DOMINO EFFECT

Domino’s pizza is delicious. The company’s success is proof that people enjoy their pizzas. The company is also tech savvy as you can order online and they even have a pizza tracker so you can keep tabs on your delivery.

Domino’s does not tell you how much the component pieces cost; they only tell you an item’s final price after you build it. In this lesson we will use linear equations to find the base price and cost per additional topping.

PART 1

Below are prices for a medium 2-topping pizza and a medium 4-topping pizza from Domino’s in Washington, DC.

<table>
<thead>
<tr>
<th>Medium (12”) Hand Tossed Pizza</th>
<th>Medium (12”) Hand Tossed Pizza</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pepperoni, Green Peppers</td>
<td>Pepperoni, Italian Sausage, Onions, Green Peppers</td>
</tr>
<tr>
<td>Price: $13.97</td>
<td>Price: $16.95</td>
</tr>
</tbody>
</table>

1. Plot the two points representing the pizzas on the included graph. Then draw a line connecting the two points and extending across the entire graph.

2. Based on the information in the picture above how much does it appear Domino’s is charging for each topping?

3. A medium, 3-topping pizza really costs $15.46 at this Dominos. Does that match what you would expect? So far we have assumed each number topping costs the same amount. What would it mean if Dominos charged you a price different than $15.46 for a 3-topping pizza?

4. For the 2-topping pizza, how much in total are you spending on toppings?

5. For the 4-topping pizza, how much in total are you spending on toppings?

6. If you wanted to order a medium cheese pizza (no toppings), how much would you expect to spend? Explain.
Often times linear equations are written in the format: \( y = mx + b \)

- \( y \) is the dependent variable.
- \( x \) is the independent variable.
- \( m \) is the slope of the line.
- \( b \) is the \( y \)-intercept of the line.

This is called **slope-intercept form**.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>In our pizza problem, which variable is the independent variable and which is the dependent variable?</td>
</tr>
<tr>
<td>8.</td>
<td>Now write an equation in slope-intercept form for the price of a medium pizza and explain what the equation means.</td>
</tr>
<tr>
<td>9.</td>
<td>Does a pizza with 12 toppings cost twice as much as a pizza with 6 toppings? Why or why not?</td>
</tr>
<tr>
<td>10.</td>
<td>Is your graph linear? How do you know?</td>
</tr>
<tr>
<td>11.</td>
<td>Does your graph represent a proportional or non-proportional relationship? How do you know?</td>
</tr>
</tbody>
</table>

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**Domino Effect**

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Cost of Pizza

\$0 \quad \$2 \quad \$4 \quad \$6 \quad \$8 \quad \$10 \quad \$12 \quad \$14 \quad \$16 \quad \$18 \quad \$20 \quad \$22 \quad \$24 \quad \$26 \quad \$28 \quad \$30 \quad \$32 \quad \$34 \quad \$36

Number of Toppings

0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \quad 11 \quad 12
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PART 2

Below are prices for two small pizzas and two large pizzas from Domino’s in Washington, DC.

<table>
<thead>
<tr>
<th>Small (10&quot;) Hand Tossed Pizza</th>
<th>Large (14&quot;) Hand Tossed Pizza</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pepperoni</td>
<td>Pepperoni, Italian Sausage, Onions, Green Peppers</td>
</tr>
<tr>
<td>Price: $9.99</td>
<td>Price: $19.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Small (10&quot;) Hand Tossed Pizza</th>
<th>Large (14&quot;) Hand Tossed Pizza</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pepperoni, Mushrooms, Green Peppers</td>
<td>Pepperoni</td>
</tr>
<tr>
<td>Price: $11.99</td>
<td>Price: $14.68</td>
</tr>
</tbody>
</table>

1. Plot the small and large pizzas on the same graph as the medium pizza, draw the lines, and then use the information to answer the following questions.

2. How much does Domino’s appear to be charging for each topping on a small pizza?

3. How much does Domino’s appear to be charging for each topping on a large pizza?

4. How much would a small pizza with no toppings cost?

5. How much would a large pizza with no toppings cost?

6. Now write an equation in slope-intercept form for the price of a small pizza and explain what the equation means.

7. Now write an equation in slope-intercept form for the price of a large pizza and explain what the equation means.

8. Which line/lines – small, medium, or large – is/are the steepest? Why?
9. Which line/lines – small, medium, or large – has/have the lowest starting value? Why?

10. Look at the graphs (next page) of how much Domino’s really charges for pizza in Washington, DC. How is the actual situation different than what you expected?

Use your original information to answer the questions below.

11. What is the y-intercept of the small pizza graph? What does this number represent?

12. What is the y-intercept of the medium pizza graph? What does this number represent?

13. What is the y-intercept of the large pizza graph? What does this number represent?

The slope of a straight line shows how steep the straight line is. The slope is calculated by the following:

\[ \text{slope} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} \]

14. What is the slope of the small pizza graph? What does the number represent?

15. What is the slope of the medium pizza graph? What does the number represent?

16. What is the slope of the large pizza graph? What does the number represent?
Activity A-5: **Domino Effect**

17. According to the graph everything looks normal until the fourth topping. At this point Domino’s appears to stop charging for additional toppings.

   What is the slope of the line between topping 4 and topping 10?

18. What is one reason (not necessarily mathematical) why it appears that Domino’s does not charge for toppings 5-10?

19. What is one reason (not necessarily mathematical) why it appears that Domino’s does not allow you to order more than 10 toppings?
EXTENSION – You may use a calculator for this page.

Pizza chains like Domino’s charge different prices for toppings depending on the size of the pizza: a topping for a small pizza costs less than a topping for a medium pizza, which costs less than a topping for a large pizza. This makes sense: the larger the pizza, the more topping you get.

How do the differences in topping prices compare to the differences in topping amounts? If pepperoni costs $1 on a small pizza and $1.49 on a medium are you really getting $0.49 more worth of pepperoni?

The large pizza has a 14 inch diameter including a 1 inch crust all around.
The medium pizza has a 12 inch diameter including a 1 inch crust all around.
The small pizza has a 10 inch diameter including a 1 inch crust all around.

1. Using the formula for the area of a circle, \( A = \pi r^2 \), determine the interior area (area available for toppings) of a large pizza. Round to the nearest whole number.

2. Determine the interior area of a medium pizza. Round to the nearest whole number.

3. Determine the interior area of a small pizza. Round to the nearest whole number.

4. Complete the table below. Round percentages to the nearest percent.

5. Based on your results do you think the cost of an additional topping is fair compared to the amount of topping you get in each case? Why or why not?

<table>
<thead>
<tr>
<th>Percent Change (Increases)</th>
<th>Percent more area</th>
<th>Percent change in price of one topping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small to Medium</td>
<td></td>
<td>58%</td>
</tr>
<tr>
<td>Medium to Large</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small to Large</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EXTENSION 2

Pizza Hut pizzas come in three sizes: large; medium; and personal. Find out how much a cheese pan pizza costs in each size where you live. How much are you paying for each slice and is the pizza with the cheapest slice the best deal?

A large pizza is 14 inches in diameter (8 slices). A medium is 12 inches in diameter (8 slices) and a personal is 6 inches in diameter (4 slices). For each size, how much pizza (in square inches) are you getting with each slice?

Based on your answers above, which pizza would you say is the best deal and why?

No matter the size, Pizza Hut crust is always the same width: 1-inch. For each pizza, calculate the area of the pizza that’s inside (i.e. the cheesy part), and the area of the pizza that’s crust.

Plot the “inside percent” and “crust percent” for each size: large, medium & personal. Then, pick two more diameters and plot their percents. What do you notice and how does this influence which size you think is the best deal?