

5.1 REPRESENTING PATTERNS

Name: _____

Block _____

Recognizing patterns...building equations...

1. Complete the table and explain your rational.

| Figure #1 | Figure #2 | Figure #3 | Figure #4 | How many ☺ would there be in the 7 th figure? | How many ☺ would there be in the 50 th figure? |
|-----------|---------------|----------------|------------------------|--|---|
| ☺ ☺☺ | ☺ ☺☺ ☺☺ | ☺ ☺☺ ☺☺☺ | ☺ ☺☺ ☺☺☺ ☺☺☺☺ | | |

Explain how to find the number of ☺s in **any** box.

2. Complete the table and explain your rational.

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Explain how to find the number of ☺s in **any** box.

Definition:

Rate of change: The rate of change for a set of numbers is the measure by which each number in the sequence is changing.

- Given 5,10,15,20... The rate of change is addition by 5 each time.
- Given 9,7,5,3... The rate of change is subtraction by 2 each time.

TABLE OF VALUES

Determine the pattern, complete the table of values and state the rate of change.

| <p>34.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 50%;">x</th> <th style="width: 50%;">y</th> </tr> </thead> <tbody> <tr><td>1</td><td>11</td></tr> <tr><td>2</td><td>12</td></tr> <tr><td>3</td><td>13</td></tr> <tr><td>4</td><td>14</td></tr> <tr><td>5</td><td></td></tr> </tbody> </table> | x | y | 1 | 11 | 2 | 12 | 3 | 13 | 4 | 14 | 5 | | <p>35.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 50%;">x</th> <th style="width: 50%;">y</th> </tr> </thead> <tbody> <tr><td>1</td><td>7</td></tr> <tr><td>2</td><td>11</td></tr> <tr><td>3</td><td>15</td></tr> <tr><td>4</td><td>19</td></tr> <tr><td>5</td><td></td></tr> </tbody> </table> | x | y | 1 | 7 | 2 | 11 | 3 | 15 | 4 | 19 | 5 | | <p>36.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 50%;">x</th> <th style="width: 50%;">y</th> </tr> </thead> <tbody> <tr><td>1</td><td>10</td></tr> <tr><td>2</td><td>8</td></tr> <tr><td>3</td><td>6</td></tr> <tr><td>4</td><td>4</td></tr> <tr><td>5</td><td></td></tr> </tbody> </table> | x | y | 1 | 10 | 2 | 8 | 3 | 6 | 4 | 4 | 5 | |
|--|----|---|---|----|---|----|---|----|---|----|---|--|---|---|---|---|---|---|----|---|----|---|----|---|--|---|---|---|---|----|---|---|---|---|---|---|---|--|
| x | y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| x | y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| x | y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Rate of change:

Rate of change:

Rate of change:

Expression vs. Equation

Expression

Equation

Example:

Example:

How Can We Represent Patterns?

Example #1: As a fundraiser, the Recycling Club is going to sell t-shirts for \$15 each.

Fill in the **table of values** for the relationship. How are **n** and **D** related?

| Number of t-shirts sold (n) | Total amount raised, in dollars (D) |
|---------------------------------|---|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

Write an **equation** that calculates the total amount raised, D , in dollars, when n t-shirts are sold.

$D =$ _____

Check your equation using **substitution**:

When two variables are related, it is called a relation.

Relations can be represented in 4 different ways:

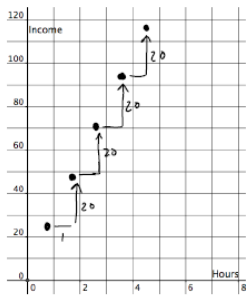
i. _____

ii. _____

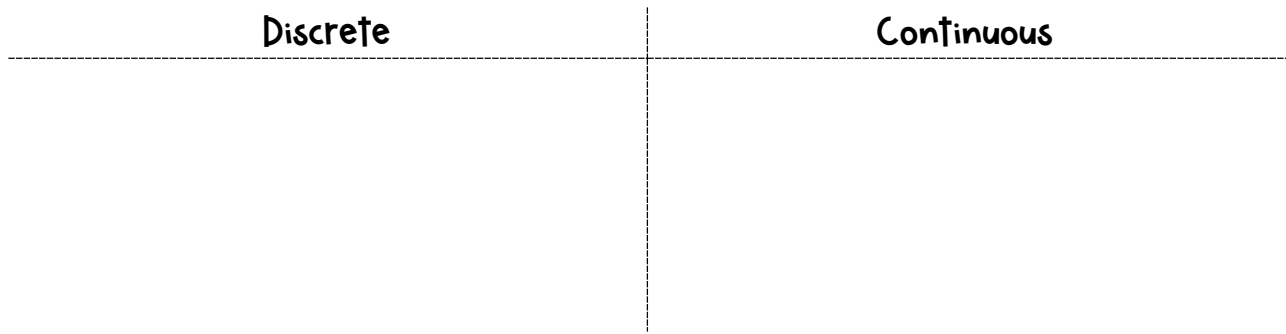
iii. _____

iv. _____

Describe a written pattern in a table of values, a graph and an equation.

| | | | | | | | | | | | | | | | | | |
|--|---|-----|-----|---|----|---|----|---|----|---|----|---|-----|---|-----|---|--|
| <p>Study the Pattern</p> <p>Jason cuts lawns as his summer job. He charges a travelling fee of \$10 plus \$20/hour for his time.</p> | <p>24. Fill out the table of values.</p> <p>Let $x = \text{Hours}$ & $y = \text{Income}$</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <tr> <td style="border: none;">x</td> <td style="border: none;">y</td> </tr> <tr> <td style="border: none;">1</td> <td style="border: none;">30</td> </tr> <tr> <td style="border: none;">2</td> <td style="border: none;">50</td> </tr> <tr> <td style="border: none;">3</td> <td style="border: none;">70</td> </tr> <tr> <td style="border: none;">4</td> <td style="border: none;">90</td> </tr> <tr> <td style="border: none;">5</td> <td style="border: none;">110</td> </tr> <tr> <td style="border: none;">6</td> <td style="border: none;">130</td> </tr> </table> | x | y | 1 | 30 | 2 | 50 | 3 | 70 | 4 | 90 | 5 | 110 | 6 | 130 | <p>25. Plot as many points as will fit.</p>  | <p>Answer the questions.</p> <p>26. Rate of change: How is the y changing? He earns \$20/h</p> <p>27. Write an equation to represent this pattern.</p> <p style="text-align: center;">$I = 20h + 10$ $Y = 20x + 10$</p> |
| x | y | | | | | | | | | | | | | | | | |
| 1 | 30 | | | | | | | | | | | | | | | | |
| 2 | 50 | | | | | | | | | | | | | | | | |
| 3 | 70 | | | | | | | | | | | | | | | | |
| 4 | 90 | | | | | | | | | | | | | | | | |
| 5 | 110 | | | | | | | | | | | | | | | | |
| 6 | 130 | | | | | | | | | | | | | | | | |
| <p>How can you ensure that your equation is correct? Substitute values from the table into the equation and make sure they work. For example $20(6) + 10 = 130$. Correct.</p> | | | | | | | | | | | | | | | | | |

Discrete VS. Continuous Relationships



Example #2: Another club member suggests a different price for the t-shirts. Here is the table of values.

| Number of t-shirts sold (n) | Total amount raised, in dollars (D) |
|---------------------------------|---|
| 0 | 0 |
| 2 | 25 |
| 4 | 50 |
| 6 | 75 |
| 8 | 100 |
| 10 | 125 |

How is this table of values different from the first one?

Explain how you can use the **table** to find out how much each t-shirt is being sold for.

Why did we start our table of values at 0?

Write a formula. $D =$ _____



For the questions below you need to think about how n and D related.

1. Write an equation to go with each table of values.

a)

| n | D |
|-----|-----|
| 0 | 0 |
| 1 | 5 |
| 2 | 10 |
| 3 | 15 |
| 4 | 20 |
| 5 | 25 |

$D =$ _____

b)

| n | D |
|-----|-----|
| 0 | 0 |
| 2 | 5 |
| 4 | 10 |
| 6 | 15 |
| 8 | 20 |
| 10 | 25 |

$D =$ _____

c)

| n | D |
|-----|-----|
| 0 | 0 |
| 5 | 30 |
| 10 | 60 |
| 15 | 90 |
| 20 | 120 |
| 25 | 150 |

$D =$ _____

Check each of your equations above **using substitution**:

a)

b)

c)

2. The distance D (in km) a car can travel on L litres of fuel is given by the formula $D = 8.2L$. What is the meaning of the number 8.2?

3. The temperature of a solution T (in $^{\circ}\text{C}$) after t minutes is given by $T = 2.3t$. What is the meaning of the number 2.3?

Example #3: The Recycling Club has found a manufacturer for the t-shirts they want to sell. The manufacturer charges \$50 to make the silkscreen and then \$10 for printing each t-shirt.

Fill in the table of values and write an equation for C.

| Number of t-shirts printed (n) | Total cost, in dollars (C) |
|------------------------------------|--------------------------------|
| 0 | 50 |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

$C =$ _____

Check your equation using substitution:

Why aren't there any negative values in our table of values?

Example #5: Here is a partial table of values for another t-shirt manufacturer. Complete the table of values.

| Number of t-shirts printed (n) | Total cost, in dollars (C) |
|------------------------------------|--------------------------------|
| 0 | |
| 1 | |
| 2 | 75 |
| 3 | 90 |
| 4 | 105 |
| 5 | |

Write the equation for *this relationship* :

$C =$ _____

Check your equation using substitution:



1. A car rental company charges \$35 per day, plus \$0.10 for each kilometer given.

Fill in the table of values showing the relationship between the total cost for the day (C) and the distance driven (d), and then write the equation for C .

| Distance driven (d) | Total cost (C) |
|-------------------------|--------------------|
| 0 | |
| 50 | |
| 100 | |
| 150 | |
| 200 | |

$C =$ _____

2. Here is a partial table of values for a different car rental company.

Find the daily cost and the cost per kilometer, and then write the equation for the total cost.

| Distance driven (d) | Total cost (C) |
|-------------------------|--------------------|
| 0 | |
| 50 | |
| 100 | \$70 |
| 150 | \$80 |
| 200 | |

$C =$ _____

3. For a final car rental company the equation to calculate the total cost is $C = 0.12d + 35$.

a) What is the daily cost? Explain how you know.

b) What is the cost per kilometer? Explain how you know.

4. The temperature T of a solution after t minutes is given by $T = 13 + 0.5t$.

a) What is the meaning of the number 13?

b) What is the meaning of the number 0.5?



Required
1, 2, 3, 4, 5, 7, 8, 9,
10, 11

Extra Practice
6, 12, 13, 16

Extension
14, 15

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