# Increasing Portions, Expanding Waist Lines

NAME_____

Obesity is a major concern in America. Many studies point to larger than ever portions and increased calories from beverages as one source of the problem. The following activity will have you calculate some volumes and write some functions to explore the impact calories can have on your long-term weight.

**1.** Many doctors and nutritionists consider weight a function of a simple relationship: Calories in and calories out. We get "calories in" from food and beverages that we eat that contain calories, and "calories out" from exercise or even just existing. If you eat more calories than your body uses your body stores the excess as fat and you gain weight. When you eat fewer calories than your body uses your body burns fat to make up the difference and you lose weight.

According to this theory of weight gain and loss, a 19 year old woman who is 5'7" tall and weighs 165 pounds needs 2160 calories a day to maintain her current weight. If she eats 500 calories a day more than that she will gain one pound a week and if she eats 500 calories a day less than that she will lose one pound per week.

Write a linear function that describes this woman's weight, $W$, after $t$ weeks if she consumes $c$ calories a day.

ILLUMINATIONS Resources for Teaching Math

© 2011 National Council of Teachers of Mathematics
http://illuminations.nctm.org

**2.** A study was done about how portion control has changed over time. The relevant portion of the article is excerpted below:

> Brian Wansink, a food researcher at Cornell University, and his staff surveyed the seven editions of *The Joy of Cooking* and found that only 18 recipes have appeared in all seven editions . . . The team then analyzed the serving sizes for those 18 recipes across the seven editions to see if the portion sizes (and thus the number of calories in each portion) had changed over time. Unsurprisingly, they did increase for 14 of the 18 recipes. Between the 1936 edition and the 2006 edition, the average number of servings in a recipe decreased by a little over 1 serving per recipe, and the average number of calories in a serving increased by over 60%.
>
> What's especially interesting is that Dr. Wansink's team notes that the average serving sizes increased by about 33% (one-third) since 1996.

Take the 2160 calories our friend from part one needed to maintain her healthy weight and calculate a 33% and a 60% increase. How many calories does she eat a day after each of these increases (round to the nearest calorie if necessary)?

33% increase: 60% increase:

ILLUMINATIONS Resources for Teaching Math
© 2011 National Council of Teachers of Mathematics
http://illuminations.nctm.org

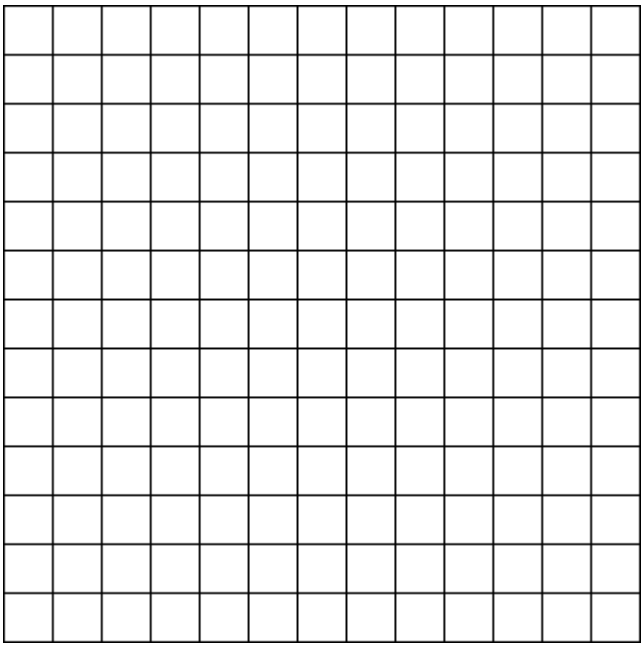
**3.** Use the function you wrote in Question 1 to write an equation that models her weight if her daily calories increased 33% and 60% from what she needs to maintain the same weight. Write the functions and draw a graph for each below.

**4.** Use each function to predict how much she would weigh after 1 month, 6 months, 1 year, 5 years, and 10 years.

| TIME | WEIGHT AFTER 33% INCREASE | WEIGHT AFTER 60% INCREASE |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

ILLUMINATIONS Resources for Teaching Math
© 2011 National Council of Teachers of Mathematics
http://illuminations.nctm.org

**5.** On the same axes, make a graph of her weight if she a) eats the amount of calories she needs to maintain her weight b) eats 33% more than that and c) eats 60% more than that.



**6.** What impact are the increased portion sizes having on her weight over time?

ILLUMINATIONS Resources for Teaching Math
© 2011 National Council of Teachers of Mathematics
http://illuminations.nctm.org