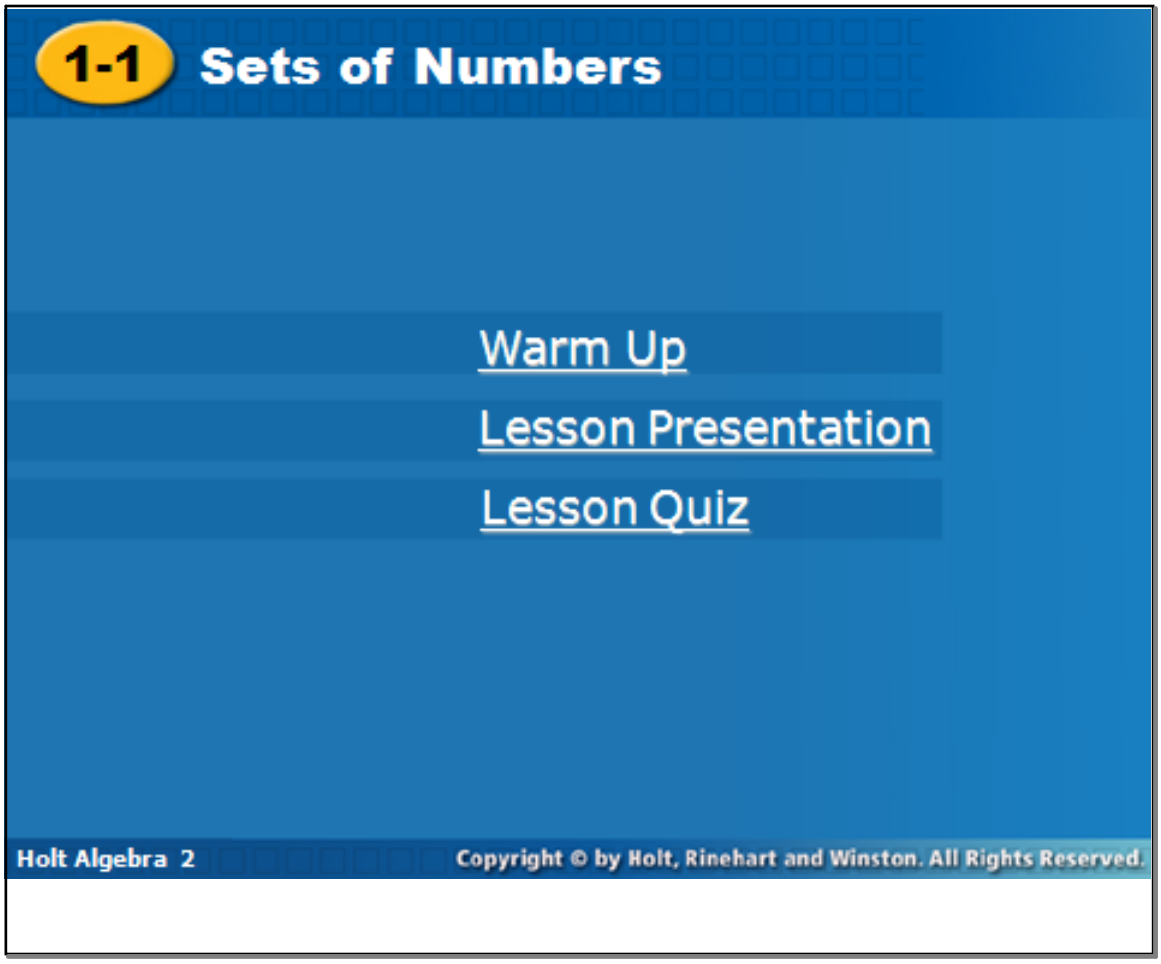
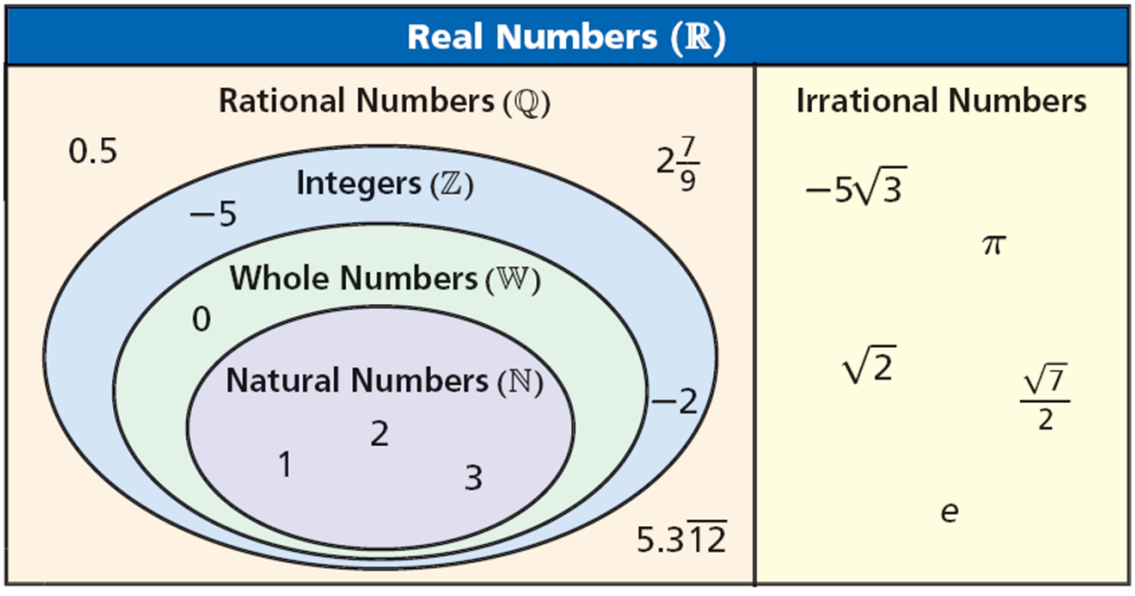
-Sit wherever you want (preferably a place where you can see and concentrate).
-Get out a piece of paper, write your name on it, write who you live with and how to contact them (email and phone).
-At the bottom write a little bit about yourself.



1-1 Sets of Numbers

A **set** is a collection of items called **elements**. The rules of 8-ball divide the set of billiard balls into three *subsets:* solids (1 through 7), stripes (9 through 15), and the 8 ball.

A **subset** is a set whose elements belong to another set. The **empty set**, denoted ∅, is a set containing no elements.



1-1 Sets of Numbers

Rational numbers can be expressed as a quotient (or *ratio*) of two integers, where the denominator is not zero. The decimal form of a rational number either terminates or repeats.

Irrational numbers, such as $\sqrt{2}$ and π, *cannot* be expressed as a quotient of two integers, and their decimal forms do not terminate or repeat. However, you can approximate these numbers using terminating decimals.

Consider the numbers $2.\overline{3}, \pi, \sqrt{5}, -\frac{11}{2}$, and 2.7652.

Order the numbers from least to greatest.

What should we do when we see a problem like this? What steps should we take?

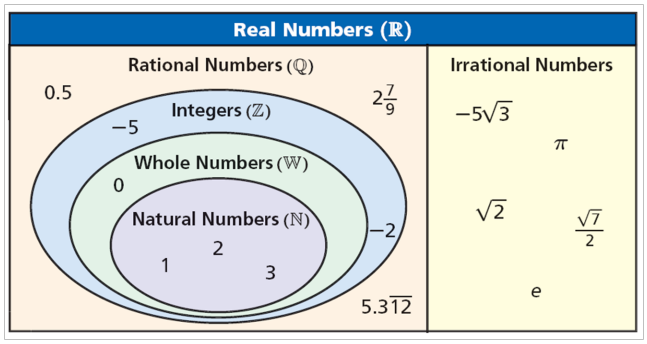
$-\frac{11}{2}, \sqrt{5}, 2.\overline{3}, 2.7652, \pi$

Consider the numbers $2.\overline{3}$, π, $\sqrt{5}$, $-\frac{11}{2}$, and 2.7652.

Classify each number by the subsets of the real numbers to which it belongs.

$2.\overline{3}$ - $\mathbb{R}$, $\mathbb{Q}$

π - $\mathbb{R}$, Irrational



How many possible subsets can one number be? Give an example of a number of your choosing and all the subsets it belongs to...

Consider the numbers -2, π, -0.321, $\frac{3}{2}$ and $-\sqrt{3}$.

Order these numbers and classify them.

There are 4 ways to define sets of numbers, words, roster notation, interval notation and set-builder notation.

$x \geq 5$

1) Words: pretty self explanatory, just describe what you see as the set, aka keep it simple.

Ex: x<3 as words would be all the numbers less than 3.

Come up with your own set, define it in words, give your set to your partner. Have them define it in words, check to make sure your answers match

Ex 2: {2, 3, 4, 5} in words:

2) Roster notation: what is a roster? You make that using numbers now...The only difference is you list your numbers using braces ie: { }

Ex: The integers that are greater then 1.7 and less than 7.3

{ 2, 3, 4, 5, 6, 7 }

Come up with your own set and define in words and roster notation.

Notice on the previous example I used the classification of integers, if not it would be impossible to list every number between 1.7 and 7.3 (there are infinitely many). This brings us to the idea of finite versus infinite sets.

Finite Set: Set that ends

Ex: {10,20,30}

Infinite Set: Set that never ends

Ex: {10,20,30,...}

You can't use roster notation to define an infinite set because it is impossible to write infinitely many numbers...therefore we have to use other sets of notation to show this. You already know one kind: the inequality. This 3<x<5 represents every number between 3 and 5. Believe it or not there are infinitely many numbers between them. Start thinking of some and I guarantee you can always find one more. To fix this problem we use interval notation.

3. Interval notation: works like brackets, represents inequality signs. Therefore we could write 3<x<5 as (3,5)

Note: the parantheses are used for < and > and the blocks(not sure) [ ] are used for ≤ and ≥

$3 \le x < 6$ $\le$ [$<$ (

$[3,6)$ $\ge$ [

Try and write the following inequalities using interval notation

$-2 \le x < 8$

$[-2, 8)$

$0 \le x \le 9$

$[0, 9]$

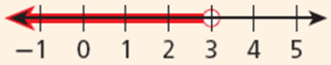
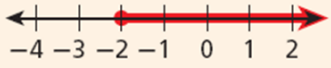
$0 \le x \le 9$

$0 < x$ $(0, \infty)$

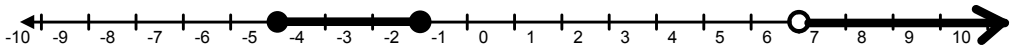
Since infinity (∞) is not a number be sure to use a parenthesis when doing interval notation

Write your own inequality and put it into interval notation. Have your partner check your work.

Methods of Representing Intervals

Words	Number Line	Inequality	Interval Notation
Numbers less than 3		$x < 3$	$(-\infty, 3)$
Numbers greater than or equal to −2		$x \ge -2$	$[-2, \infty)$
Numbers between 2 and 4		$2 < x < 4$	$(2, 4)$
Numbers 1 through 3		$1 \le x \le 3$	$[1, 3]$

Use interval notation to represent the set of numbers.



$[-5,-2]$ or $(6,\infty)$

$x \leq 2$ or $3 < x \leq 11$

$(-\infty,2]$ or $(3,11]$

$8 < x \leq 15$

4) Set builder notation: Yep, you are building sets now using math (we are speaking a foreign language). This way uses the properties of elements in sets (ie the Integers, Whole Numbers, etc), inequalities and the element symbol, $\in$.

1-1 Sets of Numbers

The set of all numbers x such that x has the given properties

$$\{x \mid 8 < x \leq 15 \text{ and } x \in \mathbb{N}\}$$

Read the above as "the set of all numbers x such that x is greater than 8 and less than or equal to 15 and x is a natural number."

Helpful Hint

The symbol $\in$ means "is an element of." So $x \in \mathbb{N}$ is read "x is an element of the set of natural numbers," or "x is a natural number."

Some things to remember:

-you need a variable, you choose, I tend to go with x.

-after your variable a vertical line |

-after that define what the set is, inequalities are generally the best

-then place a comma and define which classification your variable is using the element of symbol ∈

-you can now use set builder! Congrats.

$x \in \mathbb{Z}$

Ex: positive multiples of 10

$$\{x \mid 10x, x \in \text{positive}\mathbb{Z}\}$$

1 2 3 4

10, 20, 30, ...

Try one on your own, make it up yourself, make sure your partner checks your work.

Methods of Set Notation			
Words	**Roster Notation**	**Interval Notation**	**Set-Builder Notation**
All real numbers except 1	Cannot be written in roster notation	$(-\infty, 1)$ or $(1, \infty)$	$\{x \mid x \neq 1\}$
Positive odd numbers	$\{1, 3, 5, 7, \ldots\}$	Cannot be notated using interval notation	$\{x \mid x = 2n - 1 \text{ and } n \in \mathbb{N}\}$
Numbers within 3 units of 2	Cannot be written in roster notation	$[-1, 5]$	$\{x \mid -1 \leq x \leq 5\}$

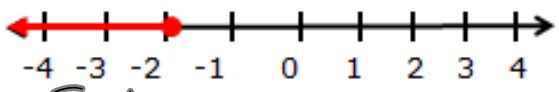
1-1 Sets of Numbers

Example 3: Translating Between Methods of Set Notation

Rewrite each set in the indicated notation.

A. $\{x \mid x > -5.5, x \in \mathbb{Z}\}$; words

B. positive multiples of 10; roster notation

C. 

; set-builder notation

$\{x \mid x \leq -2, x \in \mathbb{Q}\}$

1-1 Sets of Numbers

Check It Out! Example 3

Rewrite each set in the indicated notation.

a. {2, 4, 6, 8}; words

b. $\{x \mid 2 < x < 8 \text{ and } x \in \mathbb{N}\}$; roster notation

$x \geq 99$

c. $[99, \infty)$; set-builder notation

$\{x \mid x \geq 99, x \in \mathbb{R}\}$

Homework: p. 10 #12-17, 19, 21, 30-35