Relations
- A connection between two things that are represented by numbers
- Create a set of ordered pairs to show relationship

Ordered Pair
(x, y)

x-value \(\Rightarrow\) input or DOMAIN
y-value \(\Rightarrow\) output or RANGE or \(f(x)\)
6 Common Ways to Represent a Relation/Function

1. Ordered Pairs
   \((3, 6), (-1, 2), (8, 3)\)

2. Mapping

3. Table

<table>
<thead>
<tr>
<th>x</th>
<th>3</th>
<th>-1</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>6</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

4. Graphing

5. Verbal Description (Word Problem)

6. Algebraic Equation/Function
   \(y = x + 1\)
Inverse of a Relation (or Function)

\[(2, 4)(1, -2)(3, 0)(-2, 4)(-1, 2)\]

\[\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \]

\[(4, 2)(-2, 1)(0, 3)(4, -2)(2, -1)\]

- Switching the x-values for the y-values
- The ordered pair is still \((x, y)\), the values are just switched
Vending Machine Example

Question to Ask:

Am I getting out the same thing every time that I push a "flavor" of the drink buttons?

Gatorade → Gatorade
Pepsi → Pepsi
Mtn Dew → Mtn Dew
Sierra Mist → Sierra Mist

yes
Gatorade  
Pepsi  
Mtn Dew  
Diet Mtn Dew  
Diet Pepsi  
Gatorade  
Pepsi  
Mtn Dew  
Sierra Mist  
Gatorade  
Pepsi  
Mtn Dew  
Crush  
Aquafina  

yes

yes
No

Yes
FUNCTIONS

DO NOT FORGET THIS!!!!

- A relation where every input (domain) value has only one output (range) value
- All functions are relations, but not all relations are functions
- Functions can be linear OR non-linear
Is it a function or not?
If not, state what needs to be changed to make it a function.

1. yes
2. no
   - change a 1 to a different # (not 3)
   - make the outputs the same # (any #)
3. yes

Is it a function or not?
Prove it without saying "Vertical Line Test."

1. Function
   - (-4, 2)
   - (-3, 2)
   - (-2, 2)
   - (-1, 2)
   - (0, 2)
   - (1, 2)
   - (2, 2)
   - (3, 2)
   - y = 0
   - y = 2
2. Not a function
   - (-2, 3)
   - (-2, 2)
   - (-2, -1)
   - (-2, -2)
   - (-2, -3)
   - (-2, 0)
   - x = -2
Vertical Line Test

- Eye test to see if a graph is a function or not
- If you take a "vertical line" and move it from left to right, it will show if a graphed relation has more than one output for each input. If there is more than one point that touches that vertical line at the same time, then it is not a function.

Is it a function or not? Be able to prove it!

Yes

No

No

Yes