

Lecture 4

Friday, September 8, 2023 12:54 PM

* Prayer

Is p or $(q \text{ and } r)$ different from $(p \text{ or } q)$ and r ?

Ex:

To be on track of the math major, _____ by the end of this year.

(A) you need to finish Math 303 or a combination of Math 221 and Math 222.

(B) you need to finish Math 303 or Math 221, then finish Math 222.

The parentheses are needed to clarify the meaning of "p or q and r".

How about "p or q or r"?

Is $(p \text{ or } q)$ or r different from p or $(q \text{ or } r)$?

We use truth table to distinguish them. *Extra credit problem!*

Sets and Venn diagrams

Set (as a noun) is a collection. A member of a set is called an element of that set. The set that has no element is called the empty set, denoted by $\{\}$ or \emptyset . The empty set is analogous to number 0 in the number system.

3 ways to represent a set:

- Enumerate all the elements of the set.

Ex The set of prime numbers between 1 and 30

$$\{2, 3, 5, 7, 11, 13, 17, 19, 23, 29\}$$

The set of Church colleges is $\{\text{BYU}, \text{BYUI}, \text{BYUH}, \text{Ensign}\}$.

- Enumerate with "..."

The set of whole numbers from 1 to 100:

$$\{1, 2, 3, \dots, 100\}$$

The set of multiples of 3 from 3 to 36:

$$\{3, 6, 9, \dots, 36\}$$

Note: the pattern must be clear (no room for ambiguity). We are not playing an IQ game.

- Describe the common properties of the elements:

Set of all BYUH students,

set of all birds in the sky, ..

$$\{1, 2, 3, \dots, 100\} = \{n \mid 1 \leq n \leq 100 \text{ and } n \text{ is a whole number}\}$$

↑
such that

$$\{3, 6, 9, \dots, 36\} = \{3n \mid n = 1, 2, \dots, 12\}$$

Work on Problems 1-4 of the worksheet.

* Set of numbers:

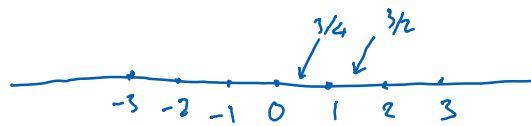
$$\mathbb{N} = \{1, 2, 3, \dots\} \text{ natural numbers}$$

$$\mathbb{Z} = \{0, \pm 1, \pm 2, \pm 3, \dots\} \text{ integers (or whole numbers)}$$

$$\mathbb{Q} = \left\{ \frac{p}{q} \mid p \in \mathbb{Z}, q \in \mathbb{N} \right\} \text{ rational numbers}$$

↑
belongs to / be an element of

The rational numbers don't fill the number line. For example, $\sqrt{2}$ is not a rational number.



The set of numbers that fill the entire line is the real numbers, denoted by \mathbb{R} .