

LESSON 1: Introducing integers

INTEGERS: $\dots, -3, -2, -1, 0, 1, 2, 3, \dots$

- consist of counting numbers and their negatives
- can be represented on a number line
- positive integers are usually written without the plus sign
- negative integers are preceded with a minus sign, e.g. $-3, -14, -35$, etc.
- zero, 0 , is a special integer.

The number line



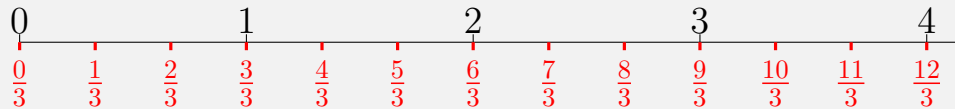
As you already know, negative integers are placed on the left; zero is in the middle; positive integers are on the right.

Example: Represent the integers $-2, 5, 7$ on a number line.



In practice, it is not necessary to space out the numbers as we did above. The important thing to keep in mind is that the negative integers should be on the left, while positive integers are on the right.

Example: In between any two integers are many many fractions. Fractions are NOT integers, unless they divide evenly. E.g, $\frac{6}{3}$ is a fraction which simplifies to 2, so $\frac{6}{3}$ is essentially an integer. But $\frac{5}{3}$ is merely a fraction, because the division leaves a (non-zero) remainder.



Comparing/ordering integers: Any positive integer is greater than any negative integer (for example, 3 is greater than -300). Zero is also greater than any negative integer. For comparisons involving two negative integers, use the fact that **the more negative an integer is, the smaller it is** (for example, -12 is smaller than -5 ; put differently, -5 is greater than -12).

Among $-3, -6, -13$, the smallest integer is -13 ; the largest is -3 .

Arrange $-4, 3, -1$ in ascending order.

The smallest integer in the list is -4 , followed by -1 , then 3. So we have $-4, -1, 3$.

Sample questions

1. Which of these is NOT an integer?

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

$[\sqrt{2}$ is **not** an integer. You'll encounter a popular proof of this if you study math beyond high school.]

2. Which of these is NOT an integer?

- A. $\sqrt{4}$
- B. 0.2
- C. $\sqrt{9}$
- D. -1

[Since $\sqrt{4} = 2$ and $\sqrt{9} = 3$, both of these square roots evaluate to integers. However, the decimal 0.2 is **not** an integer.]

3. Arrange the integers $-3, -8, -1$ in **ascending order**.

- A. $-8, -3, -1$
- B. $-1, -3, -8$
- C. $1, 3, 8$
- D. $8, 3, 1$

4. Arrange the integers $9, -2, 0$ in **descending order**.

- A. $0, -2, 9$
- B. $9, -2, 0$
- C. $9, 0, 2$
- D. $9, 0, -2$

5. Which integer is between 3 and 4?

- A. 5
- B. 2
- C. 1
- D. there is no integer between 3 and 4.

