Percent of Change

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Objectives:
- Calculate percent of change.
- Interpret graphical representation of data.

Standards:
- North Carolina Standard Course of Study (Algebra I):
  - 1.02 Use formulas and algebraic expressions, including iterative and recursive forms, to model and solve problems.
- NCTM Standards:
  - Number and Operations, Date Analysis and Probability, and Algebra
- 21st Century Skills:
  - Core Subjects and 21st Century Themes: Global Awareness and Health Literacy
  - Learning and Innovative Skills: Critical Thinking and Problem Solving
  - Information, Media, and Technology Skills: Information Literacy and Media Literacy
  - Life and Career Skills

Materials:
- Egg Recall Warm-Up
- Reported Illnesses: Percent of Change In Class Activity
- Moe’s Grocery Activity

Activities:
- Egg Recall Warm-Up
  - Reviews their knowledge of percentages
  - Introduce them into the egg recall
  - Includes collected data from internet resources about
    - Julian Date – 001 is January 1st and 365 is December 31st
    - Amount of eggs recalled
    - Number of states with recalled egg producing farms
- Interesting facts about the recall that could be shared are included below.
- Reported Illnesses: Percent of Change
  - Students practice estimating and calculating percent of change
  - Students explore what it means to have 100% increase
  - Includes an algebraic and graphical representation of percent of change
  - Requires students to give written explanations of their answers
Assessments:
- Moe’s Grocery
  - Combines percent increase and decrease
  - Incorporates a real world situation where students have to use their knowledge of percent of change to calculate prices at a grocery store
    - Calculate percent of change between sale items
    - Make financial decisions resulting in the best savings
    - Discover another meaning for “buy one get one free”
  - Teachers could also use a grocery circular from a local grocery store to make activity more authentic

Interesting Facts about the Egg Recall:
- Much of the investigation so far has been centered on restaurants in California, Colorado, Minnesota and North Carolina. They are not necessarily breakfast places -- it's possible some got sick from eating a salad dressing that had a raw egg in it, or eating soup with an undercooked egg dropped in, Braden said. In North Carolina, a cluster of about 80 illnesses in April were linked to meringue-containing chocolate pie and banana pudding served at a Durham barbecue restaurant, health officials said.
- Wright County Egg, a Galt, Iowa egg company has issued a voluntary 2010 egg recall on thirteen brands of their eggs due to an incident that was reported concerning salmonella poisoning. (The interesting fact is that the egg recalls were voluntary by the egg companies and not mandated by the FDA).
- Shell eggs are by far the most common source of Salmonella Enteritidis illness in the U.S. Of the 47 billion shell eggs Americans eat as table eggs each year, the USDA estimates that 2.3 million are contaminated with this salmonella strain.

Additional Resources:
- Venn Diagram
  - Students are asked to find parts of data
  - Ways of contamination
    - Rodents
    - Contaminated Hens
    - Tainted Feed
  - Symptoms of Salmonella
    - Cramps
    - Fever
    - Vomiting
- Introduces parts of wholes which leads to percentages
Egg Recall Warm Up

Solve these Algebra problems to learn more about the egg recall of the summer of 2010.

1. A Julian Date is the date that is expressed as a number. The Julian date on egg cartons refers to the date that the eggs were packed. The Julian Date 001 corresponds to January 1st and 365 corresponds to December 31st.

If the egg recall dates are 136 through 225, what day and month did the recall start and end on?

How many days did the egg recall last?

What percentage of the year were eggs recalled?

2. According to the American Egg Board, hens lay approximately 5 eggs per week. Wright County Egg and Hillandale Farms have almost 8 million hens combined. Assume the two egg products have approximately 7.8 million hens combined. Between the two egg producers, more than half a billion eggs were recalled. Assume that 501,000,000 eggs are recalled.

How many eggs will Wright County Egg and Hillandale Farms produce annually?

What percentage of the egg producers’ annual egg production was recalled?
3. Fourteen states sold eggs from Hillandale Farms, one of the egg producers affected by the recall. What percentage of states did not have eggs recalled from Hillandale Farms?

4. If 1,854 illnesses were linked to the recalls between May and July, on average, how many illnesses occurred each day?

5. According to SEEDS (South Eastern Efforts Developing Sustainable Spaces, Inc.), the average American eats 254 eggs each year. How many eggs does the average American eat per month? (Round your answer to the nearest whole number.)

How many eggs does the average American eat per week? (Round your answer to the nearest whole number.)
1. A Julian Date is the date that is expressed as a number. The Julian date on egg cartons refers to the date that the eggs were packed. The Julian Date 001 corresponds to January 1st and 365 corresponds to December 31st. If the egg recall dates are 136 through 225, what day and month did the recall start and end on?

   *It started on May 16th and ended on August 13th (May 15th and August 12th if they considered a leap year)*

How many days did the egg recall last?

   *It lasted 89 days*

What percentage of the year were eggs recalled?

   \[
   \frac{89}{365} = 24.38\% \text{ of the year}
   \]

2. According to the American Egg Board, hens lay approximately 5 eggs per week. Wright County Egg and Hillandale Farms have almost 8 million hens combined. Between the two egg producers, more than half a billion eggs were recalled. Assume that 501,000,000 eggs are recalled.

   How many eggs will Wright County Egg and Hillandale Farms produce annually?

   *2,028,000,000 eggs annually*

What percentage of the egg producers’ annual egg production was recalled?

   *24.7%*
3. Fourteen states sold eggs from Hillandale Farms, one of the egg producers affected by the recall. What percentage of states did not have eggs recalled from Hillandale Farms?

\[
\frac{(50-14)}{50} \approx 72\%
\]

4. If 1,854 illnesses were linked to the recalls between May and July, on average, how many illnesses occurred each day?

\[
\frac{1854 \text{ illnesses}}{92 \text{ days}} \approx 20 \text{ illnesses/day}
\]

5. According to SEEDS (South Eastern Efforts Developing Sustainable Spaces, Inc.), the average American eats 254 eggs each year.

How many eggs does the average American eat per month? (Round your answer to the nearest whole number.)

\[
\frac{254 \text{ eggs}}{12 \text{ months}} \approx 21 \text{ eggs/month}
\]

How many eggs does the average American eat per week? (Round your answer to the nearest whole number.)

\[
\frac{254 \text{ eggs}}{52 \text{ weeks}} \approx 5 \text{ eggs/week}
\]
1. Find the percent of change from the 1st week of June to the 4th week of June. Is it a percent of increase or decrease?

2. Find the percent of change from the 3rd week of June to the 2nd week in July. Is it a percent of increase or decrease?

3. Find the percent of change from the 1st week of the year to the week that has the most reported illnesses. Is it a percent increase or decrease?

What do you notice about this percent of change? What does it mean?

4. Find two months that have a percent increase of approximately 100%. Explain what this means about the relationship between the two months reported illnesses?

5. Explain what it means to have a percent of increase.

6. Explain what it means to have a percent of decrease.
1. Find the percent of change from the 1st week of June to the 4th week of June. Is it a percent of increase or decrease?

\[
\frac{205-135}{135} = 51.85\% \approx 52\% \quad \text{increase}
\]

2. Find the percent of change from the 3rd week of June to the 2nd week in July. Is it a percent of increase or decrease?

\[
\frac{220-155}{220} = 29.54\% \approx 30\% \quad \text{decrease}
\]

3. Find the percent of change from the 1st week of the year to the week that has the most reported illnesses. Is it a percent increase or decrease?

\[
\frac{225-48}{48} = 368.75\% \approx 368\% \quad \text{increase}
\]

What do you notice about this percent of change? Compare the reported illnesses for each week and explain what this means?

*The percent of increase was more than 100%. The original amount grew almost 4.5 times as much. The bar for the week with the most reported is almost 4.5 times as high as the 1st week of the year.*

4. Find two months that have a percent increase of approximately 100%. Explain what this means about the relationship between the two months reported illnesses?

*4th week in January —> 1st week in May: \(\frac{100-50}{50} = 100\%\) (answers will vary)*

*The original amount doubled during this time. The bar for 1st week in May is twice as high as the bar for the 4th week in January.*

5. Explain what it means to have a percent of increase.

*The original amount increased by a percent of that original number.*

6. Explain what it means to have a percent of decrease.

*The original amount decreased by a percent of that original number.*

http://www.cdc.gov/salmonella/enteritidis/index.html
Use the grocery circular below to calculate the cost of food for the following questions. Percentage of change will be integral in your calculations. Round answers to the nearest hundredth.

<table>
<thead>
<tr>
<th>Item</th>
<th>Was:</th>
<th>Sale Price:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td>$1.39</td>
<td>99¢</td>
</tr>
<tr>
<td>Milk</td>
<td>$1.88</td>
<td></td>
</tr>
<tr>
<td>Bananas</td>
<td>79¢/lb.</td>
<td>59¢/lb.</td>
</tr>
<tr>
<td>Kiwi</td>
<td>$1.99</td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td>99¢/Each</td>
<td></td>
</tr>
</tbody>
</table>

20% off of $3.45
2 for $1
10% off of $3.99
1. Find the percentage change between the old price and the sale price of the eggs and the bananas. Which percentage change is greater?

2. The bread and the cheese are on sale this week at Moe’s Grocery. Find the price for exact price for each item. What is the percentage of change for each item?

3. You have a coupon for 50 cents off of a jar of jam. What is the percentage of change between the original price and the price you will pay per jar by using the coupon?

4. While you are shopping, the store manager of Moe’s Grocery announces that milk is now on sale for 1 dollar. Find the percentage of change between the original price and the sales price.
5. You decide to purchase 2 pounds of bananas, 3 mangoes, 2 cartons of eggs, 1 loaf of bread, and 3 pounds of ham. Sales tax is 4.5%. How much is your total before and after tax?

6. Jam is on sale, buy one get one free. What is rate of change between one jar of jam at the original price and one jar of jam on sale?

Describe in other words what “buy one get one free” represents.

7. You decide to purchase one of each item (or 1 pound of each item if applicable) from Moe’s Grocery circular. A discount coupon offers $5 off or 20% off your total bill. Which option will you choose and why?
1. **Eggs** - percentage decrease of 28.78%
   Bananas - percentage decrease of 25.32%.
   *The eggs have a greater percentage change than the bananas*

2. **Bread** = $2.76, percentage decrease of 20%
   **Cheese** = $3.59, percentage decrease of 10%

3. Percentage decrease of 25.13%
   = ($1.99 - $1.49)/$1.99 because the amount of decrease in sales price is given (50 cents)

4. **Percentage decrease of 46.81%**

5. **Total before tax** = $17.86
   **Total after tax** = $18.66

6. **Percentage decrease of 50%**
   *You get each jar 50% off.*

7. **The total bill is** $16.28. **Using the $5 discount makes the total bill $11.28**
   and **using the 25% coupon makes the bill $12.21. Therefore, using the $5 discount will result in greater savings. $5 = 30.71% decrease**
   **25% off = 25% decrease**
Solve the following Egg Recall problems using Venn Diagrams.

1. 5.5 billion eggs have been recalled due to salmonella that a food safety expert attributes to rodents, contaminated hens, and tainted feed. 80 million eggs were recalled because rodents were discovered on the farms, 3 billion eggs were recalled because of contaminated hens, and 2.42 billion eggs were recalled due to tainted feed. 4 million eggs were recalled because of both rodents and contaminated hens, 1 million eggs were recalled because of both contaminated hens and tainted feed, and 2 million eggs were recalled because both rodents and tainted feed. If no eggs are recalled due to all three reasons, find the number of eggs recalled for each reason.

http://www.msnbc.msn.com/id/38741401/ns/health-food_safety

http://news.yahoo.com/s/ygreen/20100819/sc_ygreen/massiveeggrecallhowtocheckyourcartonforrecalledeggs
2. The massive egg recall that has caused hundreds of people to be sick is caused by salmonella on egg shells. The symptoms of salmonella poisoning begin to take effect within 6 to 72 hours of ingesting a tainted egg. Assume that 300 people have the following salmonella poisoning symptoms: fever, vomiting, and lower abdominal cramps. 160 people had fevers, 160 vomited, and 110 had cramps. 50 people experienced both fevers and cramps, and of those, 30 vomited as well. 50 people only had cramps and 80 people only vomited. How many people only had fevers?