Lesson Summary:
In this lesson, students will learn to develop an interactive spreadsheet that will allow them to investigate the attributes of equations through a guided discovery process comparing graphs of the equations. Students will experience rates of change and will describe how the attributes of equations affect the graph of that equation. They will apply these skills to help them understand and solve real-world problems.

This lesson integrates mathematics and technology, and can be taught in the mathematics classroom.

Estimated Duration: Three 50-minute class periods

Commentary:
It’s important that students develop an early understanding that equations represent problem situations and that the graphs of those equations give a physical representation of the problem and solution. With some initial experimentation with an interactive spreadsheet, students can discover rates of change and how different attributes of the equation affect the graph. Once these understandings are developed, students can construct their own interactive spreadsheet to investigate any problem situation to find solutions and describe the effects of slope and y-intercept.

Pre-Assessment:
Have students complete Attachment A, Pre-Assessment Quiz.

Scoring Guidelines:
The objective of Attachment A, Pre-Assessment Quiz, is to measure student understanding; therefore a score is not necessary. The answers to the short quiz are provided in Attachment B, Pre-Assessment Quiz Answers. The first three questions of the quiz should be taken with paper and pencil. The last question is a performance assessment to be completed on a computer.
Mathematics

Patterns, Functions & Algebra

Benchmark E
Analyze and compare functions and their graphs using attributes, such as rates of change, intercepts and zeros.

Indicator 6
Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change and y-intercept in real-world problems.

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Post-Assessment:

Given a real-world problem situation, the student will:

1. Design an interactive spreadsheet that will calculate table values and display the graph of any linear relationships for the problem situation.
2. Create a project that includes a printout of the table and graph, a written description of how the graph provides the solution to the problem and how the graph depicts the rate of change (slope) and y-intercept of the problem situation.
3. Create a visual representation of the above in any format (printed materials, slide presentation, etc.).

Students will choose one of the following scenarios to solve:

1. The Teen Wave recreation center has just opened in town. Special memberships are available for students ages 13-18 to use the pool, gym and exercise facilities. The membership levels and costs are:
   - Gold Level (unlimited; paid once a year) - $20 per month = $240 per year
   - Silver Level (unlimited; paid monthly) - $40 for a membership plus $20 per month
   - Bronze Level (paid on attendance) - $50 for a membership and $5 per visit.
   How would you choose which membership and why?

2. The local coffee shop has an Internet café. You can use one of the computers there for one-half hour for a charge of $2 if you have purchased a $25 membership. If you are not a member you must pay $5 for one-half hour. Which is most economical for you if you stop at the coffee shop and would like to use the Internet for one-half hour at least three days a week?

Scoring Guidelines:
Use Attachment C, Post-Assessment Rubric, to assess student projects.
Instructional Procedures:
Days One and Two
1. Have students complete the Pre-Assessment Quiz and score it. Review weak areas and teach necessary skills.
2. Divide students into groups and pose the following problem:
   The cheerleaders need to raise $400 for new uniforms. They are going to have a car wash for six hours this Saturday. They must decide how much to charge for the car wash. The local grocery store has offered to let them wash the cars in their parking lot and has donated the water and cleaning supplies. There were several suggestions on how much to charge. Alicia said the charge should be $3 per car. Carol thought the charge should be $8 because that’s what her Dad pays at the local car wash. Deidre thought the cost should be $6 per car. How can they select the best price?
   Instructional Tip:
   It is important to realize that the “best” price will vary by student; they need to look at all parameters of the situation, make a decision and defend that decision. The purpose of this lesson is to develop the concepts involved in relating equations to visual representations. Some students may decide that they want to charge $3.89 and give good reasons why. The key is to put them into a situation where they use visual representations to make comparisons and decisions.
3. Discuss the problem so that students will develop a sense of how profit is made. Since there are no expenses for water or supplies, the profit is simply the charge, times the number of cars, or: profit = (charge per car) x (number of cars).
   Instructional Tips:
   • The equation profit = (charge per car) x (number of cars) can be written as y = cx where y is the profit, c is the charge per car and x is the number of cars.
   • Create graphs of the different charges and be aware of how many cars the cheerleaders would need to wash to raise $400. Determine the best price of the three options (y = 3x; y = 6x or y = 8x).
   • Use the overhead projector and a computer to display graphs for students to use. If equipment is not available, distribute Attachment E, $3 charge per car; Attachment F, $6 charge per car; Attachment G, $8 charge per car; and Attachment H, All three charges compared, when appropriate in the lesson.
4. Have students create an interactive spreadsheet to graph the first equation, y = 3x.
   Instructional Tips:
   • Students will work in groups during the class activities. Make sure each team member has an opportunity to create an interactive spreadsheet. (Each group will have to create four different spreadsheets.) The post-assessment will be individualized.
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- For detailed instructions on creating an interactive spreadsheet for graphs, use Attachment D, *Interactive Spreadsheet*.

5. Have students enter $3 for the first value of \( c \) (cost) to check for potential to make $400.

6. Have students read their graph to answer the following questions:
   - How much profit is made when 40 cars are washed? ($120)
   - If 90 cars are washed, is the profit near $400? ($270 – No)
   - Can we change the graph to find the number of cars that will yield a profit close to $400? (Change the number of cars to start to 50 (change the \( x \)-scale))

7. Have students change the number of cars to start to 50 on their graphs.

8. Ask students to determine the number of cars that will yield a profit close to $400. (more than 130 cars)

**Instructional Tip:**
At this point, it is good to discuss the slope of the line before going on to consider the next option of charging $6 per car.

9. Have students make the following changes on their spreadsheet: change number of cars to start with to zero and enter the cost per car of $6.

10. Ask students to determine the number of cars that will yield a profit close to $400. (about 70 cars)

**Instructional Tip:**
Point out to students the difference in the slope of the line and how many fewer cars need to be washed to make $400. Similarly, compare these two graphs to the graph for a cost of $8 (Attachment G, $8 charge per car) and then have students experiment with one of the spreadsheets to see all three equations on one graph, as shown in Attachment H, *All three charges compared*.

11. Have students compare the three equations and discuss the slope of each equation. Then ask students how the graphs would change if the local grocery store decided to make a $100 contribution to the car wash effort. How does this affect the results in each case? What would happen if the grocery store charged $75 to host the car wash? Changing these amounts allows students to visualize the effects of changing the \( y \)-intercept value.

**Instructional Tip:**
Students should see that the costs represent the slope of the line and the greater the slope, the quicker the profit of $400 is realized. If the store makes a $100 contribution, in effect, 100 is the \( y \)-intercept and affects each equation the same. It is important that students have this interactive experience and begin to relate equations to actual events, develop understandings of slope as a rate of change, and increase understandings of \( y \)-intercepts.
Day Three
12. Review findings from yesterday’s activities, i.e. slope and y-intercepts.
13. Discuss the post-assessment with students and review Attachment C, Post-Assessment Rubric.
14. Have students select one of the problems from the post-assessment and begin their investigations.
15. Allow students an additional day to complete their assignments if needed.

Differentiated Instructional Support:
Instruction is differentiated according to learner needs, to help all learners either meet the intent of the specified indicator(s) or, if the indicator is already met, to advance beyond the specified indicator(s).
- Allow students to work in pairs or groups to complete the assignment.
- Provide students with visual representations of the data to graph.
- Challenge students with the following problem to investigate:
  The cheerleaders split into two groups and washed cars at two different locations. They mistakenly charged $8 at one location and $10 at the other location. The total amount of money that they made was $832! They know that they washed a total of 90 cars, but don't know how many they washed at each location. Can you develop a way to determine how many cars were washed at each location? Can you design an interactive spreadsheet that will provide the solution?

Instructional Tip:
Encourage students to use all possible means, guess and check, simple substitution, etc., to develop an understanding of the problem and also to determine the answers. However, the answer here is not as important as the ability to extend their knowledge to the development of an interactive spreadsheet which can provide the solution.

Extensions:
Your class is planning a canoe trip down the Little Miami River. You are on a committee to find the canoe livery that is most reasonable. You get quotes from three companies.
1) CANOE CANYOU? company charges $8 per person.
2) OVERBOARD CANOE company charges $50 plus $5 per person.
3) FLOATABOAT company charges $7 per person but gives a one-time discount of $10 for school groups.

Use a graph to show which company you would choose and why.

Calculate the total costs of the canoe trip if your class of 12 girls and 14 boys take the trip and camp overnight, renting two-person tents at a cost of $7 per person with a deposit of $25.
Home Connections:
Students can talk to their parents about how they are billed for common household expenses like water and telephone. They can determine if any of these are linear relationships and, if so, if they can develop an interactive spreadsheet to illustrate how charges are calculated.

Materials and Resources:
The inclusion of a specific resource in any lesson formulated by the Ohio Department of Education should not be interpreted as an endorsement of that particular resource, or any of its contents, by the Ohio Department of Education. The Ohio Department of Education does not endorse any particular resource. The Web addresses listed are for a given site’s main page; therefore, it may be necessary to search within that site to find the specific information required for a given lesson. Please note that information published on the Internet changes over time; therefore, the links provided may no longer contain the specific information related to a given lesson. Teachers are advised to preview all sites before using them with students.

Note: Some Web sites contain material that is protected by copyright. Teachers should ensure that any use of material from the Web does not infringe upon the content owner's copyright.

For the teacher: Computer productivity software (spreadsheet); projection system

For the student: One computer for each group of three to four students; productivity software (spreadsheet)

Vocabulary:
- cell
- chart
- coefficient
- format
- increment
- linear equation
- origin
- rate of change
- rise
- run
- slope
- spreadsheet
- y-intercept
Library Connections:
In 2003, the State Board of Education and the Ohio Department of Education established library guidelines that represent a standards-based education approach to school library programs. Entitled Academic Content Standards K-12 Guidelines Library, Ohio’s library guidelines provide a variety of content-specific, grade-level indicators describing information literacy, literacy linked to library-based technologies, and media literacy experiences for students. Featured on pages 204-219 are sample activities for making library connections across academic content standards and disciplines. Also included are grade-band models for student research and specific information concerning copyright and fair use of materials laws. K-12 teachers are encouraged to utilize the library guidelines and collaborate with the school library media specialist whenever possible. Ohio’s library guidelines can be found under the heading of Library at www.ode.state.oh.us/academic_content_standards/

Research Connections:

1. Identifying similarities and differences enhances students’ understanding of and ability to use knowledge. This process includes comparing, classifying, creating metaphors and creating analogies and may involve the following:
   - Presenting students with explicit guidance in identifying similarities and differences.
   - Asking students to independently identify similarities and differences.
   - Representing similarities and differences in graphic or symbolic form.

2. Nonlinguistic representations help students think about and recall knowledge. This includes the following:
   - Creating graphic representations (organizers);
   - Making physical models;
   - Generating mental pictures;
   - Drawing pictures and pictographs;
   - Engaging in kinesthetic activity.

3. Cooperative learning has a powerful effect on student learning. This type of grouping includes the following elements:
   - Positive interdependence;
   - Face-to-face promotive interaction;
   - Individual and group accountability;
   - Interpersonal and small group skills;
   - Group processing.

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Authentic experiences help students develop real-world knowledge and skills and apply their learning in ways that prepare them for their careers and lives beyond school.


Standards-based student assessment supports the systematic, multi-step process of collecting evidence on student learning, understanding and abilities and using that information to inform instruction and provide feedback to the learner, thereby enhancing learning. Students should be assessed often using a variety of tools and methods. The design of student assessments should follow set principles, such as utilizing authentic assessment that provides students the opportunity to demonstrate their knowledge and abilities in real-world situations. (Note: the complete publication and other resource materials are available online at the Ohio page of the ITEA Center to Advance the Teaching of Technology and Science [CATTs] Web link: www.iteaconnect.org/CATTsresources/CATTsresourcesOH01.html

Attachments:
Attachment A, Pre-Assessment Quiz
Attachment B, Pre-Assessment Quiz Answers
Attachment C, Post-Assessment Rubric
Attachment D, Interactive Spreadsheet
Attachment E, $3 charge per car
Attachment F, $6 charge per car
Attachment G, $8 charge per car
Attachment H, All three charges compared
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Attachment A
Pre-Assessment Quiz

Student Name________________________________________
Date______________________

1. $96 = 4x$; solve for $x$ 
   $x =$

2. If you add 12 to three times a mystery number you will get 30. What is the mystery number?
   Mystery number =

3. Given the equation $y = 2x - 4$, complete the table below with at least six sets of points and sketch a graph of the equation.
   
<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   Sketch graph here:

4. Enter the data from the table in problem #3 into a spreadsheet. Using the chart features, create a line graph of the data entered.
1. $96 = 4x$; solve for $x$  
   $x = 24$

2. If you add 12 to three times a mystery number you will get 30.  
   $12 + 3x = 30$  
   What is the mystery number?  
   $x = 6$  
   Mystery number $= x = 6$

3. Given the equation $y = 2x - 4$, complete the table below with at least six sets of points and sketch a graph of the equation.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-6</td>
</tr>
<tr>
<td>0</td>
<td>-4</td>
</tr>
<tr>
<td>1</td>
<td>-2</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Sketch graph here:

4. Enter the data from the table in problem #3 into a spreadsheet. Using the chart features, create a line graph of the data entered.
Real-World Linear Equations – Grade Eight
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Attachment C
Post-Assessment Rubric

<table>
<thead>
<tr>
<th>Real World Linear Equations</th>
<th>Student</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>Exceeds Expectation</td>
<td>Meets Expectation</td>
<td>Below Expectation</td>
<td>Barely addresses expectation</td>
<td></td>
</tr>
<tr>
<td>1. Design an interactive spreadsheet to investigate a real world problem situation.</td>
<td>Spreadsheet is well constructed, labeled and highly functional and interactive.</td>
<td>Spreadsheet contains all necessary parts</td>
<td>Spreadsheet has some flaws in design and calculation</td>
<td>Spreadsheet is poorly presented and contains no logic to design.</td>
<td></td>
</tr>
<tr>
<td>Spreadsheet correctly addresses the mathematics of the problem situation.</td>
<td>Design correctly presents the given mathematical problem and is highly creative and original.</td>
<td>Design correctly represents the given mathematical problem.</td>
<td>Design is okay but there are some errors in calculations or set up.</td>
<td>Design will not work or will not represent the given mathematical problem.</td>
<td></td>
</tr>
<tr>
<td>Variables and formulas are correctly entered and displayed.</td>
<td>Formulas are correct and evaluated on an appropriate range of data. Data is clearly presented in an orderly fashion and is easy to read and understand.</td>
<td>Correct formulas used and data is presented in rows and columns.</td>
<td>Minor errors appear in formulas, data is presented but with no apparent plan.</td>
<td>Formulas are incorrect, data is poorly displayed, or there is no logic to presentation.</td>
<td></td>
</tr>
</tbody>
</table>
### Real-World Linear Equations – Grade Eight
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**Attachment C**
**Post-Assessment Rubric, Continued**

<table>
<thead>
<tr>
<th>Score</th>
<th>Exceeds Expectation</th>
<th>Meets Expectation</th>
<th>Below Expectation</th>
<th>Barely addresses expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Describe the relationship between the equation representing the problem and its graph.</strong></td>
<td>Written description accurately describes the relationship between the printed graph and its equation.</td>
<td>Written description shows evidence that student understands relationship between printed graph and its equation.</td>
<td>Written description describes equation or graph but does not show evidence of understanding relationships.</td>
<td>Written description lacks evidence of understanding the equation, graph or relationships.</td>
</tr>
<tr>
<td>The concept of slope is presented in the graph and accurately described.</td>
<td>Written description includes discussion of slope as rate of change, rise over run, etc., with respect to given problem situations.</td>
<td>Written description shows evidence that student understands the concept of slope as a rate of change.</td>
<td>Written description mentions slope but does not show evidence of relationships between equation and graph.</td>
<td>Written description lacks evidence of the understanding of slope or rate of change in the equation and graph.</td>
</tr>
<tr>
<td>The relationship of the $y$-intercept is evident in the description.</td>
<td>Written description accurately describes the relationship of the $y$-intercept to the graph applied to the given problem situation.</td>
<td>Written description shows evidence that the student understands how the $y$-intercept in the equation affects the graph.</td>
<td>Written description mentions $y$-intercept but does not show evidence of relationships between the equation and the graph.</td>
<td>Written description lacks evidence of the understanding of $y$-intercept.</td>
</tr>
<tr>
<td><strong>3. Completed project is neat, well presented and accurately documented.</strong></td>
<td>Project contains neat print out of spreadsheet tables and graphs and accurate description of relationships of graphs to problem situation. Presentation includes appropriate graphics, colors and fonts.</td>
<td>Project contains printout of spreadsheet tables and graphs and description of relationships of graphs to problem situations.</td>
<td>Project contains printout of spreadsheet tables and graphs. Description and presentation have some inaccuracies.</td>
<td>Project contains most elements but no indication that student understands relationships.</td>
</tr>
</tbody>
</table>

**TOTAL POINTS (4-28)**
We can use the calculation features of a spreadsheet to calculate values for any function and then plot the data using \(xy\) scatter plots. This feature will allow the \(x\)-axis to be a variable.

Let’s consider a problem that we need to solve:

Suppose gasoline sells for $2 per gallon. Then five gallons cost $10 and 10 gallons cost $20. The more you buy the more you pay in exact proportion to the amount you buy. We can write this relationship \(y = 2x\), where \(x\) is the number of gallons and \(y\) is the cost for buying \(x\) gallons. Let’s use a spreadsheet scatter plot to graph this relationship and then show how we can make the spreadsheet interactive so that the cost can be changed.

Set up a table on the spreadsheet where we will enter the gallons of gas in one row. Use a formula to calculate the Cost for each entry so we can use the scatter plot feature to graph the relationship.

The entry into cell E5 should be = D5 + 5 (for increments of five gallons)
The entry into cell D6 should be the formula = 2 * D5

These formulas can then be pasted (or dragged) across cells F5 thru K6 and cells E6 thru K6.
With the resulting table, highlight the rows we wish to plot and choose the scatter plot feature.

If we change any of the table data, the scatter plot will change accordingly. For example, let’s change the Gallons so that the increments are 50.

We will change the formula in cell E5 to read: $=D5 + 50$ and drag the formula across rows E5 thru K5. Notice how the Cost and scatter plot change accordingly. Notice also that this is a plot of the relationship for these values only. If we wished to consider the function $f(x) = 2x$, we will need to connect all points in this relationship with a continuous line and recognize that it extends infinitely in both directions.
Now we can use the graph to estimate the costs of 40 gallons, or 335 gallons, and so forth.

Now we have seen how to change the increments – how can we change the cost per gallon?

If you noticed at the top of the spreadsheet – the title includes the cost per gallon in cell G2 (Refer to Attachment D, *Interactive Spreadsheet*, Part 1). We did not use this in our formula in cell D6 – we used the formula: = 2*D5

Let’s change that formula to read: = $G$2 * D5 and then drag the formula across cells E6 thru K6. (Recall that we use the $ in cell references to indicate that we are referring to that specific cell in the formula all the way across the row.)

It’s easy to see that we have not changed our plot at all. Now, however, if we change the cost per gallon to $3, the graph changes correspondingly.
Change the cost to $7.50 per gallon, $20 per gallon, etc. Notice that the graph remains linear and the scales change to accommodate the range you have selected. You can use the draw feature to connect all values as a continuous function like we did in the last example.

How can this example be changed so that in addition to changing the Cost, you could also change the increments?

You may wish to protect the interactive spreadsheet – only allowing the cells where students can change cost or increments to be unprotected (changeable).

The interactive feature allows students to investigate change and consider several different scenarios in a short period of time.
The cheerleaders need to raise $400 for new uniforms. They are going to have a car wash for six hours this Saturday. They must decide how much to charge for the car wash. The local grocery store has offered to let them wash the cars in their parking lot and has donated the water and cleaning supplies. There were several suggestions of how much to charge. Alicia said the charge should be $3 per car. Carol thought the charge should be $8 because that’s what her Dad pays at the local car wash. Deide thought the cost should be $8 per car. How can they select the best price?

### Enter the Value of C (cost) you wish to charge per car in the cell below

<table>
<thead>
<tr>
<th>Number of cars washed</th>
<th>$3</th>
<th>$6</th>
<th>$9</th>
<th>$12</th>
<th>$15</th>
<th>$18</th>
<th>$21</th>
<th>$24</th>
<th>$27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt. 1</td>
<td>$0</td>
<td>$10</td>
<td>$20</td>
<td>$30</td>
<td>$40</td>
<td>$50</td>
<td>$60</td>
<td>$70</td>
<td>$80</td>
</tr>
<tr>
<td>Pt. 2</td>
<td>$30</td>
<td>$40</td>
<td>$50</td>
<td>$60</td>
<td>$70</td>
<td>$80</td>
<td>$90</td>
<td>$100</td>
<td>$110</td>
</tr>
<tr>
<td>Pt. 3</td>
<td>$60</td>
<td>$70</td>
<td>$80</td>
<td>$90</td>
<td>$100</td>
<td>$110</td>
<td>$120</td>
<td>$130</td>
<td>$140</td>
</tr>
<tr>
<td>Pt. 4</td>
<td>$90</td>
<td>$100</td>
<td>$110</td>
<td>$120</td>
<td>$130</td>
<td>$140</td>
<td>$150</td>
<td>$160</td>
<td>$170</td>
</tr>
<tr>
<td>Pt. 5</td>
<td>$120</td>
<td>$130</td>
<td>$140</td>
<td>$150</td>
<td>$160</td>
<td>$170</td>
<td>$180</td>
<td>$190</td>
<td>$200</td>
</tr>
<tr>
<td>Pt. 6</td>
<td>$150</td>
<td>$160</td>
<td>$170</td>
<td>$180</td>
<td>$190</td>
<td>$200</td>
<td>$210</td>
<td>$220</td>
<td>$230</td>
</tr>
<tr>
<td>Pt. 7</td>
<td>$180</td>
<td>$190</td>
<td>$200</td>
<td>$210</td>
<td>$220</td>
<td>$230</td>
<td>$240</td>
<td>$250</td>
<td>$260</td>
</tr>
<tr>
<td>Pt. 8</td>
<td>$210</td>
<td>$220</td>
<td>$230</td>
<td>$240</td>
<td>$250</td>
<td>$260</td>
<td>$270</td>
<td>$280</td>
<td>$290</td>
</tr>
<tr>
<td>Pt. 9</td>
<td>$240</td>
<td>$250</td>
<td>$260</td>
<td>$270</td>
<td>$280</td>
<td>$290</td>
<td>$300</td>
<td>$310</td>
<td>$320</td>
</tr>
<tr>
<td>Pt. 10</td>
<td>$270</td>
<td>$280</td>
<td>$290</td>
<td>$300</td>
<td>$310</td>
<td>$320</td>
<td>$330</td>
<td>$340</td>
<td>$350</td>
</tr>
</tbody>
</table>

### Graph

- **$Y = CX$**
- **X-axis**: Number of cars washed
- **Y-axis**: Total charge
The cheerleaders need to raise $400 for new uniforms. They are going to have a car wash for six hours this Saturday. They must decide how much to charge for the car wash. The local grocery store has offered to let them wash the cars in their parking lot and has donated the water and cleaning supplies. There were several suggestions on how much to charge. Alicia said the charge should be $3 per car. Carol thought the charge should be $8 because that’s what her Dad pays at the local car wash. Deidre thought the cost should be $6 per car. How can they select the best price?

### Entering the Value of C
(cost) you wish to charge per car in the cell below

<table>
<thead>
<tr>
<th>$6</th>
<th>Number of cars washed</th>
</tr>
</thead>
</table>

### Entering # of cars to start with below (X)

<table>
<thead>
<tr>
<th>X</th>
<th>Pl. 1</th>
<th>Pl. 2</th>
<th>Pl. 3</th>
<th>Pl. 4</th>
<th>Pl. 5</th>
<th>Pl. 6</th>
<th>Pl. 7</th>
<th>Pl. 8</th>
<th>Pl. 9</th>
<th>Pl. 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$6.00</td>
<td>$60.00</td>
<td>$120.00</td>
<td>$180.00</td>
<td>$240.00</td>
<td>$300.00</td>
<td>$360.00</td>
<td>$420.00</td>
<td>$480.00</td>
<td>$540.00</td>
</tr>
</tbody>
</table>

**Chart:**

- **Y=CX**
- **X** values range from 0 to 100
- **Y** values range from $0 to $600.00
- The line shows a linear relationship where **Y** = **CX**.
The cheerleaders need to raise $400 for new uniforms. They are going to have a car wash for six hours this Saturday. They must decide how much to charge for the carwash. The local grocery store has offered to let them wash the cars in their parking lot and has donated the water and cleaning supplies. There were several suggestions on how much to charge. Alicia said the charge should be $3 per car. Carol thought the charge should be $8 because that’s what her Dad pays at the local car wash. Deidre thought the cost should be $8 per car. How can they select the best price?

Enter the Value of C (cost) you wish to charge per car in the cell below

<table>
<thead>
<tr>
<th>Enter # of cars to start with below (X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$8</td>
</tr>
</tbody>
</table>

Number of cars washed

<table>
<thead>
<tr>
<th>X</th>
<th>Y = CX</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$0.00</td>
</tr>
<tr>
<td>10</td>
<td>$80.00</td>
</tr>
<tr>
<td>20</td>
<td>$160.00</td>
</tr>
<tr>
<td>30</td>
<td>$240.00</td>
</tr>
<tr>
<td>40</td>
<td>$320.00</td>
</tr>
<tr>
<td>50</td>
<td>$400.00</td>
</tr>
<tr>
<td>60</td>
<td>$480.00</td>
</tr>
<tr>
<td>70</td>
<td>$560.00</td>
</tr>
<tr>
<td>80</td>
<td>$640.00</td>
</tr>
<tr>
<td>90</td>
<td>$720.00</td>
</tr>
</tbody>
</table>

Graph showing linear relationship between X and Y = CX.
The cheerleaders need to raise $400 for new uniforms. They are going to have a car wash for six hours this Saturday. They must decide how much to charge for the car wash. The local grocery store has offered to let them wash the cars in their parking lot and has donated the water and cleaning supplies. There were several suggestions on how much to charge. Alicia said the charge should be $3 per car. Carol thought the charge should be $8 because that’s what her Dad pays at the local car wash. Deidre thought the cost should be $6 per car. How can they select the best price?

<table>
<thead>
<tr>
<th>$8</th>
<th>Enter # of cars to start with (X)</th>
<th>Number of cars washed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pl. 1</td>
<td>Pl. 2</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>X=8</td>
<td>$0.00</td>
<td>$80.00</td>
</tr>
<tr>
<td>X=3X</td>
<td>$0.00</td>
<td>$30.00</td>
</tr>
<tr>
<td>X=6X</td>
<td>$0.00</td>
<td>$60.00</td>
</tr>
</tbody>
</table>

The graph shows the total income for each charge based on the number of cars washed. The data suggests that charging $8 per car yields the highest total income, which could be the best price for the car wash.