### Situation Cards

(Match each card with a graph)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>✓</td>
<td>A coach collects data on each player (age) and his height.</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>✓</td>
<td>A gardener records the age of a tree and its height.</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>✓</td>
<td>Tickets to a concert cost $20 each.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>✓</td>
<td>The temperature inside a car over time.</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>✓</td>
<td>The market sells strawberries for $5 per pound.</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>✓</td>
<td>The speed of a roller coaster at Disney World at various times.</td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>✓</td>
<td>The volume of the water in a swimming pool steadily decreases by 15 gallons per minute.</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>✓</td>
<td>Each customer who enters the grocery store gets 2 free samples of chocolate.</td>
</tr>
<tr>
<td><strong>I</strong></td>
<td>✓</td>
<td>Phillip is saving money for a dirtbike. He has $50 and saves $10 per month.</td>
</tr>
</tbody>
</table>
The formula $F = 1.8C + 32$ compares the temperatures in degrees Celsius, $C$, to temperatures in degrees Fahrenheit, $F$.

**Graph Cards**

- **Graph 1:** Samples vs. Customer
- **Graph 2:** Degrees Fahrenheit vs. Degrees Celsius
- **Graph 3:** Savings vs. Month
- **Graph 4:** Savings vs. Month
- **Graph 5:** Samples vs. Customer
- **Graph 6:** Degrees Fahrenheit vs. Degrees Celsius
Determine whether the following equations and ordered pairs are linear or non-linear. Copy the chart below on to your own paper. You will need to write the equation and/or the ordered pairs (if ordered pairs are given you need to try and write an equation for the function), include a sketch of the graph, and explain why the equation or ordered pairs is linear or why it is non-linear.

<table>
<thead>
<tr>
<th>Equation &amp; ordered pairs</th>
<th>Sketch</th>
<th>Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 2x^3 + 5$</td>
<td></td>
<td>Nonlinear</td>
</tr>
<tr>
<td>$y = 2x - 4$</td>
<td></td>
<td>Linear</td>
</tr>
<tr>
<td>$(0, 3), (1, 4), (2, 7), (3, 13))$</td>
<td></td>
<td>Nonlinear</td>
</tr>
<tr>
<td>$y = x^2$</td>
<td></td>
<td>Nonlinear</td>
</tr>
<tr>
<td>$y = 2(x - 3) + 6(1 - x)$</td>
<td></td>
<td>Linear</td>
</tr>
<tr>
<td>$y = -4x$</td>
<td></td>
<td>Linear</td>
</tr>
<tr>
<td>$(1, 1), (3, 9), (4, 13))$</td>
<td></td>
<td>Nonlinear</td>
</tr>
<tr>
<td>$y = 2x$</td>
<td></td>
<td>Nonlinear</td>
</tr>
<tr>
<td>$y = 2 - x$</td>
<td></td>
<td>Nonlinear</td>
</tr>
<tr>
<td>$(0, 1), (3, 8), (4, 16))$</td>
<td></td>
<td>Nonlinear</td>
</tr>
<tr>
<td>$y = 2x + x * x$</td>
<td></td>
<td>Nonlinear</td>
</tr>
</tbody>
</table>

### Linear

### Nonlinear
Activity 1: Comparing Continuous and Discrete Data

Student Worksheet:

Scenario 2:
A local neighborhood community is asking everyone to participate in a new recycling program. At the end of each month, each house records the number of aluminum cans they recycle. The following data is compiled in the subsequent table.

<table>
<thead>
<tr>
<th>House</th>
<th>Number of Cans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>49</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>62</td>
</tr>
<tr>
<td>5</td>
<td>41</td>
</tr>
</tbody>
</table>

1. Does this table represent data that is "continuous" or "discrete"? Explain your answer using complete sentences.
   **This is discrete. They will only collect whole cans, not parts of cans.**

2. Write an equation that models the data.
   **This data is nonlinear**

3. Can you predict how many cans the 6th house on the block will recycle the next month?
   **No—the data shows an increase in cans at some houses, and a decrease at other houses.**
Activity 1: Comparing Continuous and Discrete Data

Student Worksheet:

Problems

Scenario 1:
Mark is working at the local fast food restaurant and earns $7.15 per hour.
The following table shows the amount of money he earns by working a particular number of hours per week.

<table>
<thead>
<tr>
<th>Hours Worked</th>
<th>Money Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$7.15</td>
</tr>
<tr>
<td>3</td>
<td>$21.45</td>
</tr>
<tr>
<td>7</td>
<td>$50.05</td>
</tr>
<tr>
<td>12</td>
<td>$85.80</td>
</tr>
<tr>
<td>15</td>
<td>$107.25</td>
</tr>
</tbody>
</table>

1. Does this table represent data that is "continuous" or "discrete"? Explain your answer using complete sentences.
   This is continuous. You can work 1 1/2 hours or 3 3/4 hours, so we have points in between.

2. Write an equation that models the data.
   \[ y = 7.15x \]

3. Use the equation to predict what Mark's salary will be if he works 40 hours.
   \[ y = 7.15(40) \]
   \[ y = 286 \] He will make $286.
Graph each function rule.

1. \( y = 2 - x \)
2. \( y = \frac{1}{2}x \)
3. \( y = 3x + 1 \)

Graph each function rule. Tell whether the graph is continuous or discrete.

4. The cost \( C \), in dollars, for a health club membership depends on the number \( m \) of whole months you join. This situation is represented by the function rule \( C = 49 + 20m \).

Choose intervals of 1 for the \( m \)-axis because the cost is for every 1 month; choose intervals of 20 for the \( C \)-axis because that is the cost increment per month; discrete function.

5. The cost \( C \), in dollars, for bananas depends on the weight \( w \), in pounds, of the bananas. This situation is represented by the function rule \( C = 0.5w \).

Choose intervals of 1 for the \( w \)-axis because the cost can be measured for every 1 pound; choose intervals of 0.50 for the \( C \)-axis because that is the cost increment per pound; continuous function.
Graph each function rule.

6. \(y = |x| + 1\)

7. \(y = x^3\)

8. \(y = |x| - 2\)

9. \(y = |x - 1| + 2\)

10. \(y = -x^2\)

11. \(y = x^3 - 3\)

12. **Open-Ended** Sketch a graph of a quadratic function that has \(x\)-intercepts at 0 and 4. Sample graph:

13. **Writing** Describe the general shape of the graphs of functions of the form \(y = ax^3\).

   The function \(y = ax^3\) passes through the origin with branches in the first and third quadrants. When \(|a| > 1\), the graph is stretched. When \(0 < |a| < 1\), the graph is compressed. When \(a\) is negative, the graph is a reflection in the \(y\)-axis.
Multiple Choice

For Exercises 1–4, choose the correct letter.

1. Which table of values can be used to graph the function \( y = -4x + 3 \)? C

\[
\begin{array}{c|c}
 x & y \\
-1 & -1 \\
0 & 3 \\
1 & 7 \\
2 & 11 \\
\end{array}
\]

\[
\begin{array}{c|c}
 x & y \\
0 & 3 \\
1 & -1 \\
2 & -5 \\
3 & -9 \\
\end{array}
\]

B.

\[
\begin{array}{c|c}
 x & y \\
-3 & -9 \\
-1 & -1 \\
1 & 7 \\
3 & 15 \\
\end{array}
\]

D.

\[
\begin{array}{c|c}
 x & y \\
0 & 3 \\
1 & 7 \\
2 & 11 \\
3 & 15 \\
\end{array}
\]

2. Which term best describes a function whose graph is composed of isolated points? H

F. continuous  G. linear  H. discrete  I. nonlinear

3. Which relationship is continuous? D

A. the number of cows a farmer has owned over the years
B. the number of cookies Stan baked for the party
C. the number of people attending the assembly
D. the distance a runner ran during training

4. The total cost \( c \) a painter charges to paint a house depends on the number \( h \) of hours it takes to paint the house. This situation can be represented by the function rule \( c = 15h + 245 \). What is the total cost if the painter works for 30.25 hours? I

F. $245  G. $453.75  H. $572.75  I. $698.75

Short Response

5. The profit \( y \) on the number \( x \) of items a store sells is represented by the rule \( y = 2x - 1 \). What does a table of values for the function rule and the graph of the function look like?

[0] Neither part answered correctly.

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