Name:__________________________________________

Teacher:________________________________________

Pd: ______
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Chapter 4 EXAM
Chapter 4–1 – Relations and Functions (Day 1)

SWBAT: (1) Match simple graphs with situations
       (2) Identify the domain and range of relations and functions

Warm – Up:

Exercise #2: Given the points \( A(1, 2) \), \( B(-3, 4) \), \( C(2, -5) \), and \( D(-4, -6) \), plot and label them on the grid given below and state the quadrant that each point lies in.

![Grid with labeled points](image)

QUADRANTS

\begin{align*}
A: & \quad \underline{\text{_______}} \\
B: & \quad \underline{\text{_______}} \\
C: & \quad \underline{\text{_______}} \\
D: & \quad \underline{\text{_______}}
\end{align*}

A set of ordered pairs is called a _______________. A relation can be depicted in several different ways. An equation can represent a relation as well as ________, __________, and __________.

A mapping illustrates how each element of the \textit{domain} is paired with an element in the \textit{range}. The set of the first numbers of the ordered pairs is the \textbf{domain}. The set of second numbers of the ordered pairs is the \textbf{range} of the relation.
Using the mapping to the right, write the ordered pairs that represent this relation.

\[ (__, __), (__, __), (__, __), (__, __), (__, __). \]

Study the different representations of the same relation below.

The \( x \)-values of a relation are members of the domain and the \( y \)-values of a relation are members of the range. In the relation above, the domain is \{\ 1, -2, 0 \} and the range is \{\ 2, 4, -3 \}. 
Example 1: Express the relation \{(-4, -1), (-1, 2), (1, -4), (2, -3), (4, 3)\} as a table, a graph, and a mapping. Then, state the domain and range of the relation.

Practice Problems:

a) Express the relation \{(-2, 1), (-1, 0), (1, 2), (2, -4), (4, 3)\} as a table, a graph, and a mapping. Then, state the domain and range of the relation.
b) Express the relation \(\{(–3, –3), (–1, 1), (0, 2), (2, –3), (2, 3)\}\) as a table, a graph, and a mapping. Then, state the domain and range of the relation.

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Domain: _____________
Range: _____________

**Graphs of a Relation**  A relation can be graphed without a scale on either axis. These graphs can be interpreted by analyzing their shape.

Graphs are a way to turn words into pictures. Be sure to read the graphs from left to right.

- **Increasing**
  - Other descriptions:
    - rose
    - gained
    - grew

- **Decreasing**
  - Other descriptions:
    - fell
    - lessened
    - diminished

- **Stays the same**
  - Other descriptions:
    - constant
    - steady
    - continuous

You can divide the graph into sections every time the graph changes directions. Then label each section.

**Picture**

**Words**

This graph increases, then stays constant, increases again, and finally decreases sharply.
Example 2:

The graph shows a trip from home to school and back. The trip involves walking and getting a ride from a neighbor. Label each section of the graph.

**Daily Commute**

![Graph of Daily Commute]

**PRACTICE PROBLEMS: YOU TRY!**

Divide each graph into sections where the graph changes directions. Then label the sections as *increasing, decreasing*, or *same*.

1. ![Graph A]

2. ![Graph B]

3. Which graph above shows that the air temperature fell steadily, leveled off, fell again, and then increased slightly?
4. Sketch the graph of the situation below.

The heart rate of someone walking, then running, then resting.

**Challenge Problem:**

Write a possible situation for each graph.

**SUMMARY**

A relation is a set of ordered pairs. The relation can be in the form of a table, graph, or mapping diagram. The domain is all the x-values. The range is all the y-values.

Find the domain and range.

<table>
<thead>
<tr>
<th>x</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

D: {3, 4, 5, 6}; R: {1, 2, 3}

Find the domain and range.

D: {7, 5, 2, 0}; R: {3, 6, 7, 10}

Do not list 2 twice in the range.

range: from 3 to 5

domain: from 2 to 7

D: 2 ≤ x ≤ 7
R: 3 ≤ y ≤ 5
Exit Ticket

Use the graph below to answer questions 5–6. A conservation group has been working to increase the population of a herd of Asian elephants. The graph shows the results of their efforts. Select the correct answer.

5. Which relation represents the information in the graph?
   A \{ (1, 4.5), (2, 6), (3, 10), (4, 14.5) \}
   B \{ (1, 5), (2, 6), (3, 10), (4, 15) \}
   C \{ (4.5, 1), (6, 2), (10, 3), (14.5, 4) \}
   D \{ (5, 1), (6, 2), (10, 3), (15, 4) \}

6. What is the range of the relation shown in the graph?
   F \{ 0, 1, 2, 3, 4, 5 \}
   G \{ 1, 2, 3, 4 \}
   H \{ 4.5, 6, 10, 14.5 \}
   J \{ 5, 6, 10, 15 \}

Homework – Chapter 4-1

Express each relation as a table, a graph, and a mapping. Then determine the domain and range.

1. \{ (-1, -1), (1, 1), (2, 1), (3, 2) \}

   \[ \begin{array}{c|c}
   x & y \\
   \hline
   -1 & -1 \\
   1 & 1 \\
   2 & 1 \\
   3 & 2 \\
   \end{array} \]

   Domain: _____
   Range: _____

2. \{ (0, 4), (-4, -4), (-2, 3), (4, 0) \}

   \[ \begin{array}{c|c}
   x & y \\
   \hline
   0 & 4 \\
   -4 & -4 \\
   -2 & 3 \\
   4 & 0 \\
   \end{array} \]

   Domain: _____
   Range: _____
3. \{(3, -2), (1, 0), (-2, 4), (3, 1)\}

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Domain: ___________
Range: ___________

4. Choose the graph that best represents each situation.

A tomato plant grows taller at a steady pace.

A tomato plant grows quickly at first, remains a constant height during a dry spell, then grows at a steady pace.

A tomato plant grows at a slow pace, then grows rapidly with more sun and water.

5. Write a possible situation for each graph.

<table>
<thead>
<tr>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Graph A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Graph B</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Graph C</th>
</tr>
</thead>
</table>
SWBAT: Determine if a relation is a function, by examining ordered pairs and inspecting graphs of relations

Warm – Up:

Which situation is represented by the graph below?

A. temperature increases, decreases, then increases rapidly
B. temperature stays constant, increases, then stays constant
C. temperature decreases, stays constant, then decreases rapidly
D. temperature increases, stays constant, then increases rapidly

**Key Concept**

**Function**

**Words**
A function is a relation in which each element of the domain is paired with exactly one element of the range.

**Examples**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>-1</td>
</tr>
</tbody>
</table>

**Definition**

- A **function** is a relation in which each element of the domain is paired with exactly one element of the range.

- **Vertical Line Test**: If each vertical line passes through no more than one point of the graph of a relation, then the relation is a function.
Example 1: Determining if a Relation is a Function

Directions: Determine whether each relation is a function. Explain your answer.

A) \{(7, 4), (6, 3), (5, 2)\}  
B) \{(15, 0), (13, -2)\}  
C) \{(0, 1), (2, 1), (0, 3)\}

Function? ______  
Function? ______  
Function? ______

Explain: _________________  
Explain: _________________  
Explain: _________________

Practice: Determining if a Relation is a Function

1) \{(-1, 8), (0, 15), (1, -4), (2, 0)\}  
2) \{(-5, 2), (5, 2), (0, -3), (3, -8)\}  
3) \{(-2, 7), (6, 2), (-2, -3), (0, 9)\}

4) \{(7, 2), (4, -6), (2, -2), (4, -9)\}  
5) \{(2, 3), (2, 4), (2, 5), (2, 6)\}  
6) \{(-1, 4), (2, 4), (3, -4), (4, -4)\}

Example 2: Determining if a Relation is a Function

Directions: Determine whether each relation is a function. Explain your answer.

D) \[
\begin{array}{c|c}
  x & y \\
\hline
  -1 & 10 \\
  -2 & 13 \\
  -3 & 16 \\
\end{array}
\]  
E) \[
\begin{array}{c|c}
  x & y \\
\hline
  2 & 0 \\
  2 & -1 \\
  3 & -4 \\
\end{array}
\]  
F) \[
\begin{array}{c|c}
  x & y \\
\hline
  33 & 10 \\
  35 & 8 \\
  36 & 10 \\
\end{array}
\]

Function? ______  
Function? ______  
Function? ______

Explain: _________________  
Explain: _________________  
Explain: _________________
Practice: Determining if a Relation is a Function

Directions: Determine whether each relation is a function. Explain your answer.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
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<tr>
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<tr>
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<td>1</td>
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<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
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</thead>
<tbody>
<tr>
<td>5</td>
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<td>-3</td>
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<tr>
<td>0</td>
<td>4</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>-1</td>
<td>6</td>
</tr>
<tr>
<td>-6</td>
<td>-2</td>
</tr>
</tbody>
</table>

Example 3: Determining if a Relation is a Function (Vertical Line Test)

Directions: Determine whether each relation is a function. Explain your answer.

G) Function? _____ Explain: __________

H) Function? _____ Explain: __________

I) Function? _____ Explain: __________

Practice: Determining if a Relation is a Function (Vertical Line Test)

Directions: Determine whether each relation is a function. Explain your answer.

10. Function? Yes or no: the vertical line test

11. Function? Yes or no: the vertical line test

12. Function? Yes or no: the vertical line test

13. Function? Yes or no: the vertical line test

14. Function? Yes or no: the vertical line test

15. Function? Yes or no: the vertical line test
Example 4: Determining if a Relation is a Function

Directions: Determine whether each relation is a function. Explain your answer.

J) \[ \begin{array}{c}
-4 \\
-8 \\
5 \\
4 \\
\end{array} \quad \begin{array}{c}
2 \\
1 \\
\end{array} \]

K) \[ \begin{array}{c}
4 \\
3 \\
2 \\
\end{array} \quad \begin{array}{c}
-5 \\
-4 \\
-3 \\
\end{array} \]

Practice: Determining if a Relation is a Function

Directions: Determine whether each relation is a function. Explain your answer.

16) \[ \begin{array}{c}
5 \\
10 \\
15 \\
\end{array} \quad \begin{array}{c}
2 \\
4 \\
6 \\
8 \\
\end{array} \]

17) \[ \begin{array}{c}
-2 \\
-1 \\
1 \\
2 \\
\end{array} \quad \begin{array}{c}
5 \\
4 \\3 \\
\end{array} \]

18) \[ \begin{array}{c}
-3 \\
-2 \\
-1 \\
0 \\
\end{array} \quad \begin{array}{c}
12 \\
13 \\
14 \\
15 \\
\end{array} \]

Challenge Problem:

What values of \( a \) make the relation \( \{(a, 1), (2, 3), (4, 5)\} \) a function? Explain.

What values of \( b \) make the relation \( \{(5, 6), (7, 8), (9, b)\} \) a function? Explain.
Summary

Determining if a Relation is a Function

Examples:
(a) Is {(1, 2), (1, 3)} a function?
No, the relation is not a function.
An x value has more than one y value.

(c) Is {(1, 4), (3, 2), (5, 4)} a function?
Yes, the relation is a function.
Each x value has only one y value.

(b) No, the relation is not a function.
An x value has more than one y value.

(d) Graph 1

Exit Ticket:
Which graph represents a function?

(1) 
(3) 

Which relation represents a function?

(1) {(0, 3), (2, 4), (0, 6)}
(2) {(-7, 5), (-7, 1), (-10, 3), (-4, 3)}
(3) {(2, 0), (6, 2), (6, -2)}
(4) {(-6, 5), (-3, 2), (1, 2), (6, 5)}
Homework 4-2

Directions: Tell whether the relation is a function. Explain.

1) [Graph of a relation]

4) \[\begin{array}{c|c}
  x & y \\
  1 & 1 \\
  2 & 1 \\
  3 & 1 \\
\end{array}\]

7) \{(1, 1), (2, 2), (3, 1), (3, 2)\}

2) [Graph of a relation]

6) \[\begin{array}{c|c}
  x & y \\
  -2 & 3 \\
  3 & 8 \\
  4 & 12 \\
\end{array}\]

8) \{(-6, 5), (-3, 8), (-6, 9)\}

3) [Graph of a relation]

9) \{(1, 1), (0, 2), (3, -2)\}

10) Which of the following relations is NOT a function?

A) \{(6, 2), (-1, 2), (-3, 2), (-5, 2)\}

C) \[\begin{array}{c|c|c}
  x & 3 & 5 & 7 \\
  y & 1 & 15 & 30 \\
\end{array}\]

B) [Graph of a relation]

D) [Graph of a relation]

11) Which is NOT a correct way to describe the function \{(-3, 2), (1, 8), (-1, 5), (3, 11)\}?

F) [Graph of a relation]

H) Domain: \{-3, 1, -1, 3\}
   Range: \{2, 8, 5, 11\}

G) [Graph of a relation]

J) \[\begin{array}{c|c}
  x & y \\
  -3 & 2 \\
  -1 & 5 \\
  1 & 8 \\
  3 & 11 \\
\end{array}\]
Chapter 4–3 – WRITING FUNCTIONS (Day 3)

SWBAT:  
(1) Model functions using rules, tables, and graphs  
(2) Write a function rule from a table or real world – situation  
(3) Evaluate Function

Warm – Up:

Find the domain and range of each relation.

1. \{(-4, 3), (-2, -1), (0, 0), (1, 4), (2, 6)\}
   - Domain: ________________
   - Range: ________________

2. \{(-6, -4), (-3, -1), (1, 2), (2, 4), (3, 7)\}
   - Domain: ________________
   - Range: ________________

Determine whether each relation is a function.

3. \{(-1, 2), (0, 3), (4, 3), (0, 5)\}

4. [Diagram showing a function with inputs 0, 1, 2, 3, 4 and outputs -2, 2, 0, 2]

Find Function Values

Equations that are functions can be written in a form called function notation. For example, consider \( y = 3x - 8 \).

<table>
<thead>
<tr>
<th>Equation</th>
<th>Function Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = 3x - 8 )</td>
<td>( f(x) = 3x - 8 )</td>
</tr>
</tbody>
</table>

In a function, \( x \) represents the elements of the domain, and \( f(x) \) represents the elements of the range. Suppose you want to find the value in the range that corresponds to the element 5 in the domain. This is written \( f(5) \) and is read “\( f \) of 5.” The value \( f(5) \) is found by substituting 5 for \( x \) in the equation.

**Example 1:**
Evaluate \( f(x) = 4x - 2 \) for \( x = 0, 1, \) and 2.

\[
\begin{align*}
f(x) & = 4x - 2 \\
f(0) & = 4(0) - 2 \\
f(1) & = 4(1) - 2 \\
f(2) & = 4(2) - 2 \\
\end{align*}
\]

\( f(0) = -2 \)  \( f(1) = 2 \)  \( f(2) = 6 \)

\( \text{Substitute each value for } x. \)

\( f(0) = \)  \( f(1) = \)  \( f(2) = \)

\( \text{Simplify.} \)
Evaluate each function rule for $x = -2$.

a. $f(x) = 4x$  

b. $f(x) = -2x + 1$  

c. $f(x) = -\frac{3}{2}x + 2$

---

Practice:

If $g(x) = -x^2 - x + 7$, find each value.

1. $g(2)$

2. $g(-6)$

3. $g(-3)$

---

**Example 3: Calculating for the Range**

**Finding the Range** Evaluate the function rule $f(g) = -2g + 4$ to find the range for the domain $\{-1, 3, 5\}$.

$$f(g) = -2g + 4$$

- $f(\underline{2}) = -2(\underline{2}) + 4$  
- $f(\underline{3}) = -2(\underline{3}) + 4$  
- $f(\underline{5}) = -2(\underline{5}) + 4$

$$f(\underline{-1}) = \underline{7} + 4$$  
$$f(\underline{3}) = \underline{1} + 4$$  
$$f(\underline{5}) = \underline{3} + 4$$

The range is $\{\underline{1}, \underline{3}, \underline{7}\}$.  

16
Practice
Find the range of each function, given the domain.

a. $g(m) = m^2; \{-2, 0, 2\}$

b. $h(x) = -\frac{1}{3}x - 1; \{-3, 0, 6\}$

Example 4: Writing Functions

An aerobics class is being offered once a week for 6 weeks. The registration fee is $15 and the cost for each class attended is $10. Write a function rule to describe the total cost of the class. Find a reasonable domain and range for the function.

Practice:

Giselle is going to rent a scooter for at least one hour. The fee is $45 plus $5 for each hour it is rented. Write a function rule to describe the total cost of renting a scooter. Find a reasonable domain and range for the function if Giselle has $65.
Challenge

If \( f(3b - 1) = 9b - 1 \), find one possible expression for \( f(x) \).

Summary:

After identifying the independent and dependent variables, you can write a rule in function notation. Remember that \( f(x) \) is the dependent variable and \( x \) is the independent variable.

Identify the dependent and independent variables. Write a function rule for each situation.

A zoo charges $6 for parking and $17.50 for each child.

1. Identify the dependent and independent variables.

   The cost of admission depends on the number of children.

   Dependent \( f(x) \): cost of admission  
   Independent \( x \): number of children

2. Write the equation in words.

   The cost of admission is $17.50 multiplied by the number of children plus $6 for parking.

3. Write the function using cost of admission = \( f(x) \) and number of children = \( x \).

   \[ f(x) = 17.50x + 6.00 \]

Evaluate the function above when \( x = 4 \) and \( x = 10 \).

\[ x = 4 \]
\[ f(4) = 17.50(4) + 6.00 = 70.00 + 6.00 = 76.00 \]

\[ x = 10 \]
\[ f(10) = 17.50(10) + 6.00 = 175.00 + 6.00 = 181.00 \]

Exit Ticket:

Marsha buys \( x \) pens at $0.70 per pen and one pencil for $0.10. Which function gives the total amount Marsha spends?

\( \text{A } c(x) = 0.70x + 0.10x \)  
\( \text{B } c(x) = 0.70x + 1 \)  
\( \text{C } c(x) = (0.70 + 0.10)x \)  
\( \text{D } c(x) = 0.70x + 0.10 \)
Homework - Chapter 4–3 (Day 3)

Determine whether each of the following relations is a function.

1. \[ \{(-1, 0), (1, 1), (3, 2), \left(4, 2\frac{1}{2}\right)\} \]

2. \[ \{(2, 2), (3, 3), (6, 5), (3, 1)\} \]

3. \[
\begin{align*}
2 & \\
4 & \rightarrow 2 \\
6 & \rightarrow 3 \\
8 & \rightarrow 5
\end{align*}
\]

4. \[
\begin{align*}
6 & \rightarrow -5 \\
3 & \rightarrow -4 \\
0 & \rightarrow -3
\end{align*}
\]

Evaluate each function rule for \( x = 2 \).

7. \[ f(x) = 3x - 4 \]

8. \[ f(x) = -x + 2 \]

Find the range of each function for the given domain.

9. \[ f(x) = -2x + 1; \{3, -1, 0, 1\} \]

10. \[ f(x) = x^2 + x; \{-1, 0, 2\} \]

11. \[ h(x) = -x^2; \{-2, -1, 3\} \]

12. \[ g(x) = -\frac{1}{2}|x| + 1; \{-2, -1, 1\} \]

13. A tanning salon charges a one-time maintenance fee of $12 plus $4 for each tanning visit. Write a function to describe the situation. Find a reasonable domain and range for the function for up to 6 visits.
SWBAT: (1) Write a function rule from a table
(2) Graph functions given a limited domain

Warm-Up: Find the range of each function for the given domain.

\[ f(x) = x^2 + x - 2; \{-2, 0, 1\} \]

Example 1: Determine a relationship between the \(x\)- and \(y\)-values. Write an equation.

**Example**

1. **Writing a Rule from a Table** Write a function rule for the table.

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
</tr>
</tbody>
</table>

Ask yourself, “What can I do to 1 to get 2, 2 to get 5, . . . ?” You multiply each \(x\)-value times \[
\_
\] and add \[
\_
\] to get the \(y\)-value.

**Relate** \[
\]
\(y\) equals \[
\]
\(x\) times itself plus \[
\]

**Write** \[
\]
\(\_
\] = \[
\]
\(x\) times itself + \[
\]

A rule for the function is \[
\]

**Quick Check**

1. Write a function rule for each table.
   a. 
<table>
<thead>
<tr>
<th>(x)</th>
<th>(f(x))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
   
   b. 
<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>
   
   c. 
<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>4</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>
Example 2: Graphing Solutions Given a Domain

Graph each function for the given domain.

1) \( F(x) = \frac{1}{2}x - 3; \ D:\{-4, -2, 0, 2, 4\} \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>((x, y))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What type of function is this? ________________

2) \( F(x) = |x + 3|; \ D:\{-2, -1, 0, 1, 2\} \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>((x, y))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What type of function is this? ________________

3) \( F(x) = x^2 + 2; \ D:\{-2, -1, 0, 1, 2\} \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>((x, y))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What type of function is this? ________________
4) \( F(x) = 2^x - 1 \) \( D:\{-1, 0, 1, 2, 3\} \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( (x, y) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What type of function is this? ________________________________

**Practice**
Identify each of the following functions as one of the following:
linear, quadratic, absolute value or exponential.

\[
y = -13x^2 + 2
\]

\[
y = 3^x
\]

\[
y = 7x - 3
\]

\[
y = |x + 4|
\]

**Practice**
Identify each of the following functions as one of the following:
linear, quadratic, absolute value or exponential.

---

---

---

---
Example 3: Identifying Points on a Line

a) Is the point (2, 5) on the graph of the linear equation \(2x + 1 = y\)?

b) Find the value of \(x\) so that \((x, 7)\) satisfies \(y = 4x - 5\).

Practice:

c) Find the value of \(y\) so that \((-4, y)\) satisfies \(y = \frac{1}{2}x + 3\).

d) Is the point (1, 3) on the graph of the linear equation \(x - 2y = 7\)?

Challenge Problem:

1. Use this table to find \(f(g(x))\) for each \(x\)-value.

<table>
<thead>
<tr>
<th>(x)</th>
<th>(g(x) = -2x)</th>
<th>(g(x))</th>
<th>(f(x) = x^2 - 4)</th>
<th>(f(g(x)))</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>(g(-2) = -2(-2) = 4)</td>
<td>4</td>
<td>(f(4) = 4^2 - 4 = 16 - 4 = 12)</td>
<td>12</td>
</tr>
<tr>
<td>-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Summary:

Identifying Types of Functions

Linear  Quadratic  Absolute Value  Exponential

Writing Function Rules from Tables

<table>
<thead>
<tr>
<th>x</th>
<th>f(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

\[ f(x) = x + 2. \]

Exit Ticket

1. What type of function is graphed at the left?

   Choose:
   - quadratic
   - absolute value
   - linear
   - exponential

2. Write a function rule based on the following table.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>4</td>
<td>1</td>
<td>-2</td>
<td>-5</td>
</tr>
</tbody>
</table>
Homework – Writing and Graphing Functions – Day 4

Write a function rule for each table.

1. \[
\begin{array}{c|c}
  x & f(x) \\
  \hline
  0 & 3 \\
  2 & 5 \\
  4 & 7 \\
  6 & 9 \\
\end{array}
\]

2. \[
\begin{array}{c|c}
  x & f(x) \\
  \hline
  0 & 0 \\
  1 & 3 \\
  3 & 9 \\
  5 & 15 \\
\end{array}
\]

3. \[
\begin{array}{c|c}
  x & f(x) \\
  \hline
  5 & 0 \\
  10 & 5 \\
  15 & 10 \\
  20 & 15 \\
\end{array}
\]

Write a function rule for each table.

6. \[
\begin{array}{c|c}
  x & f(x) \\
  \hline
  -4 & -2 \\
  -2 & -1 \\
  6 & 3 \\
  8 & 4 \\
\end{array}
\]

7. \[
\begin{array}{c|c}
  x & f(x) \\
  \hline
  -3 & 9 \\
  0 & 0 \\
  1 & 1 \\
  5 & 25 \\
\end{array}
\]

8. \[
\begin{array}{c|c}
  x & y \\
  \hline
  -4 & 14 \\
  -3 & 11 \\
  -2 & 8 \\
  -1 & 5 \\
\end{array}
\]

Graph the function for the given domain.

9. \[y = x + 2; \ D: \{-2, -1, 0, 1, 2\}\]

\[
\begin{array}{c|c|c}
  x & y = x + 2 & (x, y) \\
  \hline
  \end{array}
\]

10. \[y = |x| - 1; \ D: \{-1, 0, 1, 2, 3\}\]

\[
\begin{array}{c|c|c}
  x & (x, y) \\
  \hline
  \end{array}
\]

What type of function is this? ________________________________
Graph each function for the given domain.

11. $G(x) = x^2 - 2x - 8$; $D: \{-1, 0, 1, 2, 3\}$

<table>
<thead>
<tr>
<th>$x$</th>
<th>$(x, y)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What type of function is this? ________________________________

12) Is the ordered pair $(-8, 1)$ a solution to the equation $y = \frac{1}{2}x - 3$? Justify.

13) Given the equation $y = \frac{1}{2}x - 3$, find the value of $b$ given the fact that the point $(0, b)$ satisfies the equation.

Exercise #9 The graph of the equation $2y - 3x = 4$ is shown at the right. Which of the following ordered pairs is not a solution to this equation? Explain your choice.

(1) $(-2, -1)$  
(2) $(0, 2)$  
(3) $(-3, 4)$  
(4) $(2, 5)$

Explanation:
Day 5 - Review of Relationships & Functions

I) Multiple Representations of Relations

In the scoring of some track meets, for 1st place you get 5 points, for 2nd place you get 3 points, for 3rd place you get 2 points and for 4th place you get 1 point.

1. Express the RELATION above as a ...

   a) Set of ordered pairs: _____________________________________
   
   b) Table of values

<table>
<thead>
<tr>
<th>Track Scoring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Place</td>
<td>Points</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   c) Graph

   d) Mapping

2. Analyzing Graphs

A runner in a race ran quickly for the first few minutes, slowed down some and ran a steady pace for most of the race, and then ran as fast as he could at the very end. Choose the graph that best represents this situation.

A man walks to the train station, takes a train into the city, takes a taxi, waits on a bench, and then walks home. Choose the graph that best represents this situation.
II) Domain and Range

3. The accompanying graph shows the heart rate, in beats per minute, of a jogger during a 4-minute interval. What is the range of the jogger's heart rate during this interval?

![Graph showing heart rate over time]

4. The effect of pH on the action of a certain enzyme is shown on the accompanying graph. What is the domain of this function?

![Graph showing enzyme action vs pH]

III) Identifying Functions

Give the **DOMAIN** and **RANGE** of each relation. Tell whether the relation is a **FUNCTION**.

**5)** Field Trip

<table>
<thead>
<tr>
<th>Students (x)</th>
<th>Buses (y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>2</td>
</tr>
<tr>
<td>68</td>
<td>2</td>
</tr>
<tr>
<td>125</td>
<td>3</td>
</tr>
</tbody>
</table>

**D:** __________________  
**R:** __________________  
**Function?** __________

**6)**

{(1, 4), (2, 6), (1, 10), (6, 0)}

**D:** __________________  
**R:** __________________  
**Function?** __________

**7)**

{(7, -7), (9, -1), (12, -3), (15, -3)}

**D:** __________________  
**R:** __________________  
**Function?** __________
IV) VERTICAL LINE TEST: Tell whether the relation is a FUNCTION

V) Functional Notation

12) Evaluate \( f(x) = 3x + 2 \) for \( f(-3) \)

13) Find \( f(7) \) for \( f(x) = x^2 - 10 \).

14) Find the range of each function when the domain is \( \{-4, -1, 0, 3\} \).

\[ y = \frac{1}{2}x + 8 \]
VI) Writing Functions

Write a rule in function notation for each situation.

15) A buffet charges $8.95 per person.  

Function: _____________________

16) A moving company charges $130 for weekly truck rental plus $1.50 per mile.  

Function: _____________________

17) Write a function to describe the situation. Find a reasonable domain and range for the function.

A theater can be rented for different hours. The cost is a $100 deposit plus $200 per hour.

Function: _____________________

Domain: ______________________

Range: _______________________

The tables below show two relationships. What equation represents the relationship between x and y or w and b?

18.  

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>10</td>
<td>16</td>
</tr>
</tbody>
</table>

19.  

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
</tr>
</tbody>
</table>

20.  

<table>
<thead>
<tr>
<th>Week (w)</th>
<th>Balance (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$10</td>
</tr>
<tr>
<td>2</td>
<td>$24</td>
</tr>
<tr>
<td>3</td>
<td>$38</td>
</tr>
<tr>
<td>4</td>
<td>$52</td>
</tr>
<tr>
<td>5</td>
<td>$66</td>
</tr>
<tr>
<td>6</td>
<td>$80</td>
</tr>
</tbody>
</table>
VI) Graphing Functions

Graph each function using the Domain: {-2, -1, 0, 1, 2}. Identify each function.

21. \( y = x^2 - 4 \)

\[
\begin{array}{|c|c|}
\hline
x & (x, y) \\
\hline
\vdots & \vdots \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
x & (x, y) \\
\hline
\vdots & \vdots \\
\hline
\end{array}
\]

22. \( y = |x - 1| \)

\[
\begin{array}{|c|c|}
\hline
x & (x, y) \\
\hline
\vdots & \vdots \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
x & (x, y) \\
\hline
\vdots & \vdots \\
\hline
\end{array}
\]

23. \( y = 3^x - 1 \)

\[
\begin{array}{|c|c|}
\hline
x & (x, y) \\
\hline
\vdots & \vdots \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
x & (x, y) \\
\hline
\vdots & \vdots \\
\hline
\end{array}
\]

24. \( y = 2 - x \)

\[
\begin{array}{|c|c|}
\hline
x & (x, y) \\
\hline
\vdots & \vdots \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
x & (x, y) \\
\hline
\vdots & \vdots \\
\hline
\end{array}
\]