## Lesson 7: Connecting Representations of Functions

### 7.1: Which are the Same? Which are Different?

Here are three different ways of representing functions. How are they alike? How are they different?

$y=2x$



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| $p$ | -2 | -1 | 0 | 1 | 2 | 3 |
| $q$ | 4 | 2 | 0 | -2 | -4 | -6 |

### 7.2: Comparing Temperatures

The graph shows the temperature between noon and midnight in City A on a certain day.



The table shows the temperature, $T$, in degrees Fahrenheit, for $h$ hours after noon, in City B.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| $h$ | 1 | 2 | 3 | 4 | 5 | 6 |
| $T$ | 82 | 78 | 75 | 62 | 58 | 59 |

1. Which city was warmer at 4:00 p.m.?
2. Which city had a bigger change in temperature between 1:00 p.m. and 5:00 p.m.?
3. How much greater was the highest recorded temperature in City B than the highest recorded temperature in City A during this time?
4. Compare the outputs of the functions when the input is 3.

### 7.3: Comparing Volumes

The **volume**, $V$, of a cube with edge length $s$ cm is given by the equation $V=s^{3}$.

The volume of a sphere is a function of its radius (in centimeters), and the graph of this relationship is shown here.



1. Is the volume of a cube with edge length $s=3$ greater or less than the volume of a sphere with radius 3?
2. If a sphere has the same volume as a cube with edge length 5, estimate the radius of the sphere.
3. Compare the outputs of the two volume functions when the inputs are 2.

#### Are you ready for more?

Estimate the edge length of a cube that has the same volume as a sphere with radius 2.5.

### 7.4: It’s Not a Race

Elena’s family is driving on the freeway at 55 miles per hour.

Andre’s family is driving on the same freeway, but not at a constant speed.  The table shows how far Andre's family has traveled, $d$, in miles, every minute for 10 minutes.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| $t$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| $d$ | 0.9 | 1.9 | 3.0 | 4.1 | 5.1 | 6.2 | 6.8 | 7.4 | 8 | 9.1 |

1. How many miles per minute is 55 miles per hour?
2. Who had traveled farther after 5 minutes? After 10 minutes?
3. How long did it take Elena’s family to travel as far as Andre’s family had traveled after 8 minutes?
4. For both families, the distance in miles is a function of time in minutes. Compare the outputs of these functions when the input is 3.

### Lesson 7 Summary

Functions are all about getting outputs from inputs. For each way of representing a function—equation, graph, table, or verbal description—we can determine the output for a given input.

Let's say we have a function represented by the equation $y=3x+2$ where $y$ is the dependent variable and $x$ is the independent variable. If we wanted to find the output that goes with 2, we can input 2 into the equation for $x$ and finding the corresponding value of $y$. In this case, when $x$ is 2, $y$ is 8 since $3⋅2+2=8$.

If we had a graph of this function instead, then the coordinates of points on the graph are the input-output pairs. So we would read the $y$-coordinate of the point on the graph that corresponds to a value of 2 for $x$. Looking at the graph of this function here, we can see the point $(2,8)$ on it, so the output is 8 when the input is 2.



A table representing this function shows the input-output pairs directly (although only for select inputs).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| $x$ | -1 | 0 | 1 | 2 | 3 |
| $y$ | -1 | 2 | 5 | 8 | 11 |

Again, the table shows that if the input is 2, the output is 8.



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