Name ______________________________ Period __________ Date _____________

**7-2**
**STUDENT PACKET**

# *MATHLINKS*: GRADE 7
# STUDENT PACKET 2
# RATIONAL NUMBERS ON THE NUMBER LINE

# WORD BANK

| Word or Phrase | Definition or Description | Example or Picture |
|---|---|---|
| absolute value | | |
| distance | | |
| elevation | | |
| equation | | |
| inequality | | |
| integer | | |
| opposite of a number | | |
| origin | | |
| quadrant | | |
| rational number | | |

# INTEGERS AND THE NUMBER LINE

**Summary**

We will extend the positive number line to represent all integers. We will extend the axes of the quarter plane (1st quadrant) to create a four-quadrant coordinate plane. We will use arrows to represent direction and distance. We will solve problems involving integers and temperature.

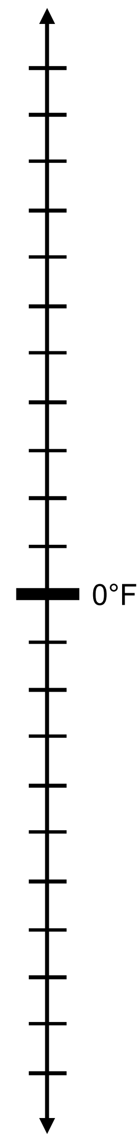
**Goals**

- Graph integers on the number line.
- Graph ordered pairs in the coordinate plane.
- Use arrows to represent direction and distance.
- Solve problems involving integers.

## Warmup

Below are some average temperatures in degrees Fahrenheit for the month of July from various locations around the world.

- Label the vertical number line to the right, showing temperatures from 100 degrees below zero (-100°F) to 100 degrees above zero (100°F).
- Graph the temperature for each location with a point on the number line. Label the points on the number line to the right.




1. Point *C*: Cape Town (a region in South Africa) at 0°F
2. Point *M*: Munich (a city in Germany) at 60°F
3. Point *F*: Fairbanks (a city in Alaska) at 40°F
4. Point *S*: The South Pole (a location in Antarctica) at -70°F
5. Point *D*: Death Valley (a region in California) at 100°F
6. Point *E*: Ellsworth Land (a region in Antarctica) at -35°F

# COMPARING TEMPERATURES

fold line

- Fold the page on the dotted line to the show the number line from the previous page.
- Compare the temperatures using your number line.
- Complete the verbal sentences. Write a number sentence using <, =, or > to match each verbal sentence.

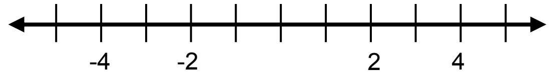
| | Verbal Sentence | Number Sentence |
|---|---|---|
| 1. | The temperature in Death Valley is greater than the temperature at the South Pole. | _____ > _____ |
| 2. | The temperature in Ellsworth Land is less than the temperature in Cape Town. | |
| 3. | The temperature in Ellsworth Land is _______________ the temperature at the South Pole. | |
| 4. | The temperature in Munich is _____________________ the temperature at the South Pole. | |

Use your number line as needed to complete each number sentence with <, =, or >. Then write a verbal sentence to match each number sentence.

| | Verbal Sentence | Number Sentence |
|---|---|---|
| 5. | Thirty is greater than zero | 30 ☐ 0 |
| 6. | | 60 ☐ -45 |
| 7. | | -60 ☐ -45 |
| 8. | | 35 ☐ 95 – 60 |

# DIRECTION AND DISTANCE ON THE NUMBER LINE

Refer to the number line to the right for problems 1-8.

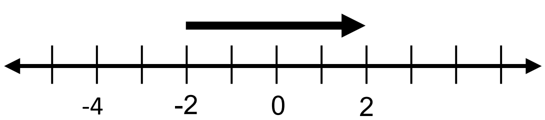


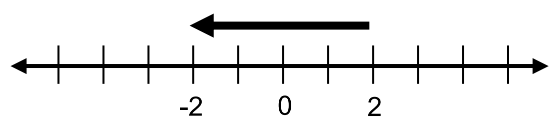

| | |
|---|---|
| 1. How do you get from -1 to 5? | 2. What is the distance from -1 to 5? |
| 3. How do you get from 5 to -1? | 4. What is the distance from 5 to -1? |
| 5. How do you get from -1 to -5? | 6. What is the distance from -1 to -5? |
| 7. How do you get from -5 to -1? | 8. What is the distance from -5 to -1? |

9. We can show direction and distance on a number line with an arrow. The length of the arrow will refer to the distance from its head to its tail.

   a. The first arrow starts at -2 and ends at 2. Its length is _______.

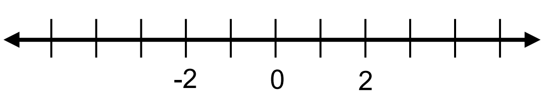
   b. The second arrow starts at 2 and ends at -2. Its length is _______.




   c. Now look at the direction of the arrows. Why do you think we say that the first arrow represents 4, while the second one represents -4?

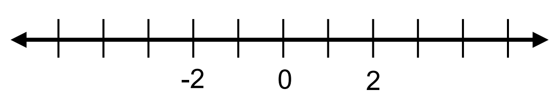
10. Draw an arrow that starts at -2 and represents the number 5.




The arrow ends at which number? ____

How do you know this arrow represents a positive number?

11. Draw an arrow that starts at 0 and represents the number -5.




The arrow ends at which number? ____

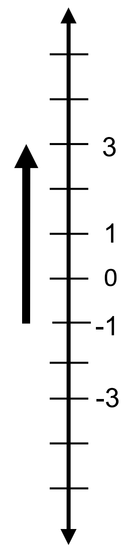
How do you know this arrow represents a negative number?

# DIRECTION AND DISTANCE ON THE NUMBER LINE (Continued)

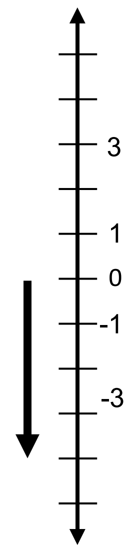
12. The first arrow to the right represents 4. Draw a different arrow near this number line that also represents 4.

13. The second arrow to the right represents -4. Draw a different arrow near this number line that also represents -4.

12.




13.




14. How do you get from 5 to 0?

15. How do you get from -5 to -1?

16. How do you get from 5 to -5?

17. How do you get from -3 to 3?

18. Which of the movements in problems 14-17 required moving the greatest distance?

    Is this a change in the positive or negative direction?

Use the number lines to the right to draw arrows. Be sure to scale each number line appropriately.

19. Draw an arrow that starts at 9 and represents the number 6.

    Where does the arrow end? _____

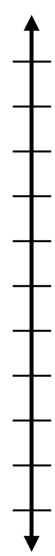
20. Draw an arrow that starts at -11 and represents the number -7.

    Where does the arrow end? _____

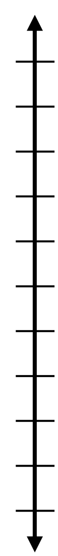
21. Draw an arrow that starts at -31 and represents the number 5.

    Where does the arrow end? _____

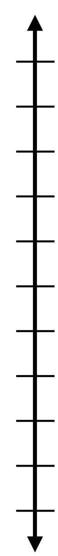
19.



20.



21.



# TEMPERATURE PROBLEMS

Draw arrows on the number lines below to represent each situation. Then answer each question.

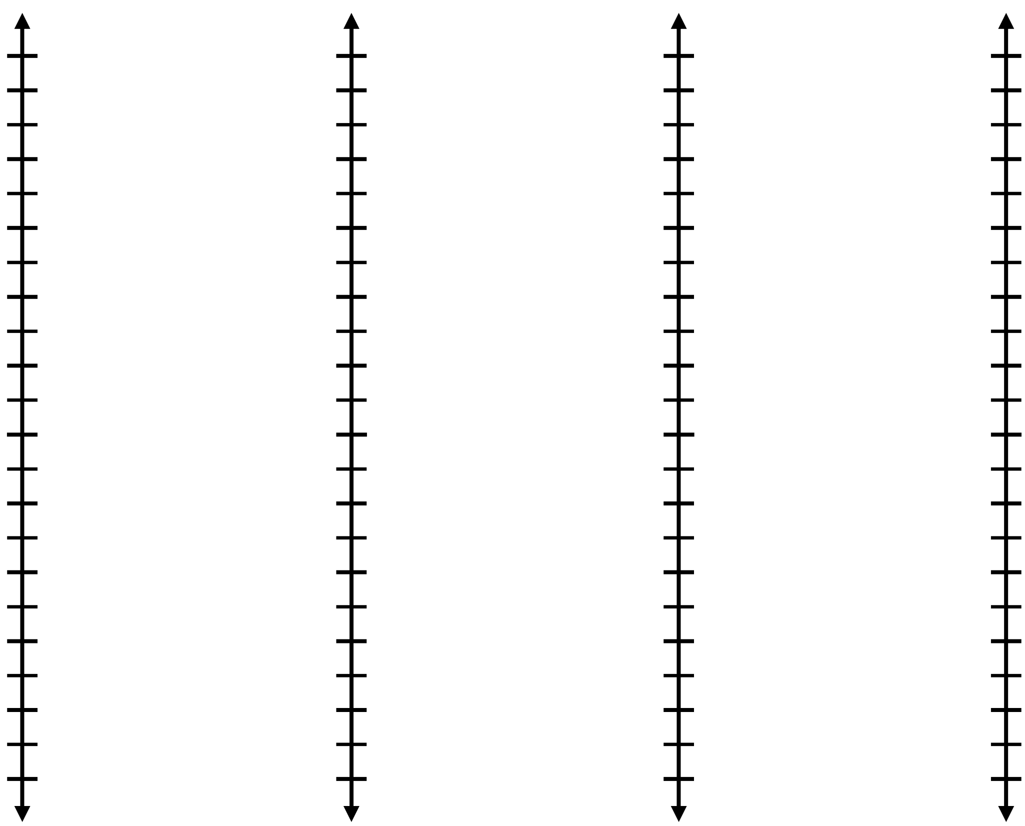
1. At 7:00 AM, the temperature in Los Angeles was 55°F. At noon, the temperature was 85°F. What was the temperature change from 7:00 AM to noon?

2. At 3:00 AM, the temperature on the Bering Strait Coast in Alaska was -10°F. At 3:00 PM, the temperature was 5°F. What was the temperature change from 3:00 AM to 3:00 PM?

3. At Hermosa Beach, the high temperature during the day was 80°F. The low temperature at night was 55°F. What is the difference between these temperatures?

4. The temperature in a refrigerator is 40°F. The temperature in a freezer is -5°F. What is the difference between these temperatures?

1. 2. 3. 4.



# TEMPERATURE PROBLEMS (Continued)

Draw arrows on the number lines below to represent each situation. Then answer each question.

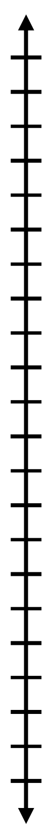
5. In Anchorage, Alaska, the temperature rose 15°F during the day. The high temperature was -10°F on this day. What was the low temperature?

6. In Siberia, Russia, the temperature one day rose 30 degrees from the day's low temperature. On this day it rose to 10°F. What was the low temperature that day?

7. A freezer is kept at a temperature of -15°F. The electricity went out one morning, and that evening the temperature inside the freezer had climbed to 45°F. How much did the temperature change?

8. At the top of a mountain, the morning temperature is -5°F. In the afternoon, it is 20°F higher. What is the afternoon temperature?

5.



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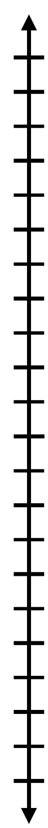

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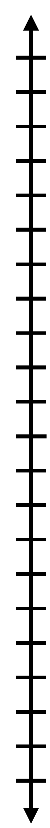

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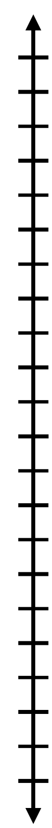


# GRAPHING IN FOUR QUADRANTS

When the *x*-axis and *y*-axis are extended to include negative values, they divide the coordinate plane into four regions, called quadrants. The quadrants are numbered in a clockwise order using Roman Numerals. Each quadrant is scaled the same.

1. Label the *x*- and *y*-axes.
2. Graph the origin at the point (0, 0) and label it *O*.
3. Scale the axes.
4. Graph the ordered pairs and label them with the given letters.

*A* (4, 4) *B* (-4, -4)

*C* (1, 5) *D* (-1, -5)

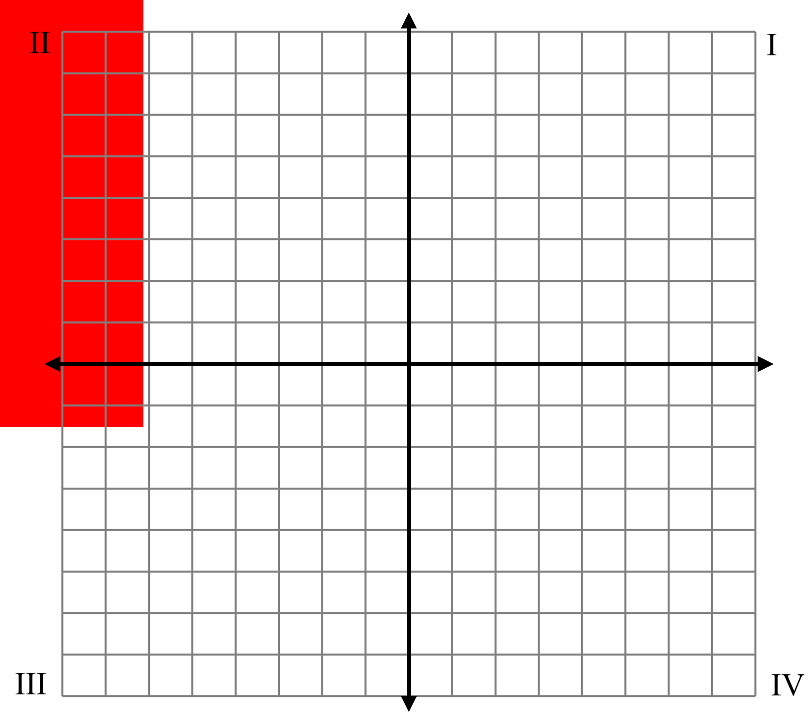
*E* (5, 1) *F* (5, -1)

*G* (3, 0) *H* (-3, 0)

*I* (0, 3) *J* (0, -3)

*K* (8, 6) *L* (-8, 6)

*M* (6, 8) *N* (6, -8)




5. Name the location of each ordered pair above by the quadrant it is in or the axis it is on.

| Point | Location | Point | Location |
|---|---|---|---|
| *A* | | *H* | |
| *B* | | *I* | |
| *C* | | *J* | |
| *D* | | *K* | |
| *E* | | *L* | |
| *F* | | *M* | |
| *G* | | *N* | |

# BATTLING SHIPS

**The Setup:**

Each player uses two coordinate grids. Label all axes from -5 to 5. One grid should be labeled “Self” and the other “Opponent.” (One game setup is provided below.)

Each player then decides where to place three rectangular ships: a **B**attleship (5 units x 1 unit), a **C**ruiser (3 units x 1 unit), and a **D**estroyer (2 units x 1 unit). All ships must be placed in straight lines either horizontally or vertically. It is legal (but not required) for two or more ships to be adjacent to each other, but they cannot overlap. Label the ships B, C, and D.

**The Game:**

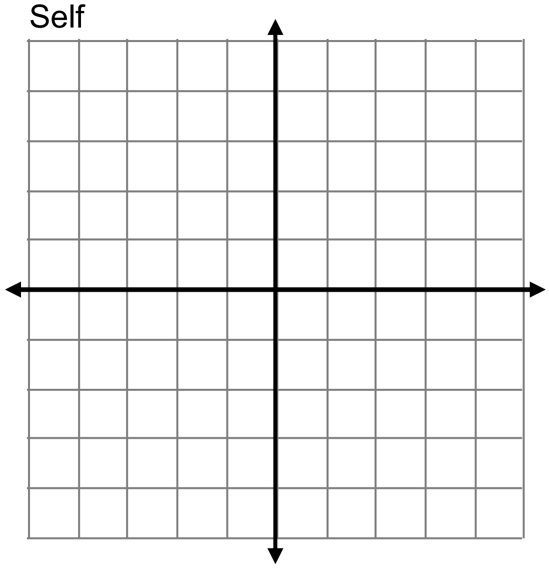
Players take turns calling out one coordinate at a time. If a player calls a coordinate where an edge or corner of a ship is located, the opponent says "hit" and the player gets another turn. If no ship is located at the coordinate, the opponent says "miss," and players change roles.

Players should take care to record their hits and misses on their "Opponent" grid so that they do not call a coordinate more than once. Players should also mark the "Self" grid with shots taken by their opponent.

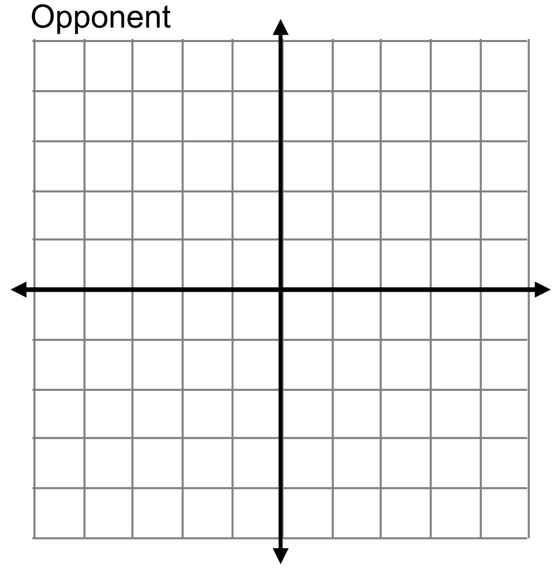
A ship is sunk when all of its coordinates have been hit. When this happens, the player whose ship was sunk says, "You sank my (B, C, or D) ship."

The winner is the first player to sink all of the opponent's ships. Make sure to exchange grids afterwards to check that both players marked coordinates correctly.

Self



Opponent



# OPPOSITES AND ABSOLUTE VALUE

| Summary | Goals |
| --- | --- |
| We will learn to interpret and evaluate the opposite and absolute value of a number. | • Graph integers on a number line.<br>• Understand and apply the meaning of opposites.<br>• Understand and apply the meaning of absolute value. |

## Warmup

Elevation relative to sea level is measured vertically from sea level. It can be measured in miles, kilometers, feet, etc. We use positive measurements for locations above sea level, and negative measurements for locations below sea level.

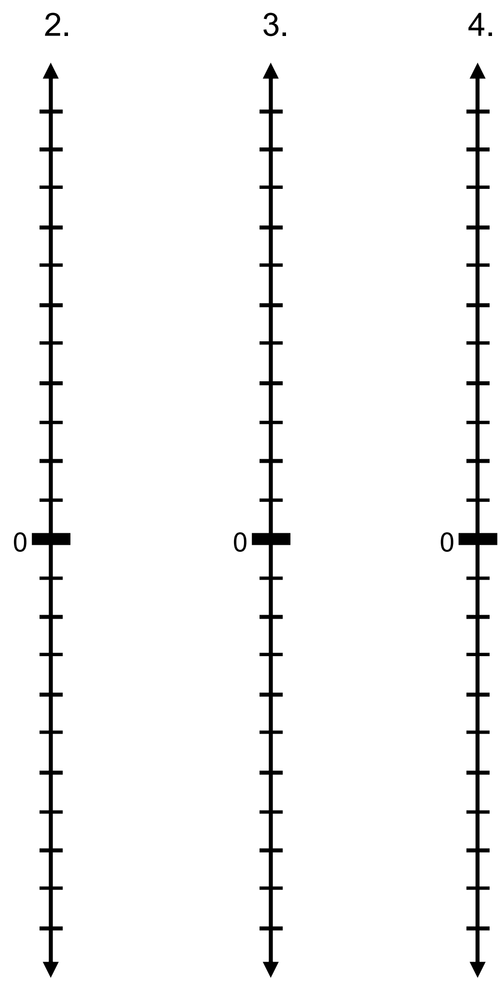
1. Suppose we are measuring elevation relative to sea level in meters. What does an elevation of 0 meters represent?

Label the number lines to the right in appropriate increments of meters for each problem. Illustrate each situation with an arrow and answer each question.

2. A flying fish starts 15 meters below the surface and jumps to a height of 5 meters out of the water. What is its total change in elevation relative to sea level?

3. A diver is 5 meters above the surface of the ocean on a boat. She dives in and swims to 30 meters below the surface. What is her total change in elevation relative to sea level?

4. A shark is at -20 meters relative to sea level. It swims down to -80 meters relative to sea level. What is its total change in elevation relative to sea level?



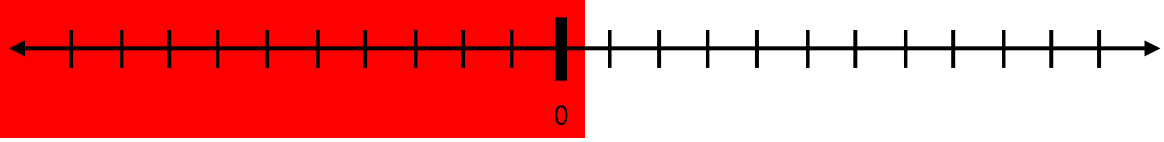
# OPPOSITES

Write a number that you might use to represent each situation. Then represent the opposite of the given situation using words and appropriate numbers. Be ready to explain your answers.

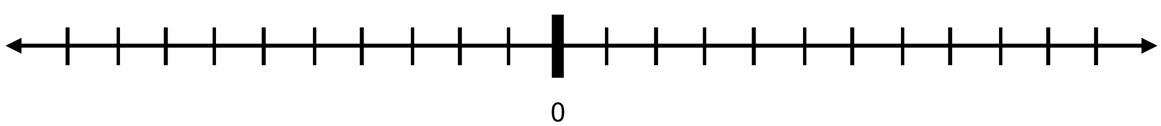
| Situation | | Opposite of the Situation | |
|---|---|---|---|
| **Words** | **Number** | **Words** | **Number** |
| 1. Fall 12 feet | -12 | Rise 12 feet | |
| 2. Find $5 | | | |
| 3. Gain 4 yards (in football) | | | |
| 4. Three steps backward | | | |

For problems 5 and 6, draw arrows to illustrate each situation on the number lines below. Then explain the end result in words.

5. A football player gains 10 yards and then loses 10 yards.




6. You take 8 steps backward and then 8 steps forward.

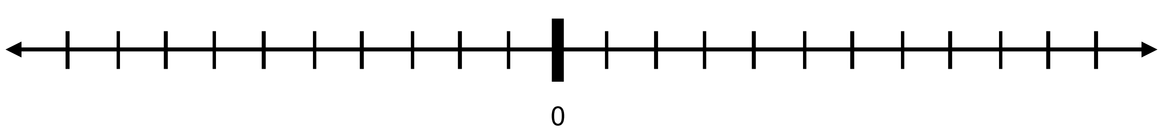



For problems 7 and 8, describe the end result of each situation in words.

7. A bird falls 20 feet and then rises 20 feet.

8. You find $40 and then lose $40.

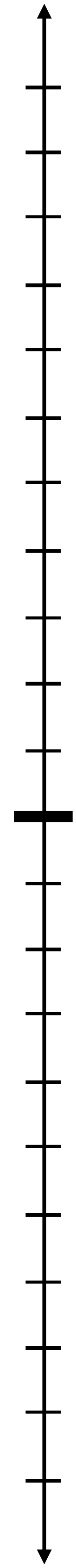
9. Use the number line below to illustrate the opposite of an opposite. Locate 6. The opposite of 6 is _____, and in turn, the opposite of this number is _____. Therefore, the opposite of the opposite of 6 is _____. We write -(-6) = _____



# ABSOLUTE VALUE

- The <u>absolute value</u> of a number is its distance from zero on the number line.
- The absolute value of a number $n$ is denoted $|n|$.
- The number 20 has distance 20 from 0, and the number -20 also has distance 20 from 0, so both have absolute value equal to 20.

  $|20| = 20$ and $|-20| = 20$.
- <u>Distance</u> and absolute value are always greater than or equal to zero.



Label the vertical number line to the right to show locations from 100 meters below sea level (-100 m) to 100 meters above sea level (100 m). Then graph and label the following points on the number line to the right.

1. Point $P$: A pigeon at 10 m above sea level
2. Point $D$: A dolphin at 20 m below sea level
3. Point $W$: A whale at 60 m below sea level
4. Point $C$: A crow at 55 m above sea level
5. Point $S$: A swimmer at sea level
6. Point $G$: A gull at 20 m above sea level

Complete the table.

| | **What** | **Location relative to sea level** | **Distance from zero (sea level)** | **Absolute value equation for the distance from sea level** |
|---|---|---|---|---|
| 7. | pigeon | +10 m | 10 m | $\lvert +10 \rvert =$ _____ |
| 8. | dolphin | | 20 m | $\lvert -20 \rvert =$ _____ |
| 9. | | -60 m | | |
| 10. | | | 55 m | |
| 11. | | +20 m | | |
| 12. | swimmer | | | $\lvert 0 \rvert =$ _____ |
| 13. | sea level | | | |

# ABSOLUTE VALUE (Continued)

fold line

Fold the page on the dotted line to show the number line from the previous page.

14. Draw an arrow from sea level to the location of the crow.

    a. How do you know from the arrow that the crow is above sea level?

    b. How do you know from the arrow that its distance from sea level is 55 meters?

    c. What is $|55|$?

15. Draw an arrow from sea level to the location of the dolphin.

    a. How do you know from the arrow that the dolphin is below sea level?

    b. How do you know from the arrow that its distance from sea level is 20 meters?

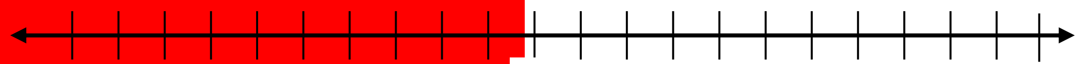
    c. What is $|-20|$?

16. What is the distance between the crow and the dolphin? How do you know?

17. What is the distance between the dolphin and the whale? How do you know?

# PRACTICE

1. On the number line below, graph each number and its opposite: 5, -3, 9, -10, 0



Write the opposite of each expression in simplified form.

| | | |
|---|---|---|
| Example: 10 – 4<br>opposite: -(10 – 4) = -6 | 2. 12<br>opposite: | 3. $\lvert 0 \rvert$<br>opposite: |
| 4. 19 – 7<br>opposite: | 5. 6 – 4<br>opposite: | 6. $-\lvert 6-4 \rvert$<br>opposite: |

7. What is the opposite of the opposite of -6? _____

8. What is the opposite of the opposite of $\lvert -6 \rvert$? _____

9. On the number line above, how do you get from a positive number to its opposite?

10. On the number line above, how do you get from a negative number to its opposite?

Simplify the absolute value expressions.

| | | |
|---|---|---|
| 11. $-\lvert -16 \rvert$ | 12. $\lvert 12 \rvert$ | 13. $\lvert 0 \rvert$ |
| 14. $\lvert 19 - 6 \rvert$ | 15. $\lvert -4 \rvert$ | 16. $-\lvert -4 \rvert$ |

Write >, <, or = in the blanks to make each statement true.

| | | |
|---|---|---|
| 17. $\lvert -8 \rvert$ _____ 8 | 18. $\lvert -8 \rvert$ _____ -8 | 19. $-\lvert -8 \rvert$ _____ -8 |

20. Marge thinks that the opposite of a number and the absolute value of a number are the same thing. Is Marge correct? Use examples or counterexamples to support your answer.

# RATIONAL NUMBERS AND THE NUMBER LINE

| Summary | Goals |
|---|---|
| We will locate and order rational numbers on the number line. We will graph ordered pairs in the coordinate plane. | • Graph rational numbers on the number line.<br>• Order rational numbers.<br>• Graph ordered pairs of rational numbers in the coordinate plane.<br>• Use arrows to represent direction and distance. |

## Warmup

Use the symbols <, =, or > to make each number sentence true. Explain your reasoning.

1. $\frac{3}{4}$ ______ $\frac{3}{7}$

2. 0.40 _____ 0.04

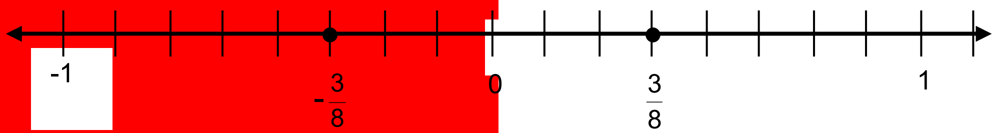
3. -(-5) _____ 5

4. $\frac{6}{7}$ ______ $\frac{9}{10}$

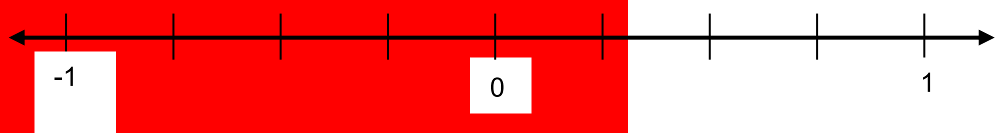
5. $|-30|$ _____ -30

# FRACTIONS AND THEIR OPPOSITES

The opposite of a fraction is its additive inverse and is located the same distance from zero as the fraction, but in the opposite direction. For example, $\frac{3}{8}$ is a fraction, and $-\frac{3}{8}$ is its opposite.

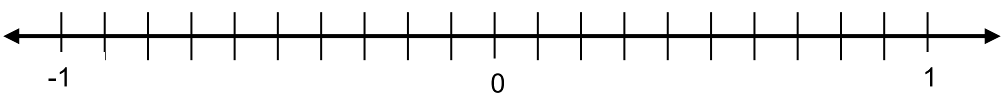



1. Label the hatch marks on the number line below with the appropriate numbers.

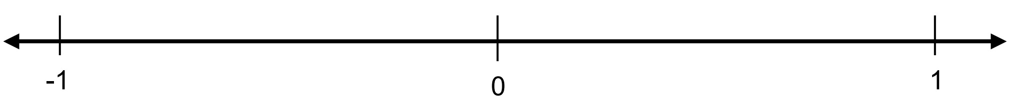



2. Graph and label each number on the number line below.

$\frac{2}{10}$    $\frac{2}{5}$    $-\frac{6}{10}$    $-\frac{1}{5}$    $-\frac{4}{5}$



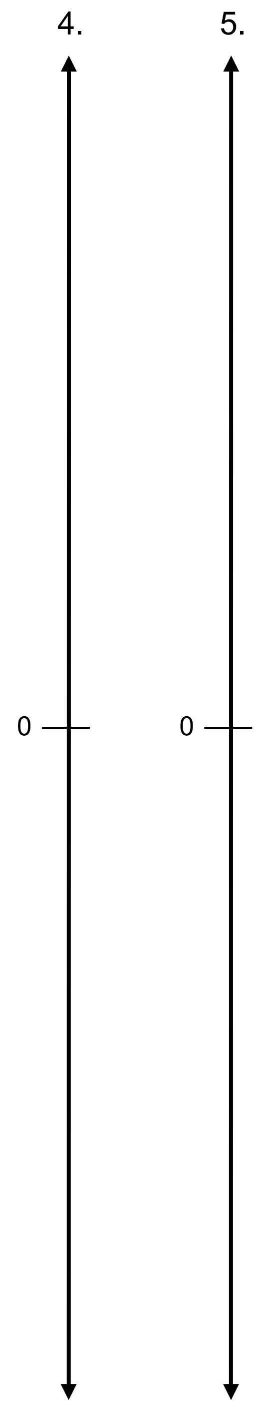

3. Estimate the location of $\frac{1}{3}$, $\frac{2}{3}$, and their opposites on the number line below.




On the number lines at the right, draw appropriate hatch marks to help you estimate the location of the given numbers.

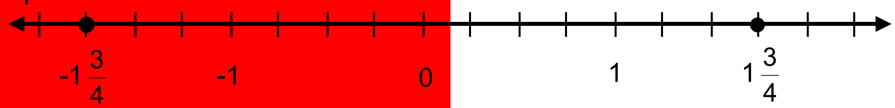
4. $\frac{4}{8}$    $\frac{1}{8}$    $\frac{7}{8}$    $-\frac{3}{8}$    $\frac{2}{8}$    $\frac{0}{8}$    $-\frac{6}{8}$    $-\frac{8}{8}$

5. $\frac{3}{6}$    $\frac{1}{6}$    $-\frac{2}{6}$    $-\frac{5}{6}$    $\frac{6}{6}$    $-\frac{0}{6}$

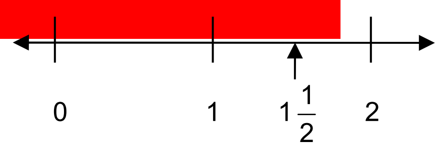
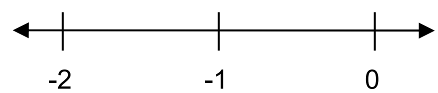


# MIXED NUMBERS AND THEIR OPPOSITES

The opposite of a mixed number is its additive inverse and is located the same distance from zero as the mixed number, but in the opposite direction. For example, $1\frac{3}{4}$ is a mixed number, and $-1\frac{3}{4}$ is its opposite.



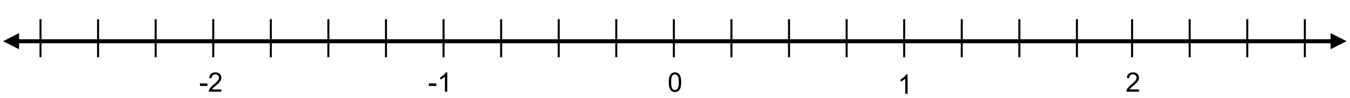

Fill in the blanks.

| | Mixed Number | Opposite of the Mixed Number |
|---|---|---|
| **Example** | $1\frac{1}{2}$ | $-1\frac{1}{2}$ |
| 1. **Read as** | "one and one-half" | "____________________________" |
| 2. **The sum of** | 1 and $\frac{1}{2}$ | -1 and ______ |
| 3. **Number line representation** |   |   |
| 4. **As a fraction (or its opposite)** | $1\frac{1}{2} = \frac{3}{2}$ | $-1\frac{1}{2} = -\left(\square\frac{\square}{\square}\right) = -\frac{\square}{\square}$ |

Fill in the blanks.

| Number | The sum of | Mixed number and its opposite |
|---|---|---|
| 5. $2\frac{1}{2}$ | ________ and ________ | |
| 6. $-2\frac{1}{2}$ | ________ and ________ | |
| 7. $-1\frac{3}{4}$ | ________ and ________ | |

8. Graph $2\frac{1}{4}$ and $-2\frac{1}{4}$ on the number line below.

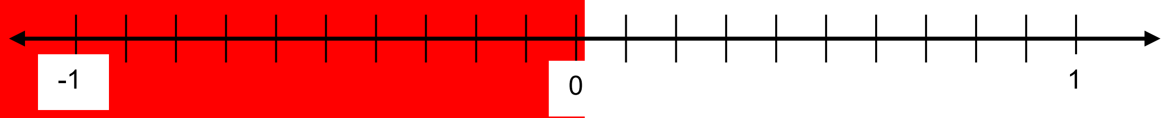


# DECIMALS AND THEIR OPPOSITES

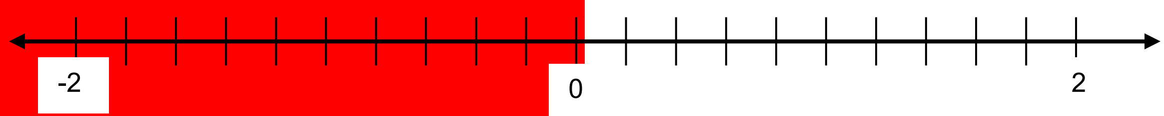
The opposite of a decimal is its additive inverse and is located the same distance from zero as the decimal, but in the opposite direction. For example, 0.25 is a decimal, and -0.25 is its opposite.

For problems 1 and 2, graph and label each number on the number lines below.

1. 0.5 -0.5 0.8 -0.2 0.25 -0.3 -0.65

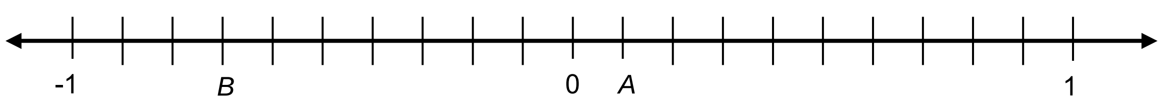



2. 1 -1 1.5 -1.8 1.25 1.7 -1.65



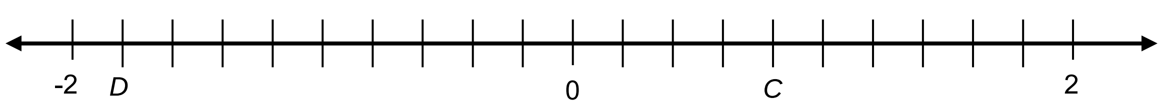

3. Find the value of *A*, *B*, -*A* and -*B.* Locate -*A* and -*B* on the number line below.

*A* = _____ *B* = _____ -*A* = _____ -*B* = _____




4. Find the value of *C*, *D*, -*C* and -*D.* Locate -*C* and -*D* on the number line below.

*C* = _____ *D* = _____ -*C* = _____ -*D* = _____




5. Graham says that -*X* could represent a positive number on a number line. Give an example that supports Graham's statement.

# ORDERING RATIONAL NUMBERS ON THE NUMBER LINE

A <u>rational number</u> is a number that can be expressed in the form $\frac{a}{b}$ or $-\frac{a}{b}$ for some fraction $\frac{a}{b}$. Rational numbers are numbers that can be expressed as a quotient of integers where the denominator cannot be zero.

Examples: $1\frac{1}{2} = \frac{3}{2}$ $-6 = -\frac{6}{1}$ $0.75 = \frac{3}{4}$.

1. Here is a list of rational numbers: $\frac{3}{8}$ 1.5 $-\frac{3}{8}$ $-1\frac{3}{4}$ $-\frac{11}{8}$

   - From the list, the greatest number is ________. The least number is ________.
   - Make hatch marks for some relevant integer values on the number line below.
   - Break unit segments into relevant fractional parts.
   - Graph each number as a point on the number line.

2. Here is a list of rational numbers.

   $\frac{5}{8}$ $-1.6$ $\frac{5}{3}$ $-2\frac{1}{10}$ $-1\frac{4}{5}$ $-\frac{1}{4}$ $-0.75$ $-\frac{2}{3}$

   a. Estimate the location of each number on the number line below.

   b. Which rational numbers did you locate on your number line first?

   c. Explain how you located $-1.6$ and $-1\frac{4}{5}$.

# ORDER IT!

You will need:

- 2 or more players
- 32 or more Rational Number Cards

The object of this game is to get five numbers in a row, in order, from least value to greatest value. Once a card is placed on the table face up, it may not be moved to another location. However, a new card may be placed on top of it.

- Shuffle all the cards and place the cards face down in a pile.
- To begin, put 5 cards face-up, in the order they are drawn.
- The first player draws a card from the pile and places it <u>on top of</u> one of the existing face-up cards. If all of the cards are now in order from least to greatest, then the player wins. If not, then play passes to the next player.
- The next player draws a card from the pile and places it <u>on top of</u> one of the existing face-up cards. If all the cards are now in order from least to greatest, then the player wins. If not, then play continues until eventually one player wins by getting all five cards in order from least to greatest.

In order to win, the player must convince his or her opponent with a reasonable argument that the cards are in order.

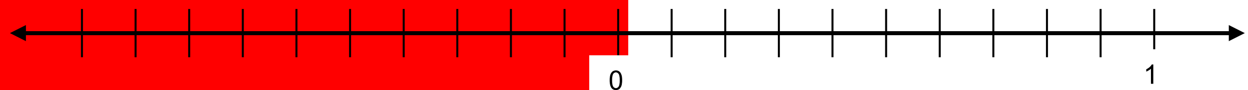
1. Play two rounds of Order It! Record one of the ordered card sequences here.

___________ ___________ ___________ ___________ ___________

2. Explain how you know that the numbers are in order.

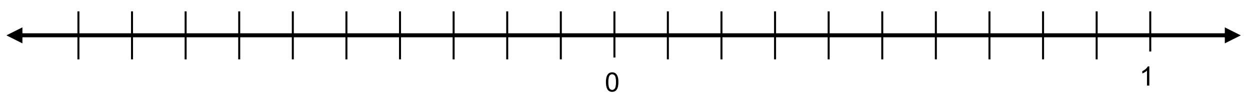
# DIRECTION AND DISTANCE ON THE NUMBER LINE: RATIONAL NUMBERS

Use the number line below for problems 1-8.




| | |
|---|---|
| 1. How do you get from 0.2 to 0.5? | 2. What is the distance from 0.2 to 0.5? |
| 3. How do you get from 0.7 to -0.2? | 4. What is the distance from 0.7 to -0.2? |
| 5. How do you get from -0.3 to 0.4? | 6. What is the distance from -0.3 to 0.4? |
| 7. How do you get from -0.4 to -0.3? | 8. What is the distance from -0.4 to -0.3? |

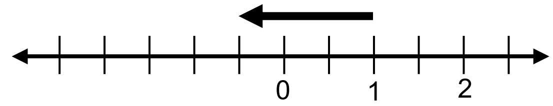
Use the number line below for problems 9-16.




| | |
|---|---|
| 9. How do you get from $\frac{1}{4}$ to $\frac{1}{2}$? | 10. What is the distance from $\frac{1}{4}$ to $\frac{1}{2}$? |
| 11. How do you get from $2\frac{1}{4}$ to $\frac{3}{4}$? | 12. What is the distance from $2\frac{1}{4}$ to $\frac{3}{4}$? |
| 13. How do you get from $\frac{3}{4}$ to $-1\frac{1}{2}$? | 14. What is the distance from $\frac{3}{4}$ to $-1\frac{1}{2}$? |
| 15. How do you get from $-2\frac{1}{2}$ to $1\frac{1}{4}$? | 16. What is the distance from $-2\frac{1}{2}$ to $1\frac{1}{4}$? |

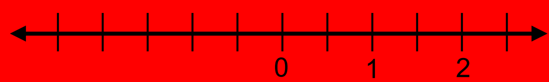
# DIRECTION AND DISTANCE ON THE NUMBER LINE: RATIONAL NUMBERS (Continued)

The arrow from 1 to $-\frac{1}{2}$ on the number line to the right represents $-1\frac{1}{2}$.

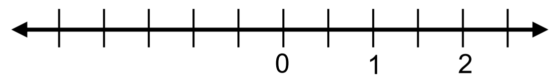



17. Draw two arrows that represent $-1\frac{1}{2}$, but with the given starting points. Then name the ending points.

a. Starts at $\frac{1}{2}$ and ends at _____ .

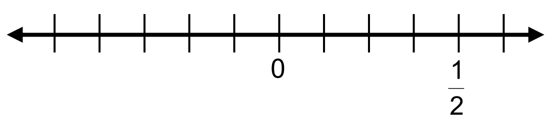



b. Starts at $-\frac{1}{2}$ and ends at _____ .

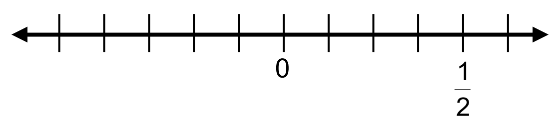



18. Draw two arrows that represent $-\frac{5}{8}$, but with the given ending points. Then name the starting points.

a. Starts at _____ and ends at 0.

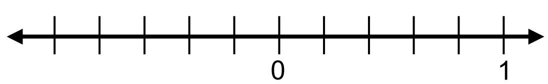



b. Starts at _____ and ends at $-\frac{1}{2}$.

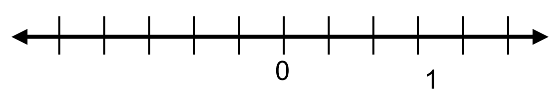



19. Draw two arrows that represent 0.6, but with the given starting points. Then name the ending points.

a. Starts at 0.2 and ends at _____ .

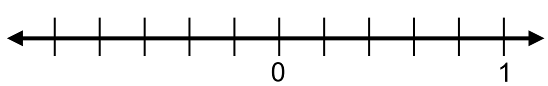



b. Starts at -0.8 and ends at _____ .

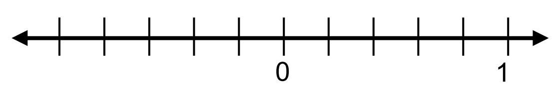



20. Draw two arrows that represent -0.4, but with the given ending points. Then name the starting points.

a. Starts at _____ and ends at 0.2.




b. Starts at _____ and ends at -0.2.



# RATIONAL NUMBER COORDINATES

The *x*-axis and the *y*-axis can be extended to include all rational numbers. Let each small square on the grid represent a one-by-one unit square.

1. Label and scale the axes.
2. Graph the origin at the point (0, 0) and label it *O*.
3. Graph the ordered pairs and label them with the given letters.

*A* (0, 4) *B* $(-4\frac{1}{2}, -4\frac{1}{2})$

*C* (1.5, 5.5) *D* (-1.5, -5.5)

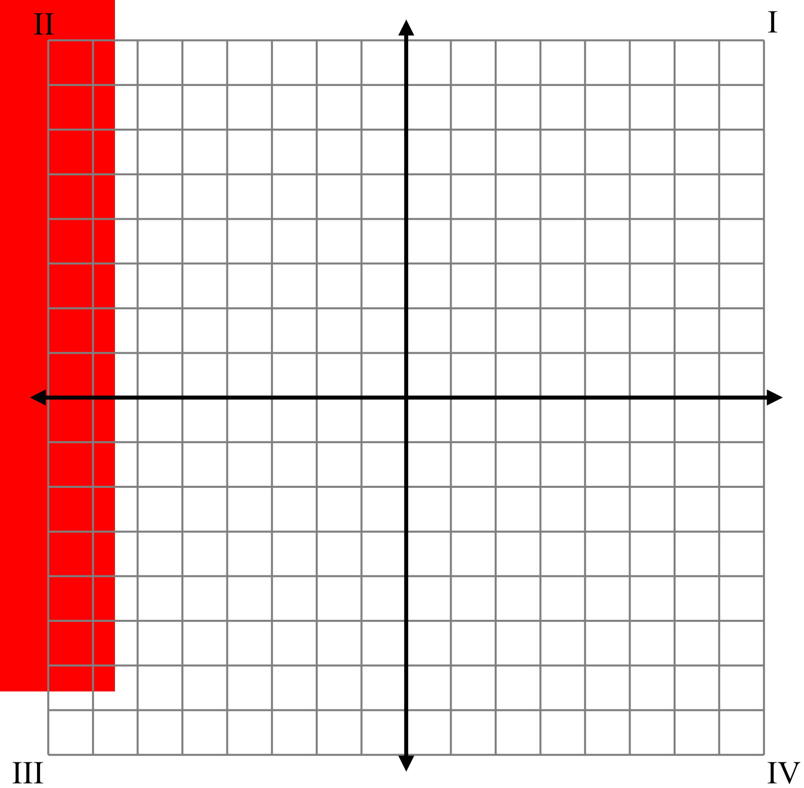
*E* $(5\frac{1}{4}, 1\frac{3}{4})$ *F* $(5\frac{1}{4}, -1\frac{3}{4})$

*G* (3.2, 0.8) *H* (-3.2, 0.8)

*I* (0.8, 3.2) *J* (0.8, -3.2)

*K* $(7\frac{1}{3}, 6\frac{2}{3})$ *L* $(-7\frac{1}{3}, 6\frac{2}{3})$

*M* $(6\frac{2}{3}, 7\frac{1}{3})$ *N* $(6\frac{2}{3}, -7\frac{1}{3})$




4. Name the location of each ordered pair by the quadrant it is in or the axis it is on.

| Point | Location | Point | Location |
|---|---|---|---|
| *A* | | *H* | |
| *B* | | *I* | |
| *C* | | *J* | |
| *D* | | *K* | |
| *E* | | *L* | |
| *F* | | *M* | |
| *G* | | *N* | |

# PRACTICE

1. Ocean water freezes at about -2° *C*. Fresh water freezes at 0° *C*. Antifreeze, a liquid used in the radiators of cars, freezes at about -60° *C*. Imagine that the outside temperature has dropped to the freezing point for ocean water. How many degrees more must the temperature drop for the antifreeze to turn solid?

2. Why are the numbers $\frac{0}{6}$ and $-\frac{0}{6}$ equivalent?

Complete the table.

| **Rational Number** | **Round to the nearest lesser integer** | **Round to the nearest greater integer** | **Graph the rational number** (First locate and label a few relevant integers on the number line.) |
|---|---|---|---|
| 3. $\frac{13}{3}$ | | | |
| 4. $-2\frac{1}{3}$ | | | |
| 5. -1.7 | | | |

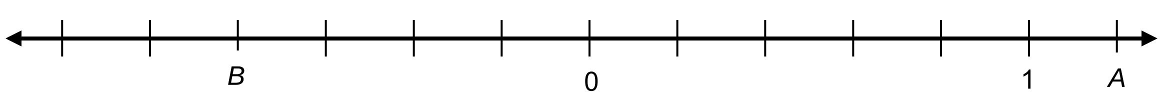
6. Which number in problems 3-5 above was most difficult to locate on a number line? _______ Explain.

7. Fill in the blanks with these three numbers: $-\frac{1}{5}$, $\frac{2}{5}$, $-\frac{4}{5}$ _____ > _____ > _____

8. Simplify: a. $\left|\frac{2}{5}\right|$ b. $\left|-\frac{1}{5}\right|$ c. $-\left|\frac{4}{5}\right|$

9. What is the opposite of $\frac{2}{7}$? ______ What is the opposite of the opposite of $\frac{2}{7}$? ______

10. Locate *-A*, and *-B* on the number line below. Then fill in the blanks below.

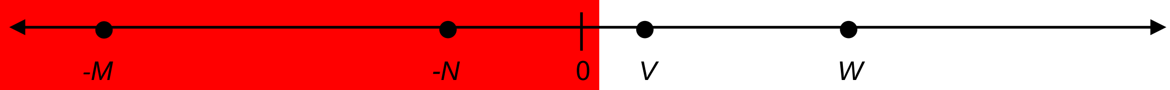



*A* = _____ *B* = _____ *-A* = _____ *-B* = _____

# PRACTICE (Continued)

11. Graph and label an estimated location for each of the following points on the number line below.

$-V$ $M$ $-(-W)$ $-(-N)$

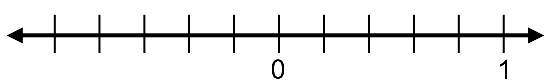



a. If $V = 0.2$ and $W = \frac{5}{8}$, name any three numbers that could lie between $V$ and $W$ on the number line.

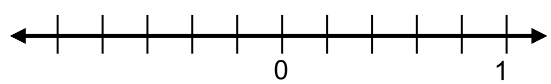
b. If $M = \frac{9}{10}$, name the two integers that $-M$ is between on the number line.

12. Draw two arrows that represent 0.4, but with the given starting points. Then name the ending points.

a. Starts at 0.4 and ends at _____




b. Starts at -0.9 and ends at _____




13. Name the quadrant in which each ordered pair is located.

(-4, 5) _______ (3.4, -2) _______ $(-3\frac{1}{6}, -10)$ ________

14. Miguel says that (0, 6) and (-6, 0) represent opposites on an axis in the coordinate plane. Explain what his error might be and offer a possible correction.

# SKILL BUILDERS, VOCABULARY, AND REVIEW

## SKILL BUILDER 1

Compute.

| | |
|---|---|
| 1. $4.5 + 9$ | 2. $25 - 8.9$ |
| 3. $103.7 - 4.67$ | 4. $\frac{8}{9} - \frac{2}{9}$ |
| 5. $3\frac{1}{4} + 1\frac{2}{4}$ | 6. $2\frac{1}{8} - \frac{5}{8}$ |

7. Josie, Connor, and Olivia had a total of $20.00 to spend at the mall. Josie had $5.67 and Connor had $9.12. How much money did Olivia have?

8. Circle all of the expressions that are equivalent to 143.

$252 - 109$ $5{,}005 \div 36$ $118 + 25$ $26 \bullet 4$

# SKILL BUILDER 2

Compute.

| | |
|---|---|
| 1. $\frac{1}{2} + \frac{3}{4}$ | 2. $\frac{3}{5} - \frac{1}{10}$ |
| 3. $\frac{1}{3} + \frac{3}{5}$ | 4. $1\frac{5}{6} + 2\frac{1}{4}$ |
| 5. $2\frac{5}{8} - 1\frac{3}{10}$ | 6. $3\frac{1}{12} - 1\frac{5}{8}$ |

7. At Joe's Pizza, Camille, Frank, and Julie ate an entire pizza together. Camille ate $\frac{2}{5}$ of the pizza and Frank ate $\frac{1}{4}$ of the pizza. Who ate the greatest amount of pizza, Camille, Frank, or Julie? Explain.

8. Write three fractions that are equivalent to $\frac{4}{6}$.

# SKILL BUILDER 3

Compute.

| | |
|---|---|
| 1. $6.2 \bullet 3$ | 2. $1.81 \bullet 5$ |
| 3. $4.52 \bullet 1.07$ | 4. $\frac{1}{2} \bullet \frac{3}{4}$ |
| 5. $1\frac{5}{6} \bullet 8$ | 6. $3\frac{1}{8} \bullet 1\frac{3}{10}$ |

7. Jill is planning her birthday party. She wants to take 8 of her friends to an amusement park. A ticket to get into the park costs $40.88. If Jill has $245 to spend on her friends, does she have enough money to invite them all to the birthday party? Explain.

Write a decimal representation for each number.

| | | |
|---|---|---|
| 8. $\frac{3}{4}$ | 9. $\frac{1}{8}$ | 10. $1\frac{5}{9}$ |

# SKILL BUILDER 4

1. Maya jogs 8 yards every 5 seconds.

   a. Complete the table.

| **yards** | 8 | | | 40 | | | 1 | 2 |
|---|---|---|---|---|---|---|---|---|
| **seconds** | | 10 | 15 | | 0 | 1 | | |

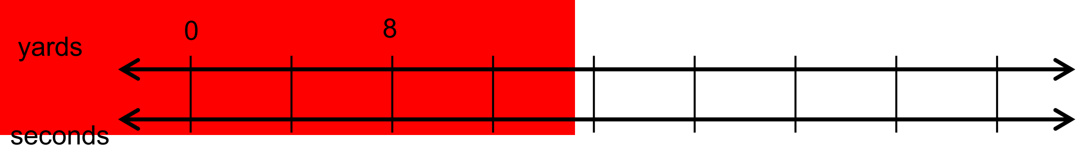
   b. Complete each sentence.

   Maya's rate of jogging is ______ yards for one second.

   Maya's unit rate in yards per second is ______.

   At this rate, Maya will jog ______________________________ in one minute.

   c. Label the double number line diagram below, which represents this relationship.




2. To make orange dye, Enrique uses red dye and yellow dye in a ratio of 3 : 2. He began a tape diagram to find how many quarts of red and yellow dye he will need to make 30 quarts of dye. Finish the tape diagram and solve Enrique's problem.

| | | |
|---|---|---|
| R | R | R |

Compute.

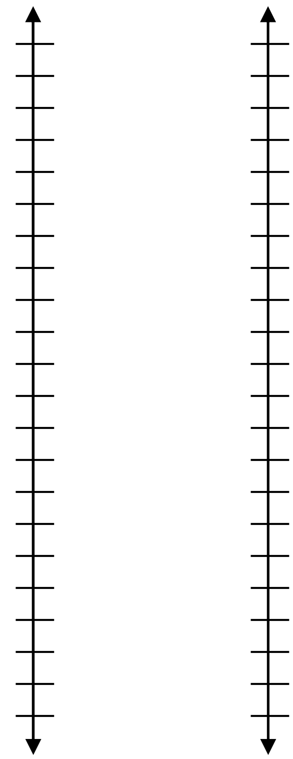
| | |
|---|---|
| 3. 546 • 8 | 4. 4,536 ÷ 36 |

# SKILL BUILDER 5

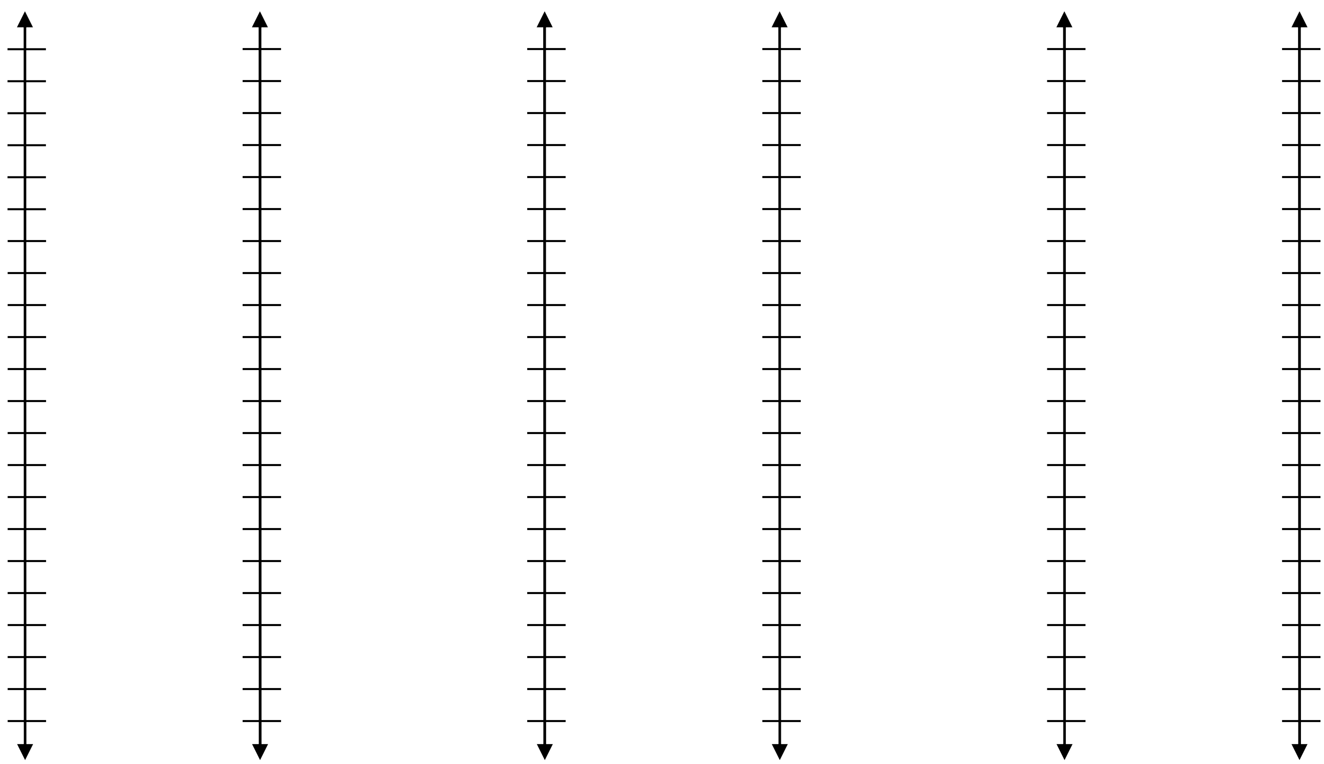
Draw an arrow on each number line to help you complete the table. Scale appropriately.

| | Morning Temperature | Change | Afternoon Temperature |
|---|---|---|---|
| 1. | -30° F | rises 45° F | |
| 2. | -20° F | falls 20° F | |
| 3. | -20° F | rises 20° F | |
| 4. | 20° F | | 45° F |
| 5. | 0° F | | -15° F |
| 6. | | falls 40° F | -30° F |
| 7. | | rises 10° F | 5° F |
| 8. | | falls 30° F | 0° F |

1. 2.



3. 4. 5. 6. 7. 8.



# SKILL BUILDER 6

1. Estimate the location of each number on the number line below.

$2\frac{2}{3}$ $\frac{8}{5}$ 0.45 2.25 $\frac{4}{3}$ 0.8

2. Explain how you located $\frac{8}{5}$ on the number line above.

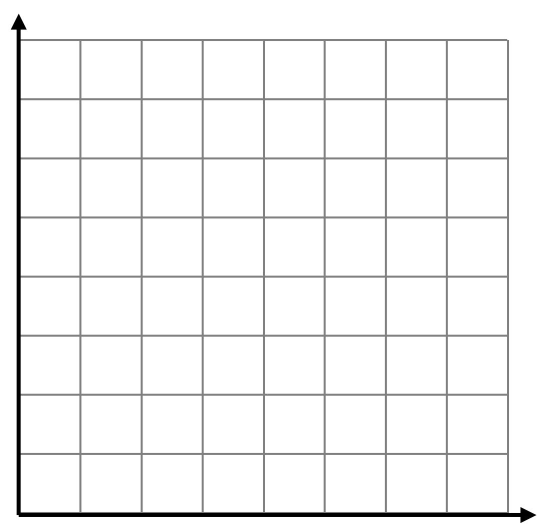
Use the symbols <, =, or > to compare.

| | | |
|---|---|---|
| 3. $\frac{1}{9}$ ______ $0.\overline{1}$ | 4. $\frac{5}{6}$ ______ $\frac{5}{9}$ | 5. $\frac{5}{6}$ ______ 0.8333 |
| 6. 0.44 ______ $\frac{2}{5}$ | 7. $\frac{4}{12}$ ______ $\frac{1}{3}$ | 8. $0.\overline{5}$ ______ $\frac{1}{3}$ |

9. Mark the axes with an appropriate scale. Then locate all ordered pairs by marking a dot and labeling the letter on the coordinate plane.

*A* (0, 1) *B* (1, 0.4) *C* (0.2, 0.6)

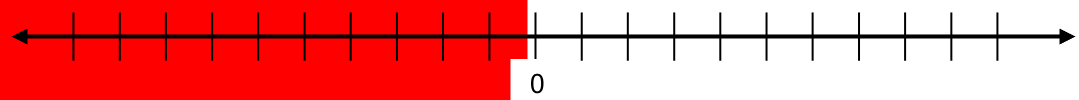
*D* (0.5, 0.9) *E* (0.3, 1.1) *F* (1.3, 0.8)



# SKILL BUILDER 7

1. On the number line below, graph the following numbers and their opposites.

7 -2 8 -4 1




Simplify the absolute value expressions.

| | | |
|---|---|---|
| 2. $\lvert -22 \rvert$ | 3. $\lvert 90 \rvert$ | 4. $\lvert 0 \rvert$ |
| 5. $\lvert 27 - 5 \rvert$ | 6. $-\lvert 4 \rvert$ | 7. $-\lvert -3 \rvert$ |

Write the opposite of each expression in simplified form.

| | | |
|---|---|---|
| 8. 8 | 9. $\lvert 5 \rvert$ | 10. $-\lvert 6 \rvert$ |
| 11. 13 – 6 | 12. 15 – 9 | 13. $-\lvert 15 - 9 \rvert$ |

14. What is the opposite of the opposite of -8? _____

15. What is the opposite of the opposite of $\lvert -8 \rvert$? _____

Write >, <, or = in the blanks to make each statement true.

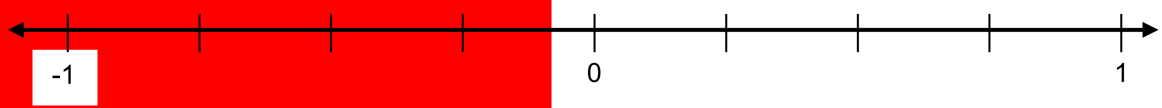
| | | |
|---|---|---|
| 16. $\lvert -12 \rvert$ _____ 12 | 17. $\lvert -12 \rvert$ _____ -12 | 18. $-\lvert -15 \rvert$ _____ -15 |

19. Grace says that the absolute value of 5 is negative five. Is Grace correct? Use examples or diagrams to support your answer

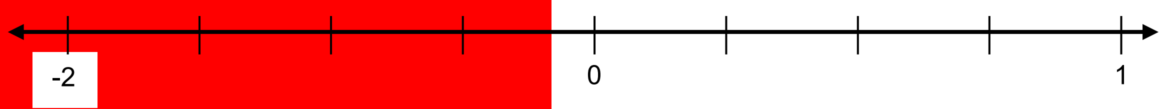
# SKILL BUILDER 8

For problems 1-3, graph and label each number on the number line.

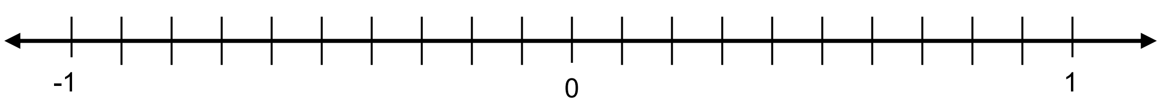
1. $\frac{1}{4}$ $\quad -\frac{3}{4}$ $\quad \frac{3}{8}$ $\quad -\frac{5}{8}$




2. $1\frac{3}{4}$ $\quad -1\frac{1}{8}$ $\quad -\frac{1}{2}$ $\quad \frac{1}{8}$

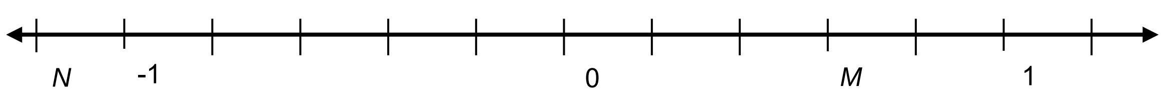



3. 0.9 -0.7 0.2 -0.5 0.35 -0.3 -0.95



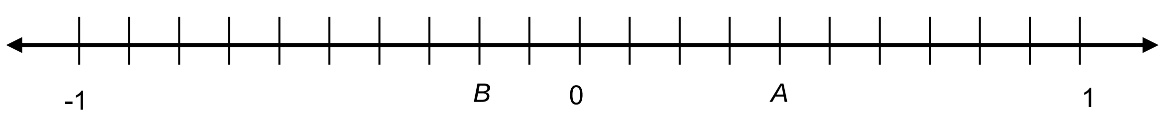

4. Locate -*M* and -*N* on the number line below. Express each of the following as a fraction.

*M* = ______ *N* = ______ -*M* = ______ -*N* = ______




5. Locate -*A* and -*B* on the number line below. Express each of the following as a decimal.

*A* = ______ *B* = ______ -*A* = ______ -*B* = ______



# SKILL BUILDER 9

Each small square on the grid is a unit square.

1. Label the axes.

2. Graph the origin at the point (0, 0) and label it *O*.

3. Graph the ordered pairs and label them with the given letters.

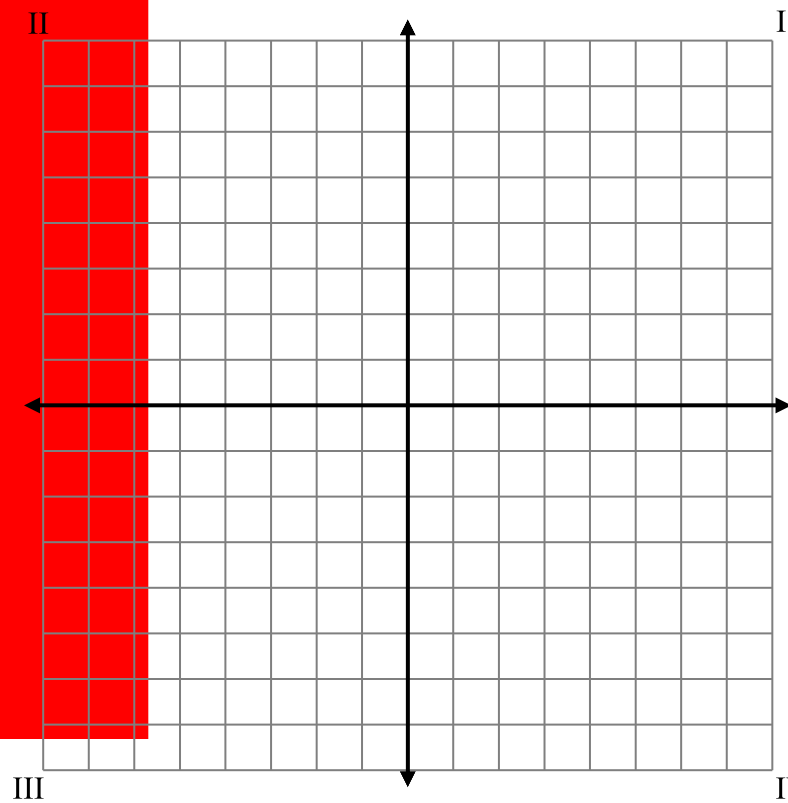
   *A* (4, 4) *B* (-5, -4)

   *C* (-8, 5) *D* (7, -2)

   *E* (5, 1) *F* (5, -1)

   *G* (0,-5.5) *H* (-3.2, 0.8)

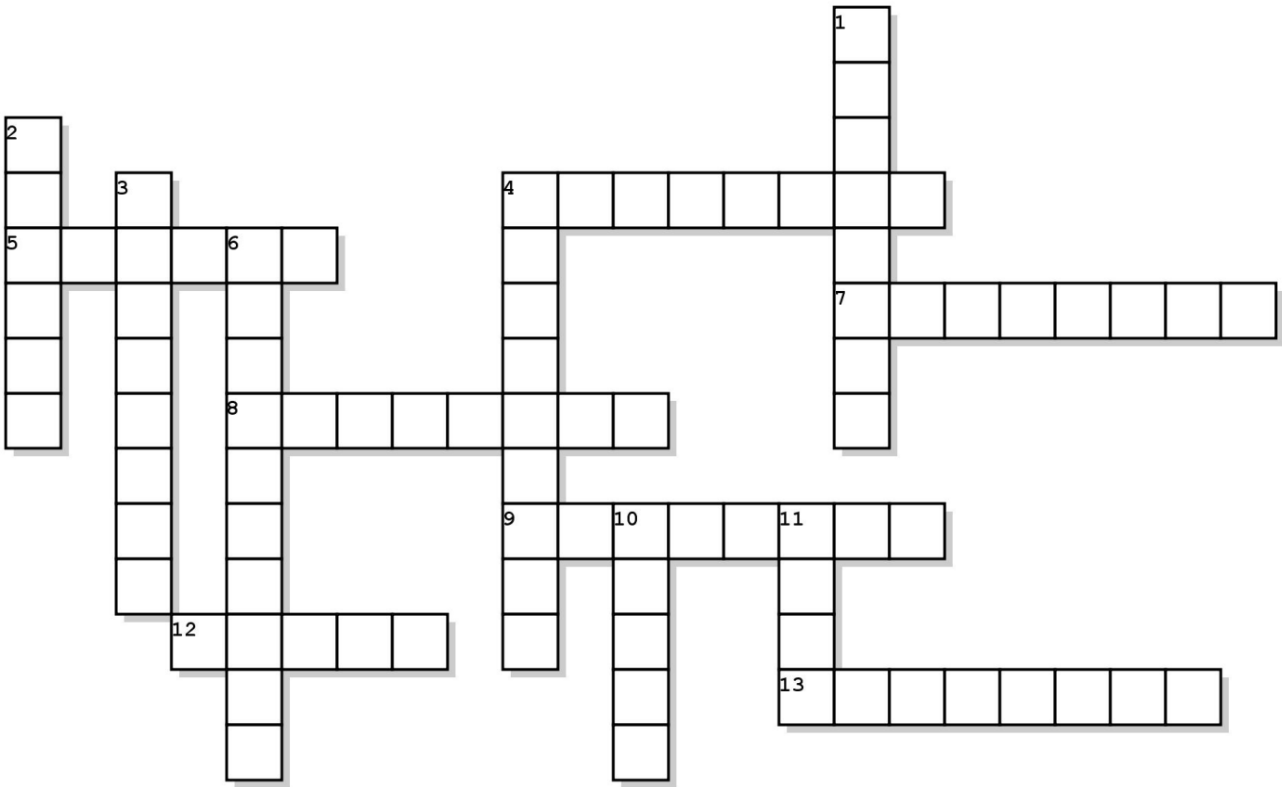
   *I* $(3\frac{1}{2}, 1\frac{3}{4})$ *J* $(-6\frac{1}{4}, -\frac{1}{2})$




4. Name the location of each ordered pair by the quadrant or axis it is on.

| Point | Location | Point | Location |
|---|---|---|---|
| *A* | | *F* | |
| *B* | | *G* | |
| *C* | | *H* | |
| *D* | | *I* | |
| *E* | | *J* | |

# FOCUS ON VOCABULARY



**Across**

4 As an example: -40 + 60 = 20

5 The point whose coordinates are (0, 0)

7 Whole numbers and their opposites

8 Any one of the four regions in the coordinate plane is called a ____ .

9 $\frac{5}{3}$ is an ____ fraction

12 $5\frac{3}{4}$ is a _____ number

13 A ____ number can be written as quotient of integers

**Down**

1 -5.34 is the ____ of 5.34

2 $\frac{3}{5}$ is a ____ fraction

3 The absolute value of a number is its ___ from zero on the number line.

4 Location above or below sea level

6 -55 < -50 is an example of an _____

10 The coordinate _____ has two perpendicular lines.

11 A point in the coordinate plane is represented by an ordered ______ .

(For word hints, see the word bank and other vocabulary used in this packet.)

# SELECTED RESPONSE

Show your work on a separate sheet of paper and choose the best answer(s).

1. Choose all the statements whose end result is a movement 5 steps forward from the starting point. The four statements are independent of each other.

   A. Move 5 steps backward and then 5 steps forward.

   B. Move 20 steps forward and then 15 steps backward.

   C. Move 20 steps backward and then 15 steps forward.

   D. Move 5 steps backward and then 10 steps forward.

2. In the morning, the temperature was -10° F. Several hours later, the temperature had risen 25° F. What was the temperature then?

   A. 35° F B. 15° F C. -35° F D. -15° F

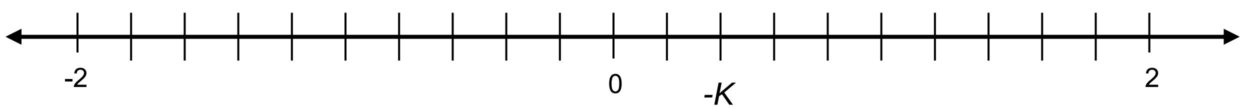
3. Choose all of the following expressions that have a value of 7.

   A. $-|7|$ B. $|16-9|$ C. $|9-16|$ D. $|-7|$

4. Choose all the true statements below.

   A. $-9 = |-9|$ B. $9 = |-9|$ C. $|-10| < 9$ D. $|-10| > 9$

5. What is the value of *K*?

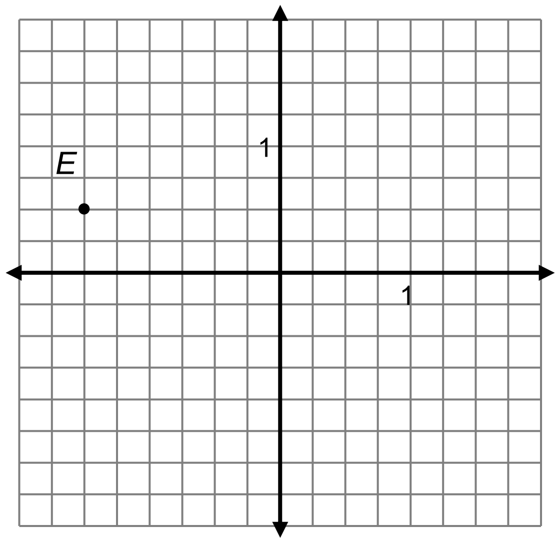



   A. $-\frac{1}{5}$ B. $\frac{1}{5}$ C. $-\frac{2}{5}$ D. $\frac{2}{5}$

6. Which of the following accurately describe the location of point *E*? Choose all that apply.

   A. (-6, 2) B. (-1.5, 0.5)

   C. $\left(-1\frac{1}{2}, \frac{1}{2}\right)$ D. $\left(-\frac{3}{2}, \frac{1}{2}\right)$



# KNOWLEDGE CHECK

Show your work on a separate sheet of paper and write your answers on this page.

### 2.1 Integers and the Number Line

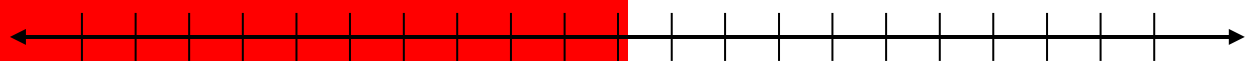
1. The morning temperature at the University of Minnesota was -2°F. In the afternoon, it was 11 degrees higher. What was the afternoon temperature?

2. Write a number sentence comparing the morning and afternoon temperatures in problem 1 using the *greater than* symbol.

### 2.2 Opposites and Absolute Value

3. Graph the following integers and their opposites on the number line below.

-3 5 -9 8 0

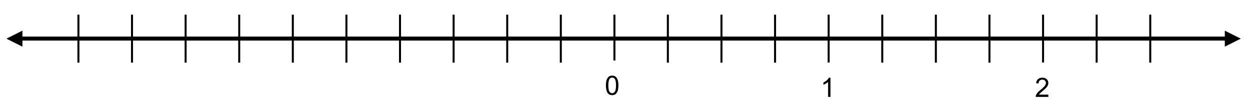


Write >, =, or < in the blanks to make each statement true.

| | | |
|---|---|---|
| 4. $\lvert -7 \rvert$ ________ 7 | 5. $\lvert -7 \rvert$ ________ -7 | 6. $-\lvert -7 \rvert$ ________ -7 |

### 2.3 Rational Numbers and the Number Line

Use the number line below for problems 7-10.



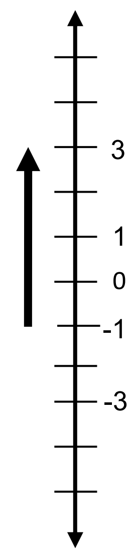

| | |
|---|---|
| 7. How do you get from $-\frac{1}{4}$ to $2\frac{3}{4}$? | 8. What is the distance from $-\frac{1}{4}$ to $2\frac{3}{4}$? |
| 9. How do you get from 1.25 to -3.75? | 10. What is the distance from 1.25 to -3.75? |

# HOME-SCHOOL CONNECTION

Here are some problems to review with your young mathematician.

1. In Harbin (China), the low temperature for the day was -12°F and the high temperature was 9°F. Find the difference between these temperatures.

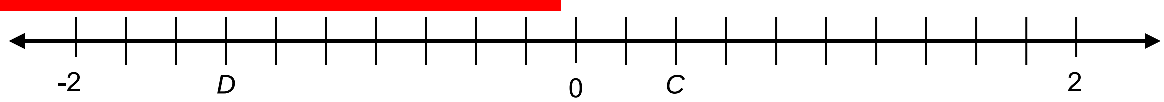
For problem 2.




2. Write a number sentence that explains the arrow on the vertical number line to the right.

3. Locate -*C* and -*D* on the number line below. Write each number as a decimal or its opposite.

   *C* = _____ *D* = _____ -*C* = _____ -*D* = _____




4. Find the length of segment $\overline{CD}$.

Parent (or Guardian) Signature ____________________________

# COMMON CORE STATE STANDARDS – MATHEMATICS

| STANDARDS FOR MATHEMATICAL CONTENT | |
|---|---|
| 6.NS.5* | Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation |
| 6.NS.6a* | Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates: Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. |
| 6.NS.6b* | Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates: Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. |
| 6.NS.6c* | Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates: Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. |
| 6.NS.7* | Understand ordering and absolute value of rational numbers. |

*Review of content essential for success in 7th grade.

| STANDARDS FOR MATHEMATICAL PRACTICE | |
|---|---|
| MP2 | Reason abstractly and quantitatively. |
| MP3 | Construct viable arguments and critique the reasoning of others. |
| MP5 | Use appropriate tools strategically. |
| MP6 | Attend to precision. |

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