**Sets of Numbers**

* Natural Numbers (*N*)
  + The ordinary whole numbers used for counting (“there are 6 coins on the table”) and ordering (“this is the 3rd largest city in the country”)
  + Some people include 0 in the set of Natural Numbers and some do not. We’ll agree to exclude zero
  + *N* = {1, 2, 3, 4, …}
* Whole Numbers (W):
  + The set of all natural numbers, as well as zero
  + *W* = {0, 1, 2, 3, …}
* Integers (*Z*):
  + Formed by the natural numbers, as well as zero, together with the negatives of the non-zero natural numbers
  + *Z* = {…, -3, -2, -1, 0, 1, 2, 3, …}
* Rational Numbers (*Q*):
  + Any number that can be expressed as a ratio of two integers
  + Essentially, this set includes all real numbers that can be expressed:
    - as an integer (such as -3 or 0 or 28), or
    - as a decimal with a definite end (such as 71.3 or -290.88 or 4.362), or
    - as a repeating decimal (such as 2.55 or -3.18)
* Irrational Numbers ():
  + Any real number that is not rational
    - This includes numbers that cannot be expressed as integers, or as a decimal with a finite number of digits, or as a repeating decimal
    - Examples include
      * , which is approximately equal to 3.14159625, but which cannot be precisely expressed as a decimal with an end
      * , which is approximately equal to 1.41421356, but which similarly never ends or becomes a repeating decimal
* Real Numbers (*R*):
  + Real numbers include any of the numbers above. In fact, most of you have probably only ever considered real numbers. The first time that you explore non-real numbers will likely take place some time after this course.
  + We are all familiar with the Cartesian plane (i.e., the x-axis and y-axis). Both the x-axis and the y-axis are real number lines. Any real number is represented by a position somewhere on the x-axis, and any real number is represented by a position somewhere on the y-axis.

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| **Example**: Find the point (2.1, -) on the Cartesian plane on the right. | |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  | |

**Set Notation**

* {} means “the set of”
* means “is an element of”
* means “such that”

Examples: Each of the following represents a set of numbers expressed in number line form. Express each in set notation.

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