

*2011 Excellence in Mathematics Contest  
Team Project*



CHANDLER-GILBERT COMMUNITY COLLEGE

School Name:

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Group Members:

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# Reference Sheet

## Formulas and Facts

You may need to use some of the following formulas and facts in working through this project. You may not need to use every formula or each fact.

$A = bh$ Area of a rectangle	$C = 2l + 2w$ Perimeter of a rectangle	$A = \pi r^2$ Area of a circle
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$C = 2\pi r$ Circumference of a circle	$A = \frac{1}{2}bh$ Area of a triangle	$m = \frac{y_2 - y_1}{x_2 - x_1}$ Slope
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$\frac{\text{change in amount}}{\text{original amount}} \cdot 100\%$ Percent Increase/Decrease	5280 feet = 1 mile	3 feet = 1 yard
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16 ounces = 1 pound	2.54 centimeters = 1 inch	$a^2 + b^2 = c^2$ Pythagorean Theorem
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1 kilogram = 2.2 pounds	1 ton = 2000 pounds	1 gigabyte = 1000 megabytes
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1 mile = 1609 meters	1 gallon = 3.8 liters	1 square mile = 640 acres
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1 sq. yd. = 9 sq. ft	1 cu. ft. of water = 7.48 gallons	1 ml = 1 cu. cm.
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$V = \pi r^2 h$ Volume of cylinder	$V = lwh$ Volume of rectangular prism	$V = \frac{4}{3}\pi r^3$ Volume of a sphere
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Lateral SA = $2\pi \cdot r \cdot h$ Lateral surface area of cylinder	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ Quadratic Formula	$\tan \theta = \frac{\sin \theta}{\cos \theta}$
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# TEAM PROJECT

## 2011 Excellence in Mathematics Contest

*The Team Project is a group activity in which the students are presented an open ended, problem situation relating to a specific theme. The team members are to solve the problems and write a narrative about the theme which answers all the mathematical questions posed. Teams are graded on accuracy of mathematical content, clarity of explanations, and creativity in their narrative.*

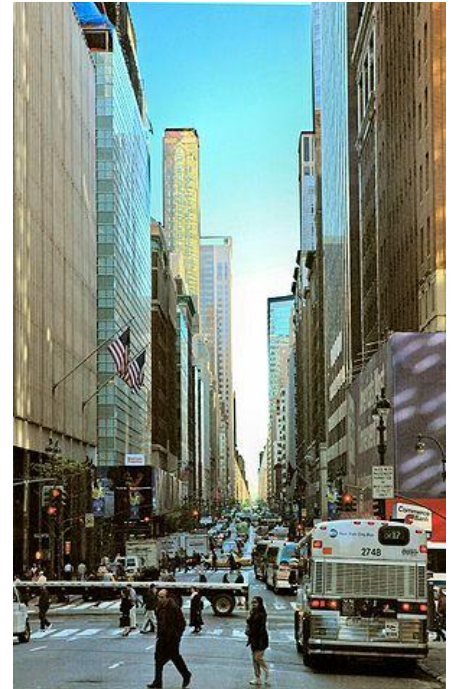
### Part 1 – Introduction

Madison Avenue, in the borough (suburb/town) of Manhattan in New York City, is often associated with the advertising industry. Starting in the 1860's and up until the 1970's or later, many advertising agencies were located on Madison Avenue. In recent decades, these



**Bashas'**

agencies have moved off of Madison Avenue and only a few remain but it is still common to hear of "Madison Avenue" when referring to any activity related to the advertising industry.



Advertising plays a very large role in our American culture. From billboards to television and radio to sports stadiums and to product placement in movies, companies work to get their product visible and known to the American people. We are all so familiar with company logos since they are made visible to us thousands and thousands of times each day.

**Wendy's**

We can learn to analyze advertisements to better understand the purpose of the ad and to learn how to respond to it. Is the advertisement designed to make us aware of a new product? Is it intended to persuade us to switch from one product to another? Who is the intended audience for the ad? Is that ad trying to convince us that their product is the best and that we really need to purchase the product?

**Coca-Cola**

We can also learn to analyze advertisements mathematically. This is the focus of this project. On the following pages, you will study a particular advertisement and respond to questions intended to allow you to think mathematically about the situation.



Have fun!



## Part I – Shrinking Twinkies

(taken from The Mathematics Teacher –Media Clips – Vol. 103, No. 2, September 2009 – National Council of Teachers of Mathematics)

**AP** Associated Press  
updated 11/3/2008 8:25:52 AM ET

**MILWAUKEE — Hostess Twinkies are becoming the latest product remade and repackaged into 100-calorie snack packs, a product some analysts say could do well given that more people are packing their own lunches in the slumping economy. The maker of the golden yellow, creme-filled cake is launching "Twinkie Bites" nationwide in stores on Monday...Some 500 million Twinkies are sold every year.**

**And while Leavitt notes that the original Twinkie come in at 150 calories, people asked for a lightened version and the company got to work. They didn't want to just shrink the Twinkie, known for its elongated shape, Leavitt said, so they created three, miniature round versions. Leavitt said people enjoy having multiple bites rather than just the one product.**

**"It's not some impostor like some portion control products would be," Leavitt said. "From that standpoint it eats like a Twinkie, it smells like a Twinkie, it tastes like a Twinkie." ...**

For this part of the project, you will need to refer to the following tables of nutritional facts.

### Nutrition Facts for One Traditional Twinkie

<b>Nutrition Facts</b>	
Serving Size 1 twinkie (42.0 g)	
<b>Amount Per Serving</b>	
<b>Calories</b> 150	Calories from Fat 40
<b>% Daily Value*</b>	
<b>Total Fat</b> 4.5g	<b>7%</b>
Saturated Fat 2.5g	<b>12%</b>
<b>Cholesterol</b> 20mg	<b>7%</b>
<b>Sodium</b> 220mg	<b>9%</b>
<b>Total Carbohydrates</b> 27.0g	<b>9%</b>
Sugars 19.0g	
<b>Protein</b> 1.0g	
Vitamin A 0%	Vitamin C 0%
Calcium 2%	Iron 0%
* Based on a <a href="#">2000 calorie diet</a>	



### Nutrition Facts for New Twinkie Bites (Three-Pack)

<b>Nutrition Facts</b>	Amount/Serving	%DV*	Amount/Serving	%DV*
Serv. Size 3 Cakes (29g)	<b>Total Fat</b> 2.5g	<b>4%</b>	<b>Total Carb.</b> 18g	<b>6%</b>
Servings Per Container 1	Sat. Fat 1g	<b>5%</b>	Dietary Fiber <1g	<b>2%</b>
<b>Calories</b> 100	Trans Fat 0g		Sugars 11g	
Calories from Fat 25	<b>Cholest.</b> 10mg	<b>3%</b>	<b>Protein</b> 1g	
	<b>Sodium</b> 160mg	<b>7%</b>		
*Percent Daily Values (DV) are based on a 2,000 calorie diet.	Vitamin A 0% • Vitamin C 0% • Calcium 0% • Iron 2%			



**Part I – continued...**

5. a) Complete the table.

	<b>1 Traditional Twinkie (Old Twinkie)</b>	<b>1 Three-pack Twinkie Bites (New Twinkie)</b>	<b>Percent Decrease (–) or Increase (+)</b>
<b>Calories from Fat</b>			
<b>Total Fat (g)</b>			
<b>Saturated Fat (g)</b>			
<b>Cholesterol (g)</b>			
<b>Sodium (g)</b>			
<b>Total Carbohydrates (g)</b>			
<b>Sugars (g)</b>			

b) If the Hostess Company used the same recipe for the new three-pack Twinkie and for the traditional Twinkie, what number should have filled each cell of the percent decrease/increase column?

c) Use the data from the table to support your conclusion in deciding whether the recipe for the new three-pack Twinkie differs significantly from the recipe for the traditional Twinkie.

## Part II – Does this ad make sense?

(taken from The Mathematics Teacher –Media Clips – Vol. 100, No. 9, May 2007 – National Council of Teachers of Mathematics)



1. How is the claim that the Hanging Mosquito Lantern can “Protect an Area 15 times Greater Than Citronella Buckets or Candles” inconsistent with the picture? How might the ad be reworded to be mathematically accurate?

**Part II – continued...**

2. Suppose that any mosquito repellent device can protect a circular area. What area would be protected by each device? How might the ad be reworded to be mathematically accurate about areas?

3. Suppose that the mosquito repellent devices protect hemispherical regions with bases on the ground. What volume would be protected by each device? How might the ad be reworded to be mathematically accurate about volumes?

**Part II – continued...**

4. Did the advertiser understate or overstate the relative benefits of its product? Why do you think the advertiser might have done that?



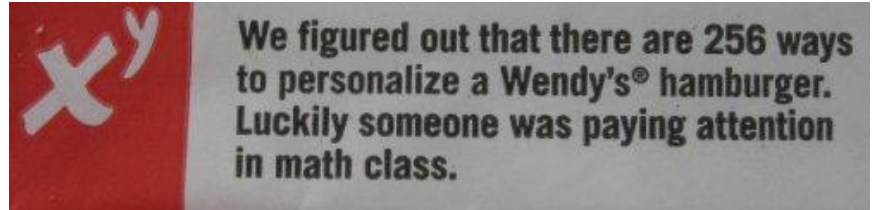
### Part III – Wendy’s Burger Variations

(taken from The Mathematics Teacher –Media Clips – Vol. 103, No. 3, October 2009 – National Council of Teachers of Mathematics)

Several years ago, a Wendy’s fast-food bag had an interesting mathematical claim.



In case you can't read the claim, it says,



At the time this advertisement appeared, Wendy's nutrition information indicated that a hamburger could have 8 possible toppings.

1. With 8 available toppings, in how many ways can you personalize a hamburger by using exactly 2 toppings (not plain or only one topping are allowed)?
2. With 8 available toppings, in how many ways can you personalize a hamburger by using exactly 5 toppings?
3. Determine the total number of ways you can personalize a Wendy's hamburger using any combination of the 8 available toppings. Is the claim on the bag correct?

**Part III – continued...**



4. Consider 4 additional toppings. With just these 4 additional choices, in how many ways can you personalize a Wendy's burger?

5. Consider the possibility of requesting double toppings. In how many ways can you personalize a hamburger with the option of doubling any of the 8 toppings? That is, you may or may not include any of the 8 toppings in this case.

6. In how many ways can you personalize a burger with the option of doubling any of the 12 toppings? Again, you may or may not include any of the 12 toppings in this case.

**Part III – continued...**

7. Create a new advertisement for the number of ways to personalize a Wendy's burger. Be creative. What suggestions would you make to Wendy's regarding its ad?



## Part IV – Analyze This Advertiser’s Claim

(taken from The Mathematics Teacher –Media Clips – Vol. 99, No. 8, April 2006 – National Council of Teachers of Mathematics)

# Kawasaki 10" Personal DVD Player



Our lowest price  
of the season!

**349<sup>99</sup>**  
Reg. 419.99

Kawasaki 10" personal  
DVD player—2X larger  
screen than 7" screen.  
Includes battery, car adapter  
and earphones.

Source: Target advertising circular, February 20, 2005

Without knowing the base, height, or area of either screen, use the following steps to determine if the area of the larger screen is twice (2X) the area of the smaller screen.

1. Write an equation relating the base  $b$  and height  $h$  of a rectangular screen with a 7-inch diagonal.
  
  
  
  
  
  
  
  
  
  
2. Write an equation relating the base  $B$  and height  $H$  of a rectangular screen with a 10-inch diagonal.

**Part IV – continued...**

3. Assume that these screens are geometrically similar in shape: that is  $B = kh$  and  $H = kh$ . Rewrite your equation in answer 2, relating  $B$  and  $H$  in terms of  $b$  and  $h$ .

4. Find the value of  $k$ .

5. Determine the ratio of the area of the 10-inch screen to the area of the 7-inch screen.