CHAPTER 0
REVIEW OF ALGEBRA
01. Sets of Real Numbers

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A set is determined by its elements. Neither rearrangements neither nor repetitions in a listing affects the set. A $setA$ is said to be a subset of $setB$ if and only if every element of A is also an element of B.

For example, if $A = \{6, 8, 10\}$ and $B = \{6, 8, 10, 12\}$, then A is a subset of B. However, B is not a subset of A. There is exactly one set which contains no elements. It is called the empty set and is denoted by $\emptyset$.

1 Real Numbers

Real numbers are a set of numbers which encompass all the possible numbers that can be represented on a continous number line. Real numbers may contain various type of numbers. Such as:

1. Rational numbers

   These are the numbers that can be expressed as **ratio of two numbers** (where the denominator is not 0). **They can have terminating decimal representations**, for instances are

   - $\frac{3}{4} = 0.75$,
   - $\frac{1}{5} = 0.4$,
   - or non-terminating and repeating decimal numbers. Such as
     (a) $\frac{1}{3} = 0.33333\ldots$,
     (b) $-\frac{4}{11} = 0.363636\ldots$,
     (c) and $\frac{2}{15} = 0.13333\ldots$

2. Irrational Numbers

   These are the numbers that cannot be expressed as a ratio of two integers. The decimal expansion are **non-terminating** and **non-repeating**. Irrational numbers cannot be written as an integer divided by integer. Examples:

   - π (pi)
   - e (Euler)
   - $\sqrt{2}$
   - $\sqrt{3}$
   - $\sqrt{5}$
   - φ (Golden Ratio)

3. Integers:

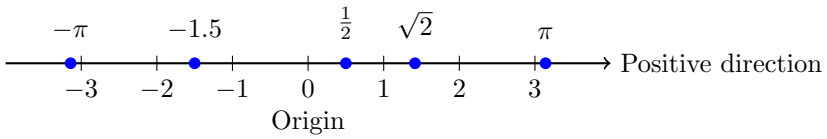
   This is a subset of rational numbers that include zero, positive whole numbers (natural numbers), and their negatives.
   Examples: ..., -2, -1, 0, 1, 2, ...

4. Whole Numbers:

   These include all natural numbers along with zero.

5. Natural Numbers:

   Also known as counting numbers. These starts from 1 and go on indefinitely (1, 2, 3, . . .)



2 Problems

In problem 1 - 12, determine the truth of each statement. If the statement is false, give a reason why is that so.

1. $\sqrt{-13}$ is an integer.

   False. It contains decimals

2. $\frac{-2}{7}$ is rational.

   Yes it is rational. Although its decimal is non terminating, it's repeating.

3. -3 is a positive integer.

   False. It is a negative integer.

4. 0 is not rational.

   False. It can be a rational. You can put 0 as a numerator in a fraction.

5. $\sqrt{3}$ is rational.

   False. It is irrational. Because it contains non-terminating and non-repeating numbers in a decimal form.

6. $\frac{-1}{0}$ is a rational number.

   False. It is undefined.

7. $\sqrt{25}$ is not a positive integer.

   True. It can be 5 *or* -5.

8. $\sqrt{2}$ is a real number.

   True. It is encompassed in all the possible numbers which can be represented in a continous line.

9. $\frac{0}{0}$ is rational.

   False. It is undefined.

10. π is a positive integer.

    False. It is not an integer because it contains decimal.

11. 0 is to the right of $-\sqrt{2}$ on the real number line.

    True.

12. Every integer is positive or negative.

    True. Zero, positive whole numbers (natural numbers), and their negatives.

13. Every terminating decimal number can be regarded as a repeating decimal number.

    True. For example is $\frac{1}{2} = 0.5000\ldots$

14. $\sqrt{-1}$ is a real number.

    False. Because there is no real numbers squared equals negative number.