Math 60, Sections 1.5-1.7 Notes and Practice Name: Solutions

Section 1.5: Set Notation and Types of Numbers

Set Notation

1. A set is a group or collection. We list the elements of a set in curly brackets { }.

   a. What numbers can you roll on a 6-sided die? Write them in set notation.

   $\{1, 2, 3, 4, 5, 6\}$

   b. How many cats can a person have? Write the elements in set notation.

   $\{0, 1, 2, 3, \ldots\}$ (whole numbers from 0 to ∞)

   Interval notation $[0, \infty)$ all numbers from 0 to ∞

   c. Write the set of U.S. shoes sizes.

   Kids $\{1, 1.5, 2, 2.5, \ldots^{13}\}$ Adults $\{5, 5.5, 6, 6.5, \ldots^{22}\}$

Sets of Numbers

2. List the sets of numbers and their notation.

Real Numbers

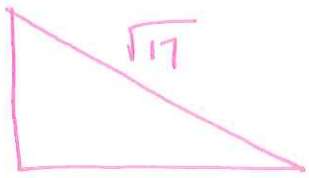
Rational Numbers
"fractional"
$\sqrt{9} = 3$
decimals + fractions
terminating → 0.5
pattern repeats → $0.\overline{3}$
$\frac{1}{2}$, $\frac{1}{3}$, $\frac{99}{100}$

Integers


$\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$

Whole numbers
$\{0, 1, 2, 3, \ldots\}$
0 is the "0" in whole

Natural numbers
Counting numbers
$\{1, 2, 3, \ldots\}$

Irrational
$\sqrt{11}$


$\pi \approx 3.14159\ldots$
e
$\sqrt{82}$

$i = \sqrt{-1}$

3. Where do decimals fit in the sets of numbers?

Repeating Decimals	Terminating Decimals	Not repeating and Not Terminating
Rational Numbers	Rational Numbers	Irrational

4. Identify which sets each number belongs to.

a. $-\frac{3}{5}$ rational real

b. π irrational real

c. $\sqrt{49} = 7$ Natural whole Integers Rational, Real

d. $1.\overline{852}$ rational real

$\sqrt{-4}$ not a real number

5. Give an example of each. If no such number exists, write none or does not exist (DNE).

a. Rational, but not a whole number.

$\frac{1}{2}$, 2.7, $1\frac{1}{4}$, -.5

b. A real number, but not an integer.

$\sqrt{7}$, -2.9, $\frac{1}{2}$

c. An integer, but not a natural number.

0, -27

6. Which set of numbers is best used when describing each scenario?

a. The number of pets in your household.

whole numbers

b. The amount of money someone earns at a casino.

wins/loses

Rational

Section 1.6: Comparison Symbols

7. Write the name of each symbol and give an example of how it is used.

$<$ less than $\leq$ less than or equal to

$>$ greater than $\geq$ greater than or equal to

$=$ equals $\neq$ not equal $\approx$ approximately equal to

8. Write $<$, $>$, or $=$ to make a true statement.

a. $-4 \boxed{<} 5$

b. $\frac{2}{5} \boxed{>} -\frac{7}{5}$

c. $\frac{1}{2} \cdot \frac{1}{2} \boxed{<} \frac{1}{2} + \frac{1}{2}$

$\frac{1}{4} < 1$

d. $|-4| \boxed{>} -|-4|$

$4 \quad -4$

e. $\frac{3}{4} \boxed{=} 0.75$

f. $\frac{4}{9} \boxed{>} 0.4$

$.\overline{4}$

9. Write whether each comparison is true or false.

a. $-4.5 \neq -\frac{9}{2}$

false

b. $-1 \leq 0$

true

$-1 \leq -1$

true

c. $-3\frac{1}{4} \leq -3\frac{1}{2}$

false

10. Use the $>$ symbol to arrange the following numbers in order from greatest to least.

$2.5, -\frac{3}{4}, \sqrt{16}, 0, -2$

$4 > 2.5 > 0 > -\frac{3}{4} > -2$

$\sqrt{16}$ $-.75$

Section 1.7: Interval and Set-Builder Notation

Variables

A variable is a letter that we use to represent an unknown quantity. The variable x is the most common, but any letter can be used. We must define what the variable represents so it is clear.

Inequalities and Number Lines

11. Consider the age of a voter. What are all possibilities for this person's age?

a. Write the possibilities in words and symbols. Then define and use a variable.

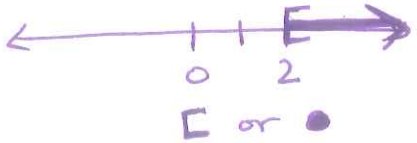
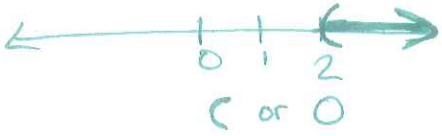
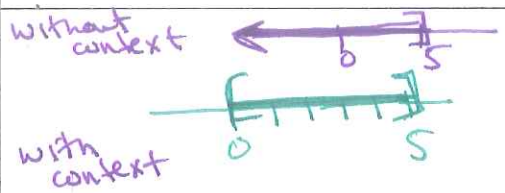
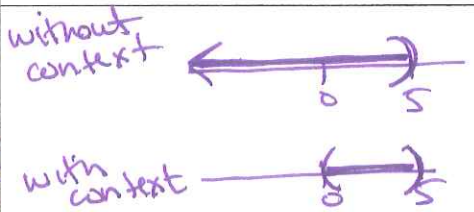
18 and over

Let V = the age of the voter $\quad V \geq 18$

b. Draw a number line representing the ages.

We have three mathematical ways to write sets: a number line graph, an interval and set-builder notation.

12. Complete following table of examples. (Note that $x \geq 2$ can also be written as $2 \leq x$.)

Inequality	Number Line Graph	Interval	Set-Builder Notation
a. $x \geq 2$ Spend at least 2 dollars to use your coupon.		$[2,\infty)$	$\{x \mid x \geq 2\}$ ↑ "such that"
b. $y > 2$ Spend more than 2 dollars to use a credit card.		$(2,\infty)$	$\{y \mid y > 2\}$
c. $s \leq 5$ You can spend at most 5 dollars		$(-\infty,5]$ $[0,5]$	$\{s \mid s \leq 5\}$ extra $\{s \mid 0 \leq s \leq 5\}$
d. $t < 5$ You need to complete a job in less than 5 hours		$(-\infty,5)$ $(0,5)$	$\{t \mid t < 5\}$ $\{t \mid 0 < t < 5\}$

More Practice

13. Consider the number of gallons of gas in a gas tank that has a maximum capacity of 12 gallons. What are all possibilities for the number of gallons of gas in this tank?

a. State this in words and symbols. Then define and use a variable.

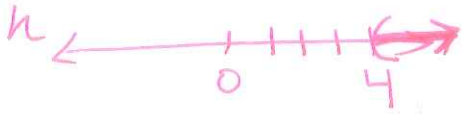
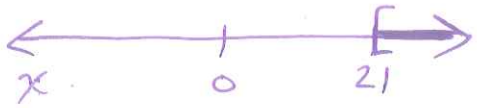
less than or equal to 12 gallons

Let g = the number of gallons in the tank

b. Draw a number line representing the quantity.

(number of gallons can't be negative) $g \leq 12$

14. Write an inequality for each situation using a variable and represent it using all three forms.

Inequality	Number Line Graph	Interval	Set-builder Notation
a. Kids must be over 4 feet tall to swim in the lake. let h = height in feet		$(4,\infty)$	$\{h \mid h > 4\}$
b. A concert venue requires people to be 21 and over to attend. Let x = age		$[21,\infty)$	$\{x \mid x \geq 21\}$
c. The submarine stayed below the surface of the water. let h = height		$(-\infty,0)$	$\{h \mid h < 0\}$
d. The maximum altitude of the plane was 30,000 feet. let a = altitude in feet		[0,30000]	$\{a \mid 0 \leq a \leq 30{,}000\}$

15. Identify which sets each number belongs to.

a. $\sqrt{11}$ Irrational, real

b. $\frac{1}{2}$ rational, real

c. 3.5 rational, real

d. -2 integer, rational, real

16. Give an example of each. If no such number exists, write none or does not exist (DNE).

a. Real, but not rational.

π, $\sqrt{7}$

b. An integer, but not a whole number.

-4, -100

c. A natural number that is not rational.

none

17. Which set of numbers is best used when describing each scenario?

a. The number of gallons of gas remaining in a car.

rational

b. The age of a person.

we usually describe age in whole numbers, but rational would also make sense.

18. Write $<$, $>$, or $=$ to make a true statement.

a. $-7 \boxed{<} -2$

b. $-\frac{1}{4} \boxed{=} -0.25$

c. $\frac{2}{3} \cdot \frac{1}{2} \boxed{>} \frac{1}{10}$

$\frac{1}{3} > \frac{1}{10}$

19. Write whether each comparison is true or false.

a. $\sqrt{2} \approx 1.414$

True

b. $-4 \geq -20$

True

c. $-0.5 \leq -0.4$

True