

R1 Sets and Real Number Line

R2 Integer Exponents and Scientific Notation

1-22-2018 class notes

Class work in the bottom.

Identifying different kinds of numbers

1. For each of the following, say all the categories of numbers to which it belongs. The categories are:

\mathbb{N} the set of natural numbers;

$\mathbb{W} = \mathbb{N} \cup \{0\}$ the set of whole numbers;

$\mathbb{Z} = \mathbb{W} \cup \{-1, -2, -3, \dots\} = \mathbb{W} \cup -\mathbb{N}$ the set of integers;

\mathbb{Q} the set of rational numbers ;

\mathbb{R} the set of all real numbers.

$$\frac{-4}{5}$$

ANSWERS IN PAGE 3 BELOW

3.14159

π

$\sqrt{5}$

$\frac{10}{5}$

$\sqrt{16/9}$

Set Notations – Ways to list sets of numbers

If we have a *finite* set of numbers, or a *sequence* we can write them like this:

$$\{1, 2, 3, \dots\}, \quad \{3, 17.34, -8.1\}$$

But if we want to describe a whole interval of numbers, we have the following methods:

Example Set: Set of all real numbers between 1 and 2 including 1 but not including 2.

Set builder notation: $\{x \in \mathbb{R} : 1 \leq x < 2\}$

Interval notation: $[1, 2)$

Number line (graphical) notation Same as above but mark [at 1 and) at 2 on number line.

If we want to combine one or more intervals we can use union \cup or intersection \cap

Infinite subsets are denoted using ∞ symbol. For example, the set of all positive real numbers are denoted by $(0, \infty)$.

2. Describe the set of real numbers that are either greater than -1 or smaller than 1 .
3. Same as 2 above except we replace “either...or” with AND.

Other topics from R1 that you need to know:

Absolute Value of a number
Simplifying sums and products of expressions.

Integer Exponents and Scientific Notation

4. Simplify the following expression and write with positive exponents:

$$3x^4y^{-3} \frac{(4xy^2)^3}{2^6x^{-1}y^3}$$

Answer below.

Scientific Notation

Scientific notation involves writing numbers in the form $A \times 10^n$ where A is *always* between 0 and 10 and n is any integer.

For example, $3 \times 10^{-4} = 0.0003$.

5. Write as a decimal number: 4.376895×10^3 .

Answer: 4376.895

6. Write the following in scientific notation:

1. Salmonella bacteria are elongated bacteria and average 0.0000035 m in length.

Answer: 3.5×10^{-6} .

2. The distance from Earth to Barnard’s Star is 32,000,000,000,000 mi.

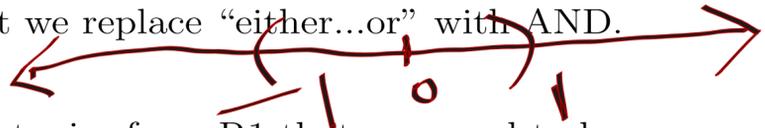
Answer: 3.2×10^{13} .

3. The average weight of a newborn baby is 7.5 lb.

The number 7.5 is already between 0 and 10. So we can leave it like that or write as 7.5×10^0 .

$$(-1, 1) \quad \{x \in \mathbb{R} \mid -1 < x < 1\}$$

3. Same as 2 above except we replace "either...or" with AND.



Other topics from R1 that you need to know:

Absolute Value of a number

Simplifying sums and products of expressions.

Integer Exponents and Scientific Notation

4. Simplify the following expression and write with positive exponents: $= 3x^8$

$$y^0 = 1$$

$$3x^4 y^{-3} \frac{(4xy^2)^3}{2^6 x^{-1} y^3} = 3x^{4+3-1} y^{-3+6-3} = 3x^6 y^0 = 3x^6$$

$$= \frac{3x^4 y^{-3} (4^3 x^3 (y^2)^3)}{2^6 x^{-1} y^3} = \frac{3x^4 y^{-3} 4^3 x^3 y^6}{(2^2)^3 x^{-1} y^3}$$

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