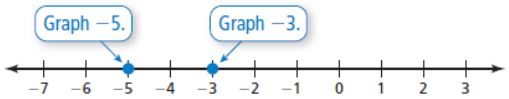
The symbol < means "is less than" and the symbol > means "is greater than."

a. Compare 2 and −6.



∴ 2 is to the right of −6. So, $2 > -6$.

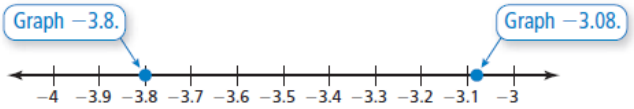
b. Compare −5 and −3.



∴ −5 is to the left of −3. So, $-5 < -3$.

EXAMPLE 2 Comparing Decimals

Compare −3.08 and −3.8.



∴ −3.08 is to the right of −3.8. So, $-3.08 > -3.8$.

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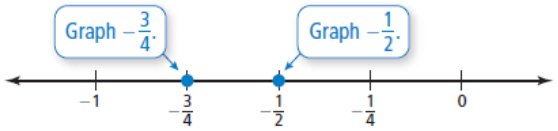
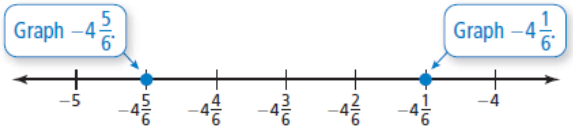
EXAMPLE 3 Comparing Fractions and Mixed Numbers

a. Compare $-\frac{1}{2}$ and $-\frac{3}{4}$.



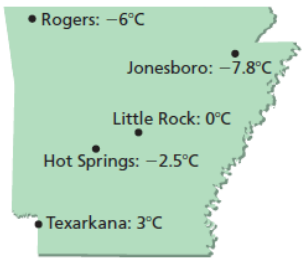
∴ $-\frac{1}{2}$ is to the right of $-\frac{3}{4}$. So, $-\frac{1}{2} > -\frac{3}{4}$.

b. Compare $-4\frac{5}{6}$ and $-4\frac{1}{6}$.



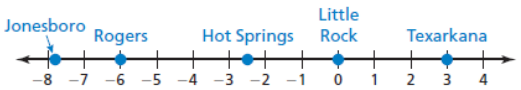
∴ $-4\frac{5}{6}$ is to the left of $-4\frac{1}{6}$. So, $-4\frac{5}{6} < -4\frac{1}{6}$.

EXAMPLE 4 Real-Life Application



The diagram shows a day's low temperatures for several cities in Arkansas. Which city had the coldest low temperature?

Graph each temperature on a number line.



∴ −7.8 is farthest to the left on the number line.
So, Jonesboro had the coldest low temperature.

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Number Line Operations

Key Idea

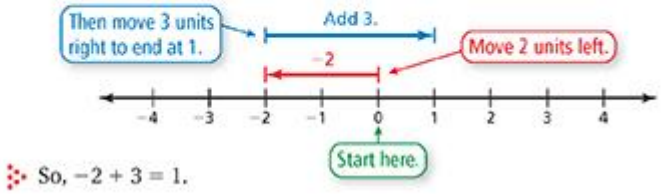
Adding and Subtracting on a Number Line

To *add* a positive number, move to the *right* on a number line.

To *subtract* a positive number, move to the *left* on a number line.

EXAMPLE 1 Adding Integers

Use a number line to find $-2 + 3$.

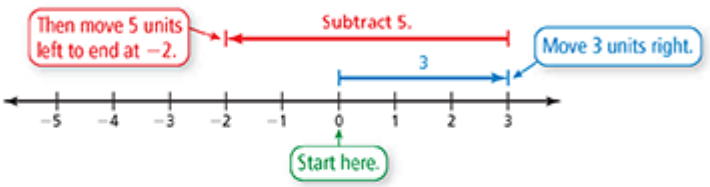


So, $-2 + 3 = 1$.

EXAMPLE 2 Subtracting Integers

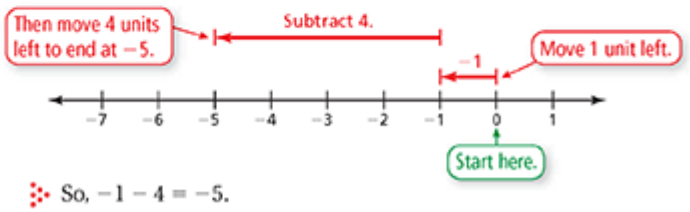
Use a number line to find (a) $3 - 5$ and (b) $-1 - 4$.

a.



So, $3 - 5 = -2$.

b.



So, $-1 - 4 = -5$.

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EXAMPLE 3 Standardized Test Practice

Price of Stock	
Month	Change
May	Down $4
June	Down $14

Which expression can be used to find the change in the stock price for May and June?

Ⓐ $-4 + 14$ Ⓑ $4 - 14$ Ⓒ $-4 - 14$ Ⓓ $14 - 4$

The word *down* indicates negative integers. So, move left on a number line for both May and June. The only expression where you move left twice on the number line is $-4 - 14$.

∴ The correct answer is Ⓒ.

EXAMPLE 4 Real-Life Application

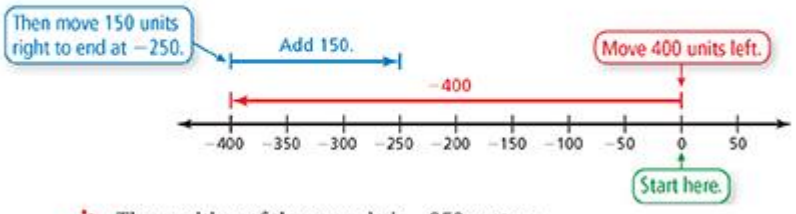
The diving capsule is raised 150 meters. Write and evaluate an expression that represents the position of the capsule after it is raised.

The phrase *below water surface* indicates a negative integer. So, -400 represents the position of the capsule before it is raised.

Words The position of the capsule | is raised | 150 meters.

Expression -400 | $+$ | 150

An expression is $-400 + 150$.



∴ The position of the capsule is -250 meters.

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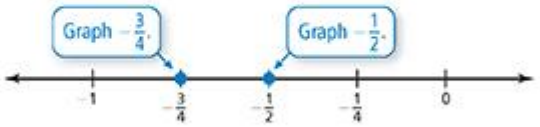
Fractions on the Number Line

EXAMPLE 1 Comparing Fractions

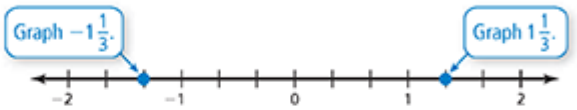
Which is greater, $-\frac{1}{2}$ or $-\frac{3}{4}$?



∴ $-\frac{1}{2}$ is to the right of $-\frac{3}{4}$. So, $-\frac{1}{2}$ is greater.

EXAMPLE 2 Comparing Mixed Numbers

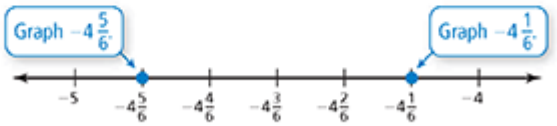
a. Which is greater, $1\frac{1}{3}$ or $-1\frac{1}{3}$?



Any positive number is greater than *any* negative number.

∴ So, $1\frac{1}{3}$ is greater.

b. Which is greater, $-4\frac{5}{6}$ or $-4\frac{1}{6}$?



∴ $-4\frac{1}{6}$ is to the right of $-4\frac{5}{6}$. So, $-4\frac{1}{6}$ is greater.

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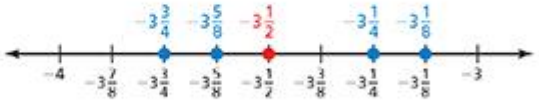
EXAMPLE 3 Finding a Median

Find the median of $-3\frac{1}{2}$, $-3\frac{3}{4}$, $-3\frac{1}{8}$, $-3\frac{1}{4}$, and $-3\frac{5}{8}$.

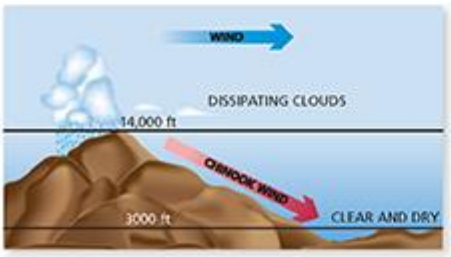
Graph the numbers on a number line.



∴ The middle value is $-3\frac{1}{2}$. So, the median is $-3\frac{1}{2}$.

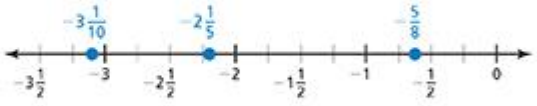
EXAMPLE 4 Real-Life Application

A *Chinook wind* is a warm mountain wind that can cause huge temperature changes. The table shows three of the biggest temperature drops ever recorded after a Chinook wind occurred. On which date did the temperature drop the fastest? Explain.



Date	Temperature change
November 10, 1911	$-\frac{5}{8}$°F per minute
January 10, 1911	$-3\frac{1}{10}$°F per minute
January 22, 1943	$-2\frac{1}{5}$°F per minute

Graph the numbers on a number line.



∴ $-3\frac{1}{10}$ is farthest to the left. So, the temperature dropped the fastest on January 10, 1911.

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Decimals on the Number Line

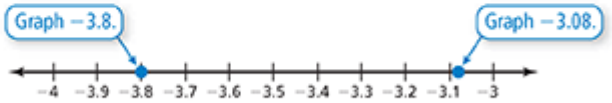
EXAMPLE 1 Comparing Decimals

a. Which is greater, 2.5 or −2.7?

Any positive number is greater than *any* negative number.

∴ So, 2.5 is greater.

b. Which is greater, −3.8 or −3.08?



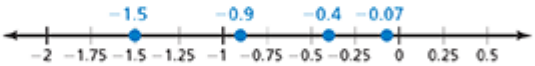
∴ −3.08 is to the right of −3.8. So, −3.08 is greater.

EXAMPLE 2 Standardized Test Practice

Which of the following numbers has a value between −1 and −0.5?

Ⓐ −1.5 Ⓑ −0.9 Ⓒ −0.4 Ⓓ −0.07

Graph the numbers on a number line.



The only given number that is between −1 and −0.5 is −0.9.

∴ The correct answer is Ⓑ.

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EXAMPLE 3 Real-Life Application

The table shows the amount (in inches) of rainfall above or below the monthly mean for a coastal city during a recent hurricane season.

Month	June	July	Aug.	Sept.	Oct.	Nov.
Rainfall Compared to Monthly Mean	0.1	−0.7	−1.3	−3.6	2	−1.9

a. Which months had less rainfall than the monthly mean?

b. Which month had rainfall closest to its monthly mean?

c. Which month had rainfall farthest from its monthly mean?

a. Graph each number on a number line. Let 0 represent the monthly mean. The months that had less rainfall than the monthly mean are to the left of 0 on the number line.

So, July, August, September, and November had less rainfall than the monthly mean.

b. The number closest to 0 on the number line is 0.1.

So, June had rainfall closest to its monthly mean.

c. The number farthest to the left on the number line is −3.6. The number farthest to the right is 2. The number farthest from 0 is −3.6.

So, September had rainfall farthest from its monthly mean.

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Fractions and Decimals on the Number Line

To add a positive fraction or decimal, move to the right on a number line. To subtract, move to the left.

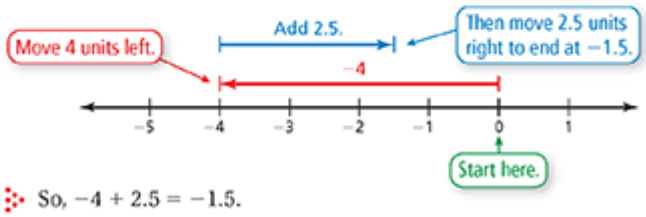
EXAMPLE 1 Adding Fractions and Decimals

Use a number line to find (a) $-3\frac{1}{2} + 4\frac{1}{2}$ and (b) $-4 + 2.5$.

a.

∴ So, $-3\frac{1}{2} + 4\frac{1}{2} = 1$.

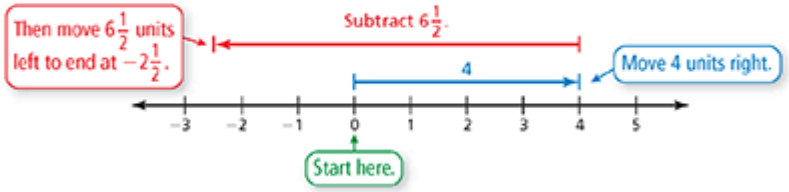
b.



∴ So, $-4 + 2.5 = -1.5$.

EXAMPLE 2 Subtracting Fractions

Use a number line to find $4 - 6\frac{1}{2}$.



∴ So, $4 - 6\frac{1}{2} = -2\frac{1}{2}$.

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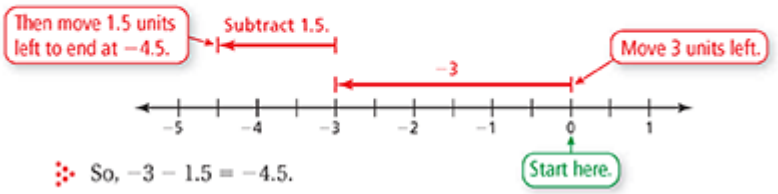
EXAMPLE 3 Subtracting Decimals

Use a number line to find $-3 - 1.5$.



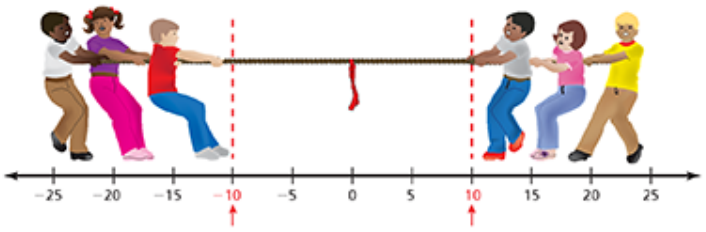
∴ So, $-3 - 1.5 = -4.5$.

EXAMPLE 4 Real-Life Application

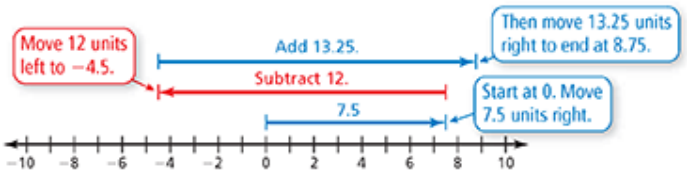
Reading

For a team to win, the flag needs to reach either −10 or 10.

In a game of *tug-of-war*, a team wins by pulling the flag over their goal line. The flag begins halfway between the two goal lines. During a game, the flag moves 7.5 feet to the right, 12 feet to the left, and 13.25 feet back to the right. Did a team win? Explain.



Check the position of the flag using a number line.



∴ No. 8.75 is less than 10. So, a team has not won yet.