Functions and Relations – 3.3 Functions and Function Notation

Today’s Outcome: Demonstrate an understanding of functions and relations.

Function: a type of relation where the x values cannot be repeated.

- Each value of the independent variable (x) is associated with exactly one value of the dependent variable (y).
- For every value in the domain (x), there is a unique value in the range (y).
- All functions are relations, but not all relations are functions.

* every x has only 1 y partner. *

Vertical Line Test: if the line only hits the graph once, it’s a function!
Example: Which of these graphs are functions?

- Function
- Not a function
- Not a function

Example: Which of these tables of values are functions?

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>3</td>
</tr>
<tr>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>-1</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Example: Which of these sets of ordered pairs are functions?

- Not a function
- Function

- All x's are different, it's a function.
- x = 2 has two partners.
- x = 1 has 4 partners

{(1, 1), (2, 2), (3, 3), (4, 4)}

{(1, 1), (2, 2), (3, 3), (4, 4), (5, 1)}

{(1, 1), (1, 2), (1, 3), (1, 4)}
**Function Notation:**
- Symbolic notation used for writing a function.
- We read f(x) as “f of x” or “f at x”

Replace y with f(x):

**Example:**
\[ y = x + 4 \rightarrow f(x) = x + 4 \]

Determine f(5).
\[
\begin{align*}
  f(x) &= x + 4 \\
  f(5) &= 5 + 4 \\
  f(5) &= 9
\end{align*}
\]

Determine x if f(x) = 10.
\[
\begin{align*}
  f(x) &= x + 4 \\
  10 &= x + 4 \\
  x &= 6
\end{align*}
\]

**Example:** y = 3x + 1

a. Write this formula using function notation.
\[ f(x) = 3x + 1 \]

b. What is f(2)?
\[
\begin{align*}
  f(x) &= 3x + 1 \\
  f(2) &= 3(2) + 1 \\
  f(2) &= 6 + 1 \\
  f(2) &= 7
\end{align*}
\]

c. What is x if f(x) = 13?
\[
\begin{align*}
  f(x) &= 3x + 1 \\
  13 &= 3x + 1 \\
  -1 &= 3x \\
  \frac{-1}{3} &= x \\
  x &= 4
\end{align*}
\]
Example: \( g(x) = 8x - 2 \)

a. Write this formula as a function in two variables.

\[ y = 8x - 2 \]

b. What is \( g(3) \)?

c. What is \( x \) if \( g(x) = 30 \)?

Practice: The function \( F(C) = 1.8C + 32 \) is used to convert a temperature in degrees Celsius to a temperature in degrees Fahrenheit.

a) Determine \( F(25) \). Explain your answer.

b) Determine \( C \) so that \( F(C) = 100 \). Explain your answer.