# Pizza, Pancakes and Fast Food: Great Contexts for Great Middle School Lessons and Projects

**NCTM 100 in 100**

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# It’s Fast Food Tuesday!!!

- **Time for some fun**
- **Time to formulate and solve problems**
- **Time to reinforce skills and understandings**
- **Time to draw from the culture and engage our students**

## So let’s PLAY!

# This evening’s formal agenda:

- **Play**
- **Model**
- **Inform**
- **Stimulate**
- **Challenge**

**Just like a great lesson!**

**(face-to-face or even remote)**

# This evening’s real agenda

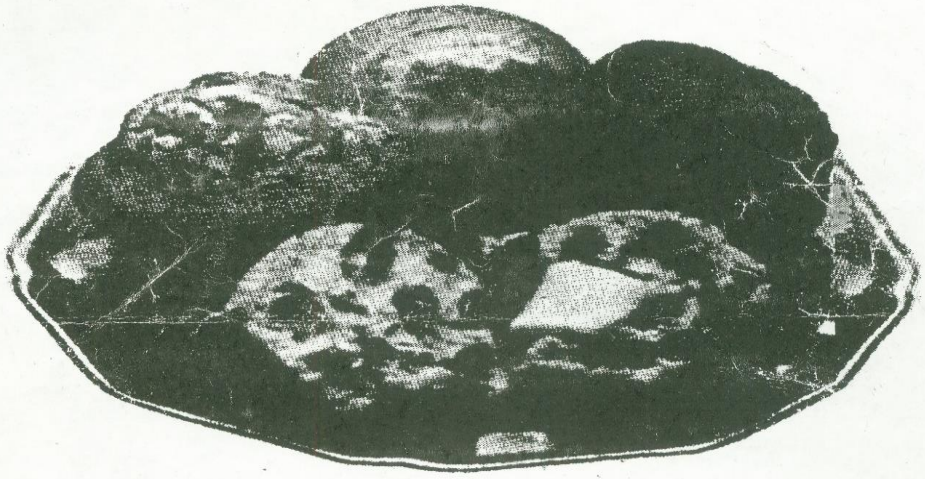
## A Veritable Feast:

- **Breakfast or dessert?**
- **Pancakes**
- **Pizza**
- **Burger King**
- **Ice Cream**
- **McDonalds**

# Ready?


# What do you notice?

# Breakfast or Dessert?



# Free

## 3 Muffins when you buy 3 at the regular ½ dozen price

Available only at participating Dunkin' Donuts® shops. One coupon per customer per visit. May not be combined with any other coupon or premium offer. Shop must retain coupon. Taxes not included.

Limit: 1 Offer

DUNKIN' DONUTS©

It's worth the trip.

Offer Good thru 1/6/91

# What's "free"?

# All the standards rolled up into one:

- **Problem Solving: What is this? What's that white thing?**
- **Communication: Tell the person sitting next to you.**
- **Reasoning:  How do you know?**
- **Connections: A real rip-off ad.**
- **Representations: A picture**

# Great Stimuli:

- **Ads**
- **Price Lists**
- **Labels**
- **Photos of items with numbers**
- **See too:**
  - **Andrew Stadel's Estimation 180**
- **What do you notice? What do you wonder and you're off to the mathematical races!**

**Peter Dowdeswell of London, England holds the world record for pancake consumption!**

**62**
**6” in diameter,**
**3/8” thick pancakes,**
**with butter and syrup**
**in 6 minutes 58.5 seconds!**
**SO?**

# So?

- About how high a stack?  Show and explain
- Exactly how high?
- How fast?
- How much?
- Could it be, considering the size of the stomach?
- What's radius of single 3/8" thick pancake of same volume?
- Draw a graph of Peter's progress.

# From Guinness:

**Largest Pancake:**

**A pancake 20 feet in diameter, 4 inches thick, weighing 2107 pounds and containing 900 pounds of pancake mix, 1600 pounds of maple syrup, 15 blocks of butter, and 100 gallons of milk, was built in Highgate, Vermont on August 18, 1984.**

**So?**

# PIZZA!!

**SMALL**

**6 slices, 12” in diameter**

**$5.75**

**LARGE**

**8 slices 16” in diameter**

**$8.00**

# Bigfoot Pizza

- Pizza Hut will join rivals in offering a value-priced menu.
- Beginning May 3, the Pepsi-owned chain will offer an $8.99 carryout pizza, the Bigfoot, to compete with the Little Caesars chain's offer of two pizzas for $8.88.
- Pizza Hut says the rectangular Bigfoot – 2' x 1'- is 25% larger than two 12" round pizzas.

# Dear sirs:

**I am in Mrs. Eaves Pre-algebra class at the Burn Middle School. We have been studying the area of shapes such as squares and circles. A girl in my class suggested that we compare the square and round pizzas sold by your store. So on April 16 Mrs. Eaves ordered one round and one square pizza from your store for us to measure, compare and…**

# The search for sense-making/future leaders

**What is the reason for the difference in the price per square inch of these two pizzas? Is it harder to cook a round pizza? Does it take longer to cook? Because if 3.35 cents per square inch is acceptable for the square pizza, then the same price per square inch should be used for the round pizza, making the price $10.31 instead of $10.99.**

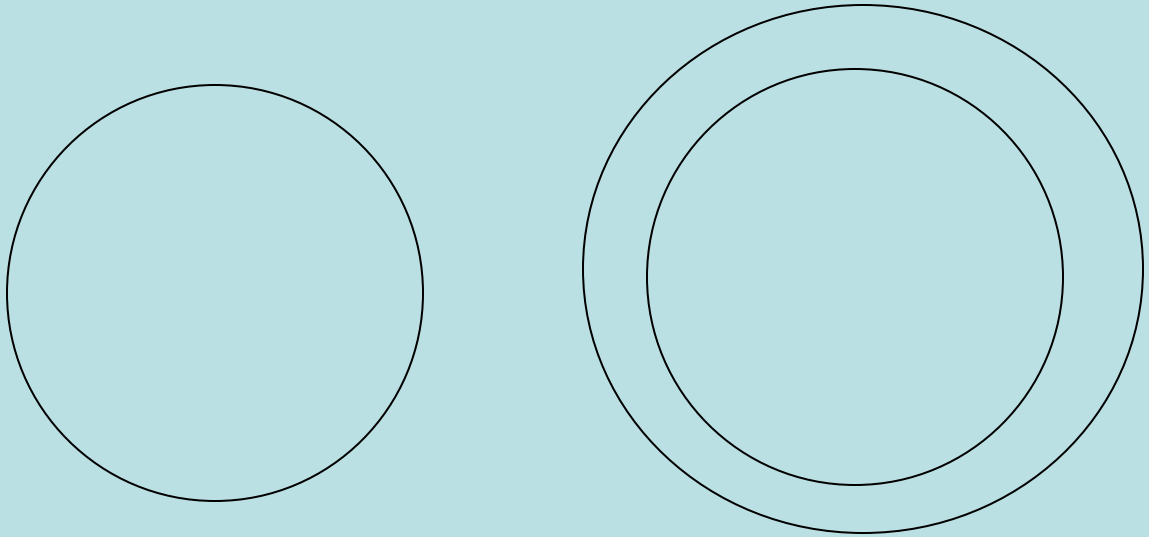
**Thanks for the tasty lesson in pizza values.**

# BK vs. BM

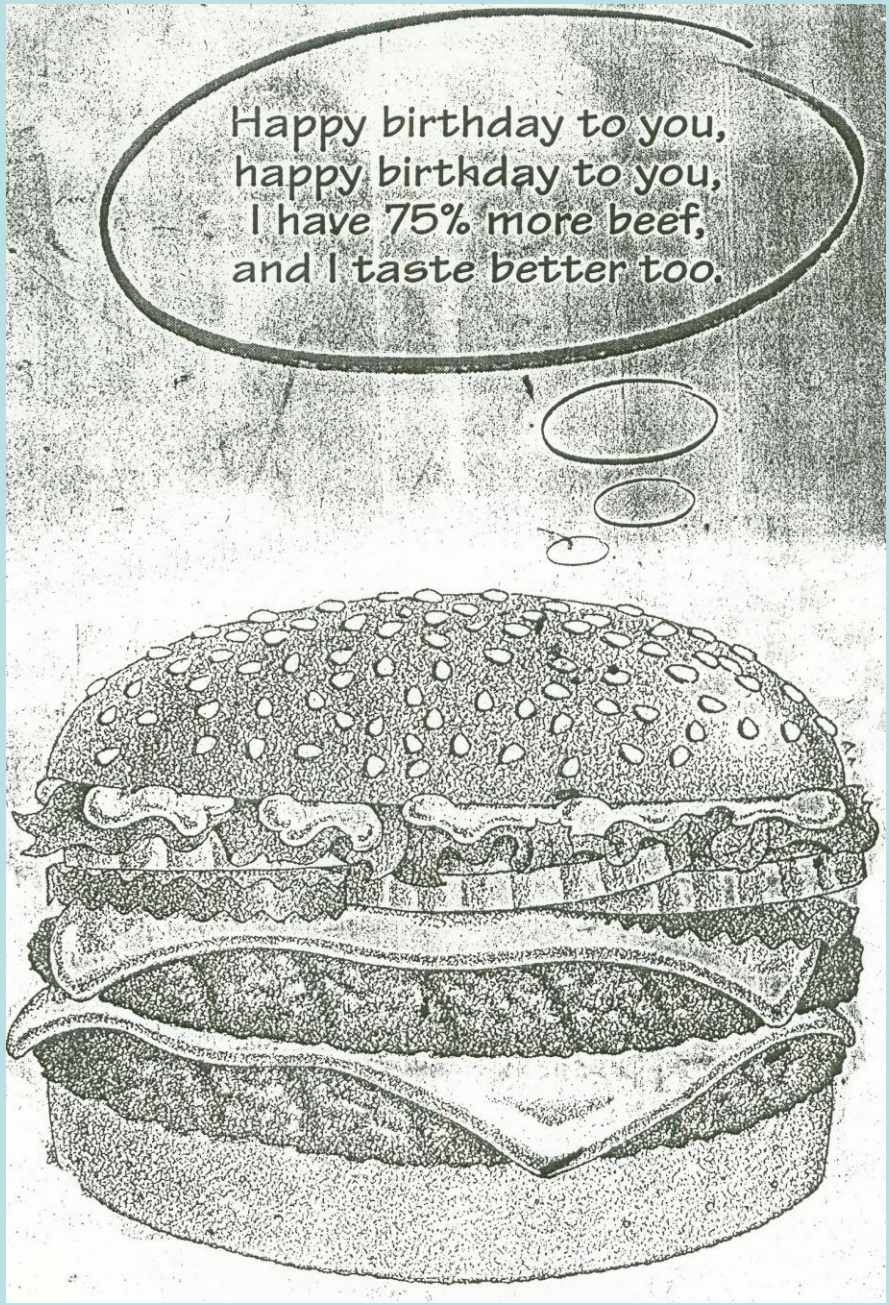
**Said the Whopper to the Big Mac:**

**My patties have _____% more beef than yours!**

# A tale of two hamburgers



Big Mac -1 3/4”  Whopper – 2 ¼”


Happy birthday to you,
happy birthday to you,
I have 75% more beef,
and I taste better too.

# 75% more beef…

- **More than what?**
- **Is the claim reasonable?**
- **Is the claim possible?**
- **Prove it!**

**BM: $\pi(7/4)^2$ vs. BK: $\pi(9/4)^2$**

**9.61 vs. 15.90**

**(15.90 – 9.61) ÷ 9.61 =**

**65%**

# Dear Mr. Gibbons, CEO

Hello, my name is Jennifer Farias. I attend Antioch Community HS in Illinois. I am writing on behalf on my fellow students and teacher in my Transition Math class. In that class we have been working with percentage.

During a discussion, your commercial, claiming that your hamburgers have 75% more meat than those of McDonalds, came up.  The discussion turned into such a frenzy that our teacher realized we had an obvious interest in the subject.

The next day we were excited to see that our teacher had done some research. On his desk were two bags. In them were hamburgers, one cooked and one uncooked from Burger King and the same from McDonalds. As we looked we were shocked. It was hard to believe that McDonald’s hamburgers were so small compared to yours.

The following day we did extensive testing. Weighing and measuring the burgers. During the testing we determined that your burger was 80% bigger and not 75%. We were wondering why not just say 80%?

Thanks for a great math lesson.

# Ice Cream Cone!!

**You may or may not remember that the formula for the volume of a sphere is $4/3\pi r^3$ and that the volume of a cone is $1/3\ \pi r^2 h$.**

**Consider the Ben and Jerry's ice cream sugar cone, 8 cm in diameter and 12 cm high, capped with an 8 cm in diameter sphere of deep, luscious, decadent, rich triple chocolate ice cream.**

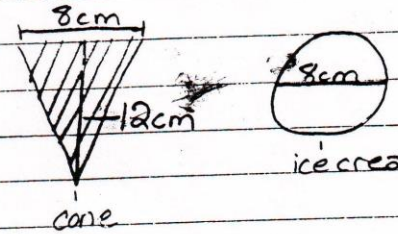
**If the ice cream melts completely, will the cone overflow or not? How do you know?**

✓ (1)

PreCalc H

The icecream sphere and cone
Problem: will icecream Fit in cone?
Time: 45 min.

vol. of sphere $= \frac{4}{3}\pi r^3$
vol. of cone $= \frac{1}{3}\pi r^2 h$



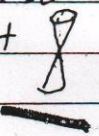

Volume of cone = 201.0619298 $cm^3$
Volume of sphere = 268.0825731 $cm^3$

Obviously, by looking at the figures one can tell the ice cream will not Fit in cone because of the Fact it has a larger volume than that of the cone. But the hypothesis is mathematically speaking. Realistically, if the ice cream is pushed in the cone with the tongue the ice cream will melt causing the icecream to become compacted and also the cone to have a certain amount of elasticity giving the cone the extra 67 $cm^3$ it needs to Fit in the cone. However, just reading problem as it states the icecream is not compactable and the cone is not elastic causing the cone to eventually crack.

② ✓✓

Mike Limetz

PreCalc H

Obviously, the first thing to do would be to plug in the values in the equations for the volume of a cone and a sphere. The cone will be refered to as a shape that looks like —  , not 

$\frac{4}{3}\pi r^2 =$ volume of a sphere

$\frac{4}{3}\pi(4)^3 =$ Volume

$268 =$ Volume

$\frac{1}{3}\pi r^2 h =$ Volume of a cone

$\frac{1}{3}\pi(4)^2 12 =$ Volume

$201 =$ volume

From this we can see that the ice cream will not fit in the cone

Now I will compare the two formulas for the volume of a cone and the volume of a sphere

| Sphere | Cone |
| --- | --- |
| $\frac{4}{3}\pi r^3$ | $\frac{1}{3}\pi r^2 h$ |

comparison

$$\frac{4}{3}\pi r^3 \stackrel{?}{=} \frac{1}{3}\pi r^2 h$$

$$4\pi r^3 \stackrel{?}{=} \pi r^2 h$$

$$4\pi r \stackrel{?}{=} \pi h$$

$$4r \stackrel{?}{=} h$$

From this final comparison, we can see that if the height of cone is exactly 4 times the radius, then the volumes will be equal.

Now, let's try our example. The cone has a diameter of 8 and a height of 12. The sphere of Ice Cream has a diameter of 8. Diameter 8 = radius 4

$$4(\text{radius of the sphere}) \stackrel{?}{=} h$$

$$4(4) \stackrel{?}{=} 12$$

$$16 > 12$$

Ergo, the ice cream will not fit into the cone. That concludes the mathematical reasoning section of my proof. Let us proceed to the reality section of my reasoning, shall we?

Many questions need to be answered as to how the ice cream will act in real life.

- Will the ice cream's volume change as it melts?
- Is it possible to compress ice cream?
- Is the ball of ice cream a perfect sphere?
- Is ice cream porous?
- Is the interior of the cone perfectly smooth?
- What kind of icecream is it?
  (bubble gum, chocalate chip, rocky road)
- Is there a hole at the tip of the cone?
- Why is the sky blue?

These questions and many more must be left unanswered. I do not posess the proper equipment or funds to do experiments with ice cream.

My hypothesis is that when the ice cream melts it will take up less space. I'm not sure if it will be small enough to fit inside the cone, however.

# And then there's

**"It's a good time for the great taste of…"**

**"Two all beef patties, special sauce, lettuce, cheese, pickles, onions on a sesame seed bun"**

**"Lovin' it!"**

# McDonalds Breakfast

- Egg McMuffin $2.29
- Sausage McMuffin $2.29
- Bacon, Egg and Cheese Biscuit $2.29
- Sausage Biscuit w/Egg $2.29
- Sausage, Egg and Cheese McGriddles $2.99
- Hot Cakes $2.69
- Hot Cakes w/sausage $3.49
- Egg and Cheese Bagel $1.49
- Big Breakfast $3.69
- Deluxe Breakfast $4.49

- Coffee $1.00 $1.29 $1.39
- Apple juice $1.00
- Soda $1.00 $1.50 $1.79
- Orange Juice $1.30/$1.89/$2.89

- Sausage burrito $1.00
- Hash brown $1.00
- Sausage biscuit $1.29
- Sausage McMuffin $1.39

# McDonalds Lunch and Dinner

| | | |
|---|---|---|
| Big Mac | $2.99 | Combo $4.29 |
| Quarter Pounder w/Ch | $2.99/$4.29 | |
| Double ¼ pounder | $3.79/$5.09 | |
| Ranch BLT | $4.30/$5.60 | |
| Filet of Fish | $2.79 | |
| Bacon Ranch Salad | $4.29 | |
| Caesar Salad | $4.29 | |
| Asian Salad | $4.29 | |
| French Fries | $1.00 | $1.69 $1.89 |
| McNuggets | | |
| 6 | $2.29 | |
| 10 | $3.89 | |
| 20 | $5.19 | |
| Hamburger Happy Meal | $2.29 | |
| McNuggets Happy Meal | $2.69 | |

| | | | |
|---|---|---|---|
| Coffee | $1.00 | $1.29 | $1.39 |
| Apple juice | | | $1.00 |
| Soda | $1.00 | $1.50 | $1.79 |

**Dollar Menu**

Small fries
McChicken
4-piece McNuggets
Small Soda
Parfait
Hot Apple Pie

Cookies $0.39 each

# So?

**Given your grade x mathematics curriculum (number, measurement, geometry, statistics, algebra), what tasks could you assign based on the data in the McDonalds menu that support the development of the mathematical ideas in your curriculum?**

# Powerful Teaching

- **Provides students with better <u>access</u> to the mathematics:**
  - **Context**
  - **Technology**
  - **Materials**
  - **Collaboration**
- **Enhances <u>understanding</u> of the mathematics:**
  - **Alternative approaches**
  - **Multiple representations**
  - **Effective questioning**

# Where can I find stuff like this?

- USA Today
- Almanacs
- Guinness Book of World Records
- Counting on Frank
- The Harper’s Index Book
- The First Really Important Survey of American Habits
- 50 Simple Things You can Do to Save the Earth
- On an Average Day…
- 100% American

# Thanks!

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