Algebra I Work Station

Rate of Change

#ThankATeacher
#TeacherDay
#TeacherAppreciationWeek
Rate of Change

TEKS A(10)(E)
Reporting Category 1
Number and Algebraic Methods

Materials
For the folder
• Yellow folder
• Yellow cardstock
• 2 Plastic sandwich bags
• 1 transparency
• Packing tape
• Dry erase markers

For each student
• Rate of Change Recording Sheet

1. Print the document.
2. Cut out, arrange, and glue the Cover and the Content Objective, Language Objective, and Key Questions to the front of the folder.
3. Cut out and glue the Folder Tab Label to the tab of the folder.
4. Cut out and glue the *Answer Key* to the back of the folder. Use packing tape and cardstock to make a cover for the *Answer Key*. Use a Velcro® dot to keep the cover closed until needed.
5. Cut out, arrange, and glue the Instructions, Task 3: Rate of Change or Slope, and Task 4: Assessment Item to the inside of the folder.

6. Print the Conversation Cards for Task 1 and the Challenge Cards for Task 2 on cardstock. Cut out the cards, place them in 2 different plastic bags. Staple one side of the bag to the folder so that the bag can still be opened once attached. Tape the label for Task 1 and Task 2 to the outside of the plastic bags.

7. Cut out the Task 2 Game Board. Glue the Game Board on the inside of the folder. Cut a transparency so that its dimensions will cover the Game Board, tape the cut transparency to protect the Game Board and provide a surface that can be written on and cleaned using dry erase markers.

8. The student recording sheet is not attached to the folder. Place copies for your students inside the folder.
Task 2:
Game Board
Content Objective
I can determine the rate of change from a table, a graph, or an equation in mathematical and real-world situations.

Language Objective
I can describe how to determine the rate of change.

Key Questions
1. How is rate of change represented algebraically?

2. How can you determine the rate of change of a linear function from different representations?
Task 1: Conversation Cards (yellow)
- Each student takes one of the Conversation Cards.
- Determine the rate of change of the relationship represented on your card.
- Each student takes a turn explaining how he or she determined the rate of change for the given card.

Task 2: Rate of Change Challenge (orange)
- Each student should choose a pattern card.
- Shuffle the Rate of Change Challenge Cards and place in a pile.
- Draw one card from the pile. All players will determine the rate of change which completes the sentence.
- Use a dry erase marker to color the square with the answer on the Game Board.
- Continue drawing cards and determining the rate of change.
- The winner is the player whose pattern card matches the colored squares on the Game Board.

Task 3: Rate of Change
- Use the phrase bank to complete the handout.

Task 4: Assessment
- Read and work through the assessment question.

Phrase Bank
- Equation
- Horizontal change
- Graph
- Ordered pairs
- Rise
- Run
- Slope formula
- Table
- Vertical change
Task 4: Assessment

The table represents some points on the graph of a linear function.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>-11.5</td>
</tr>
<tr>
<td>9</td>
<td>-29.5</td>
</tr>
</tbody>
</table>

What is the rate of change of $y$ with respect to $x$ for this function?

A  $\frac{2}{9}$
B  $-\frac{2}{9}$
C  $\frac{9}{2}$
D  $-\frac{9}{2}$
Back cover of folder:

Answer Key

Task 1

<table>
<thead>
<tr>
<th>Card A</th>
<th>Card B</th>
<th>Card C</th>
</tr>
</thead>
<tbody>
<tr>
<td>−4.5</td>
<td>−0.4</td>
<td>28</td>
</tr>
</tbody>
</table>

Task 2

1  −4
2  0.2
3  4
4  3
5  50
6  4.5
7  −3.5
8  −7
9  4
10 3
11 −1
12 900

Task 3: Possible answer. In order to determine the rate of change of \( y \) with respect to \( x \), I would use the two ordered pairs \((2, 23)\) and \((5, 57.5)\). Then I would use the formula for slope and determine the change in the \( y \)-values, which is 34.5. The change in the \( x \)-values is 3. The ratio of the change in the \( y \)-values and the change in the \( x \)-values is \( \frac{34.5}{3} \), or 11.5. For each additional car, the earnings increase by $11.50.

Task 4: D
Task 1: Conversation Cards

Yellow cardstock

A
The table represents some points on the graph of a linear function.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8</td>
<td>30</td>
</tr>
<tr>
<td>0</td>
<td>-6</td>
</tr>
<tr>
<td>4</td>
<td>-24</td>
</tr>
<tr>
<td>10</td>
<td>-51</td>
</tr>
</tbody>
</table>

What is the rate of change of \( y \) with respect to \( x \) for this function?

B
The amount of money on a gift card can be modeled by the graph of the linear function shown on the grid.

What is the rate of change of the balance with respect to the number of candy purchases?

C
A store pays an hourly rate and a monthly stipend for expenses. The equation \( y = 28x + 25 \) can be used to determine the total pay, \( y \), that a worker would be paid for \( x \) hours of work.

What is the rate of change of the total pay with respect to the number of hours worked?
Task 2: Rate of Change Challenge Cards

Orange cardstock

1. The number of baskets made and the distance from the basket is recorded in the table below.

<table>
<thead>
<tr>
<th>Distance from basket (feet)</th>
<th>Number of baskets made</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>8</td>
<td>28</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

The rate of change of the number of baskets made with respect to the distance from the basket is _____ baskets per foot.

2. The scatterplot shows the average price of a movie ticket, \( y \), over the last 20 years.

The rate of change of the cost of a ticket with respect to elapsed number of years is $____ per year.

3. The rate of change of \( x \) with respect to \( y \) of the line that passes through the points \((8, 9)\) and \((5, -3)\) is ________.

4. The table represents some points on the graph of a linear function.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>-6.5</td>
</tr>
<tr>
<td>-1</td>
<td>-0.5</td>
</tr>
<tr>
<td>2</td>
<td>8.5</td>
</tr>
<tr>
<td>5</td>
<td>17.5</td>
</tr>
</tbody>
</table>

The rate of change of \( y \) with respect to \( x \) is ________.
5. The function that models the total cost of a plumbing repair is \( y = 48 + 50x \), where \( y \) represents the total cost and \( x \) represents the number of hours needed to complete the repair.

The rate of change of the total cost with respect to the number of hours needed to complete the repair is $____ per hour.

6. The table represents paired values that show the relationship between the total distance walked and the elapsed time.

<table>
<thead>
<tr>
<th>Elapsed time (hours)</th>
<th>0</th>
<th>0.5</th>
<th>2.25</th>
<th>3.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total distance walked (miles)</td>
<td>0</td>
<td>2.25</td>
<td>10.125</td>
<td>15.75</td>
</tr>
</tbody>
</table>

The rate of change of \( y \) with respect to \( x \) is ______ miles per hour.

7. The graph shows a spring’s distance from the floor, \( y \), and the mass, \( x \), attached to the end of the spring.

The rate of change of distance from the floor with respect to the weight of the mass is _____ centimeters per gram.

8. Since he started working in the animal control department, an officer has recorded \( y \), the number of stray dogs found each year in his district.

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Stray Dogs</td>
<td>62</td>
<td>55</td>
<td>48</td>
<td>41</td>
</tr>
</tbody>
</table>

The rate of change of the number of stray dogs with respect to the year is _____ dogs per year.
Given the equation $4x - 3y = 18$, the rate of change of $y$ with respect to $x$ for this is _____.

The population for a small town in Texas is recorded in the table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>8,600</td>
</tr>
<tr>
<td>2005</td>
<td>8,900</td>
</tr>
<tr>
<td>2010</td>
<td>9,200</td>
</tr>
<tr>
<td>2015</td>
<td>9,500</td>
</tr>
</tbody>
</table>

The rate of change of $y$ with respect to $x$ for this situation is ______.

The rate of change of $y$ with respect to $x$ of the line that passes through the points $(-28, 8)$ and $(-42, 15)$ is ______.

Gene has made predictions about his salary for the next 15 years.

<table>
<thead>
<tr>
<th>Year, $x$</th>
<th>Salary, $y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>$55,000</td>
</tr>
<tr>
<td>2025</td>
<td>$59,500</td>
</tr>
<tr>
<td>2030</td>
<td>$64,000</td>
</tr>
<tr>
<td>2035</td>
<td>$68,500</td>
</tr>
</tbody>
</table>

The rate of change of $y$ with respect to $x$ for this situation is ______.
Task 3: Rate of Change

Describe how to determine the rate of change of $y$ with respect to $x$ for this situation.

<table>
<thead>
<tr>
<th>Number of Cars Washed</th>
<th>Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>$23.00</td>
</tr>
<tr>
<td>5</td>
<td>$57.50</td>
</tr>
<tr>
<td>7</td>
<td>$80.50</td>
</tr>
<tr>
<td>12</td>
<td>$138.00</td>
</tr>
</tbody>
</table>

Task 4: Assessment

The answer is _____ because . . .