

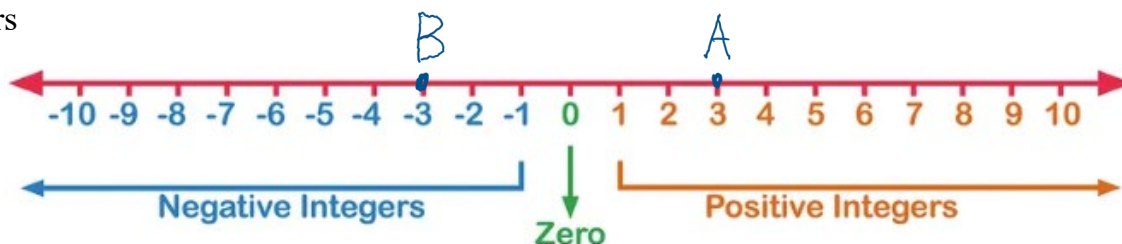
Math 4. Class Work 10

Positive and negative numbers

To make the subtraction $a - b$ possible when $b > a$, we introduce negative numbers.

- **Negative numbers** like -1 , -5 use the same notation as before but have a minus sign in front. They represent “opposite” values (negative temperature, level below sea level ...), or magnitude of loss, deficiency (losing 5\$ is -5 in your wallet).
- All integers we used before without 0 are **positive numbers**; we write the sign $+$ in front ($+7$, $+\frac{3}{4}$).
- The number 0 is neither positive nor negative and has no sign in front.

Rational numbers: the set of all positive values we have used so far, the zero, and all negative numbers



Modeling of the rational numbers with points on a line. Coordinates of a point.

- Draw a ray
- Pick a point in the middle to represent the 0
- Pick the direction to the right to represent the positive direction and note
- Chose a segment size to represent 1 unit
- Every number can be represented with a point on the line called an image of the number.

Example. Point A is 3 units to the right of 0 and is the image of $+3$.

Point B is 3 units to the left of 0 and is the image of -3 .

The **coordinate of point A** is $+3$, written as $A(+3)$, and the coordinate of point B is -3 , written as $B(-3)$.

Opposite numbers. Absolute

- Numbers placed on the number line at an equal distance away from zero are called opposite numbers. For example, because points $A(+3)$ and $B(-3)$ are at an equal distance from zero, the numbers $+3$ and -3 are opposite numbers.
- The “ $-$ ” sign denotes the opposite number, and the “ $+$ ” sign the same number.

Example: $-(-3) = +3 = +(3)$. The opposite number of negative 3 is positive 3, which is equal to the same number as positive 3.

- Absolute value is a property of every positive or negative number and is the distance from the number to 0 on the number line. $|a| = a$, and $|-a| = a$

Example: $|+2| = 2$, and $|-2| = 2$

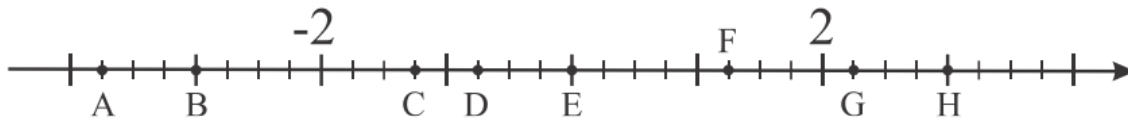
Problems:

1. The temperature during the day was x° . During the night, it became 6° lower. Calculate the temperature at night for the following day values:

$$x = 18, x = 15, x = 6$$

2. Write with positive or negative numbers
- 7° above zero and 7° above zero
 - 650 \$ profit and 230\$ loss
 - 35 minutes rotation clockwise, or 25 minutes rotation counterclockwise

3. Find the coordinates of points A, B, C, D, E, F, G, and H on the number line below:



4. a) Mark the points with the following coordinates

$$A(0), B(1), C(-1 \frac{1}{2}), D(5), E(-5), F(-3), G(3)$$



- b) Is there anything in common between points F and G, D and E?
 c) What is the opposite number of 5? What is the addition of two opposite numbers?

5. Write the opposite or the same number of:

$$-(+5) =$$

$$+(+5) =$$

$$-(-(-(-5))) =$$

$$-(-5) =$$

$$-(-(+5)) =$$

$$+(-5) =$$

$$-(-(-5)) =$$

6. Rewrite without parenthesis

$$\text{Example: } 30 - (2 + 1) = 30 - 2 - 1$$

$$30 - (2 - 1) = 30 - 2 + 1$$

To check your solution, you can find the value for both parts of the equality:

$$30 - (2 + 1) = 30 - 3 = 27;$$

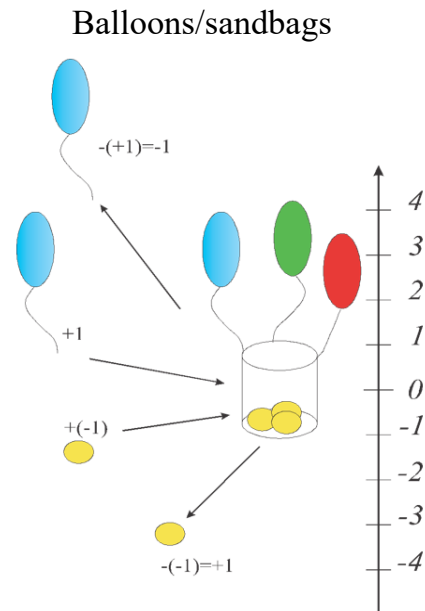
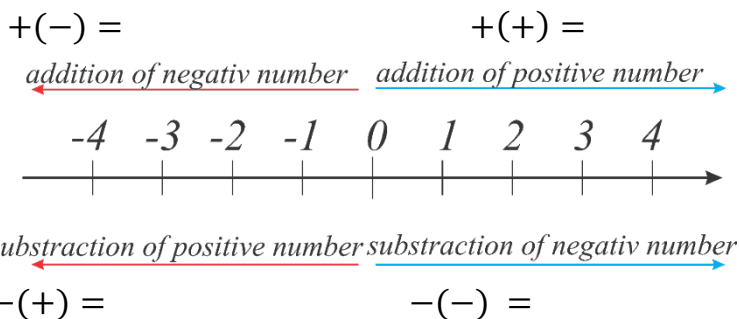
$$\text{or } 30 - (2 - 1) = 30 - 1 = 29$$

- a. $20 + (2 - 3)$
- b. $20 - (2 - 3)$
- c. $20 - (-2 + 3)$
- d. $20 - (-2 + (-3))$

7. Addition and subtraction of positive and negative numbers.

Evaluate:

$3 + (+2)$	$-3 - (-2)$
$3 + (-2)$	$-3 + (+2)$
$3 - (+2)$	$-3 - (+2)$
$3 - (-2)$	$-3 + (-2)$



8. Compare:

$-4 < 4$	$-4 < 4$	$-4 < -6$
$6 > -4$	$-4 < 0$	$-1 < -\frac{1}{2}$
$\frac{2}{3} < -\frac{3}{2}$	$-\frac{2}{3} < -1$	$-2 < \frac{1}{2}$

9. What is the distance of each point to the origin of the coordinate system 0.

A(+3), B(-11), C(- $\frac{1}{2}$), D(+2 $\frac{3}{4}$) E(-5). Write then using the notation for absolute value.



Position of a point in a plane.

On a plane (imagine a map of a city), it is convenient to determine the position of a point using distances to 2 perpendicular number lines ($0x$ and $0y$)

The pair of ordered numbers $(2, 3)$ are **the coordinates of the point**; the first is the distance to 0 on the horizontal line (the x -coordinate), the second number is the distance to 0 on the vertical line (the y -coordinate).

The point $(0,0)$ is called **the origin**.

The signs of these pairs of numbers (x,y) represent a **quadrant**: quadrant I - both coordinates are positive, $(+, +)$, quadrant II $(-, +)$, quadrant III $(-, -)$, and quadrant IV $(+, -)$.

10. Label the point A $(2,3)$, B $(4,-3)$, C $(-4,2)$, D $(-3,-2)$

11. Label point E $(-1,5)$. Which quadrant is it in?

