

Name:	John											
Date:	12/3/2021											
Instructor:	Samuel Chukwuemeka											
Project:	Akron Ohio Water Bill Calculator											
Company:	City of Akron (https://www.akronohio.gov/cms/site/dced0363af40e9b7/index.html)											
Objectives:	<p>1.) To calculate the water bill of Akron residents depending on their water usage.</p> <p>2.) Write a piecewise function for different water rates</p> <p>3.) Calculate power bill using random water usage values and plugging them into piecewise function.</p>											
Information:	<p style="text-align: center;">Current Akron Water Rates</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Block 1</td> <td style="width: 33%;">0 – 30 hcf</td> <td style="width: 33%;">\$2.73 per hcf</td> </tr> <tr> <td>Block 2</td> <td>31 – 5,000 hcf</td> <td>\$2.45 per hcf</td> </tr> <tr> <td>Block 3</td> <td>5,001 and over hcf</td> <td>\$1.29 per hcf</td> </tr> </table> <p style="text-align: center;">Monthly Bill Fee: \$4.00</p>			Block 1	0 – 30 hcf	\$2.73 per hcf	Block 2	31 – 5,000 hcf	\$2.45 per hcf	Block 3	5,001 and over hcf	\$1.29 per hcf
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Numbers to Test:	<p>1.) 0 hcf</p> <p>2.) 30 hcf</p> <p>3.) 50 hcf</p> <p>4.) 4,000 hcf</p> <p>5.) 6,000 hcf</p>											
Arithmetic Method:	<p>This application has three pieces Monthly Bill Fee is not a piece Let w = water used Let c = cost per hcf or water used in \$</p> <p>1. 0 hcf falls in the first piece Monthly Bill Fee = \$4.00 Cost for 0 hcf @ \$2.73 per hcf = $0 * 2.73 = 0$ $4.00 + 0.00 = 4.00$ Cost for 0 hcf is \$4.00</p> <p>2. 30 hcf falls in the first piece Monthly Bill Fee = \$4.00 Cost for 30 hcf @ \$2.73 per hcf = $2.73 * 30 = 81.90$ $4.00 + 81.90 = 85.90$ Cost for 30 hcf is \$85.90</p> <p>3. 50 hcf falls in the second piece Monthly Bill Fee = \$4.00 Before we can use the second piece, we must go through the first piece first. Cost for 30 hcf @ \$2.73 per hcf = $2.73 * 30 = 81.90$</p>											

	<p> $50 - 30 = 20$ We need to find the cost for the remaining 20 hcf That takes us to the second piece Second piece for 20 hcf Cost for 20 hcf @ \$2.45 per hcf = $2.45 * 20 = 49.00$ $4.00 + 81.90 + 49.00 = \\134.90 Cost for 50 hcf = \$134.90 </p> <p> 4. 4,000 hcf falls in the second piece Monthly Bill Fee = \$4.00 Before we can use the second piece, we must go through the first piece first. Cost for 30 hcf @ \$2.73 per hcf = $2.73 * 30 = 81.90$ $4,000 - 30 = 3,970$ We need to find the cost for the remaining 3,970 hcf That takes us to the second piece Second piece for 3,970 hcf Cost for 3,970 hcf @ \$2.45 per hcf = $2.45 * 3970 = 9,726.50$ $4.00 + 81.90 + 9,726.50 = \\$9,812.40$ Cost for 4,000 hcf = \$9,812.40 </p> <p> 5. 6,000 hcf falls in the third piece Monthly Bill Fee = \$4.00 Before we can use the third piece, we must go through bot the first and second pieces. First piece for 30 hcf Cost for 30 hcf @ \$2.73 per hcf = $2.73 * 30 = 81.90$ $5,000 - 30 = 4,970$ Second piece for 4,970 hcf Cost for 4,970 hcf @ \$2.45 per hcf = $2.45 * 4970 = 12,176.50$ $6000 - 5000 = 1000$ We need to find the cost for the remaining 1,000 hcf Third piece for 1,000 hcf Cost for 1,000 hcf @ \$1.29 per hcf = $1000 * 1.29 = 1,290.00$ $4.00 + 81.90 + 12,176.50 + 1,290.00 = \\$13,552.40$ Cost for 6,000 hcf = \$13,552.40 </p>
Algebraic Method:	<p> Let w = water used Let c = cost per hcf or water used in \$ </p> <p> First piece: Monthly Bill Fee: \$4.00 Cost for w hcf @ \$2.73 per hcf = $w * 2.73 = 2.73w$ $2.73w + 4$ </p>

	<p>Second piece: Monthly Bill Fee: \$4.00 “Finishing” first piece: Cost for 30hcf @ \$2.73 per hcf = $2.73 * 30 = 81.9$ $4 + 81.9 = \mathbf{\\$85.90}$ Since we found max value of first piece, I can multiply the remaining consumption of power: $c(w) = 85.9 + 2.45(w - 30)$ $c(w) = 85.9 + 2.45w - 73.5$ $c(w) = 2.45w + 12.4$</p> <p>Third piece: Monthly Bill Fee: \$4.00 First piece already finished for max value = \$85.90 “Finishing” second piece by finding max value for second piece: $5,001 - 31 = 4,970$ Cost for 4,970hcf @ \$2.45 = $4970 * 2.45 = \mathbf{\\$12,176.50}$ First max + second max = $85.9 + 12176.5 = \mathbf{\\$12,262.40}$ Then, can multiply remaining water consumption by \$1.29 $c(w) = 12262.4 + 1.29(w - 5000)$ $c(w) = 12262.4 + 1.29w - 6450$ $c(w) = 1.29w + 5812.4$</p>
<p>Piecewise Function:</p>	$c(w) = \begin{cases} 2.73w + 4; & 0 \leq w \leq 30 \\ 2.45w + 12.4; & 30 < w \leq 5000 \\ 1.29w + 5812.4; & w > 5000 \end{cases}$
<p>Numbers Tested using algebraic method:</p>	<p>5hcf – First piece: $2.73(5) + 4 =$ $13.65 + 4 =$ \$17.65 for 5hcf of water used</p> <p>30hcf – First piece: $2.73(30) + 4 =$ $81.9 + 4 =$ \$85.90 for 30hcf of water used</p> <p>50hcf – Second piece: $2.45(50) + 12.4 =$</p>

	$122.5 + 12.4 =$ $\$134.90 \text{ for } 50\text{hcf of water used}$ <p>4,000hcf – Second piece: $2.45(4000) + 12.4 =$ $9800 + 12.4 =$ $\\$9,812.40 \text{ for } 4,000\text{hcf of water used}$</p> <p>6,000hcf – Third piece: $1.29(6000) + 5812.4 =$ $7740 + 5812.4 =$ $\\$13,552.40 \text{ for } 6,000\text{hcf of water used}$</p>
Citations:	<p>APA 7</p> <p>Chuckwuemeka, S.D (2018). <i>Piecewise functions</i>. Piecewise Functions. Retrieved December 14, 2021, from https://piecewise-functions.appspot.com/#powerBill</p> <p><i>Customer service</i>. Water and Sewer Rates : City of Akron. (2016). Retrieved December 14, 2021, from https://www.akronohio.gov/cms/site/dced0363af40e9b7/index.html</p>