Display Data

In this lesson you will extend your knowledge of data displayed in graphs. You will examine, analyze, and evaluate double-bar graphs, pictographs, circle graphs, scatter plots, and misleading graphs.

Displaying Data in Graphs
Constructing a Circle Graph
Same Data in Different Graphs
Pictographs
Scatter Plots
Misleading Statistics

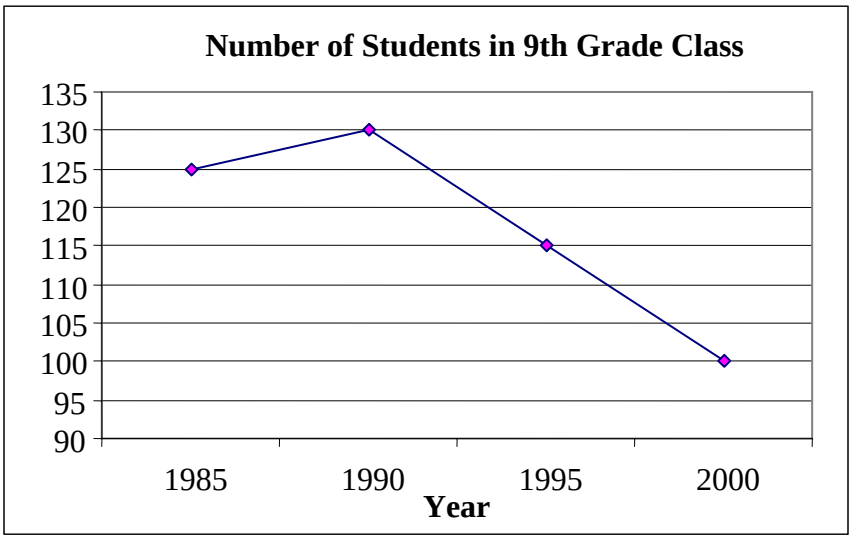
Displaying Data in Graphs

Let's take a look at some data and the resulting appropriate graphs.

Beth is examining the student enrollment in her school's 9th grade class. She started with the year 1985 and made a line graph to look for a trend for the enrollment at her school. The line graph displays that there is an overall gradual decline in enrollment.

Number of Students in 9th Grade Class

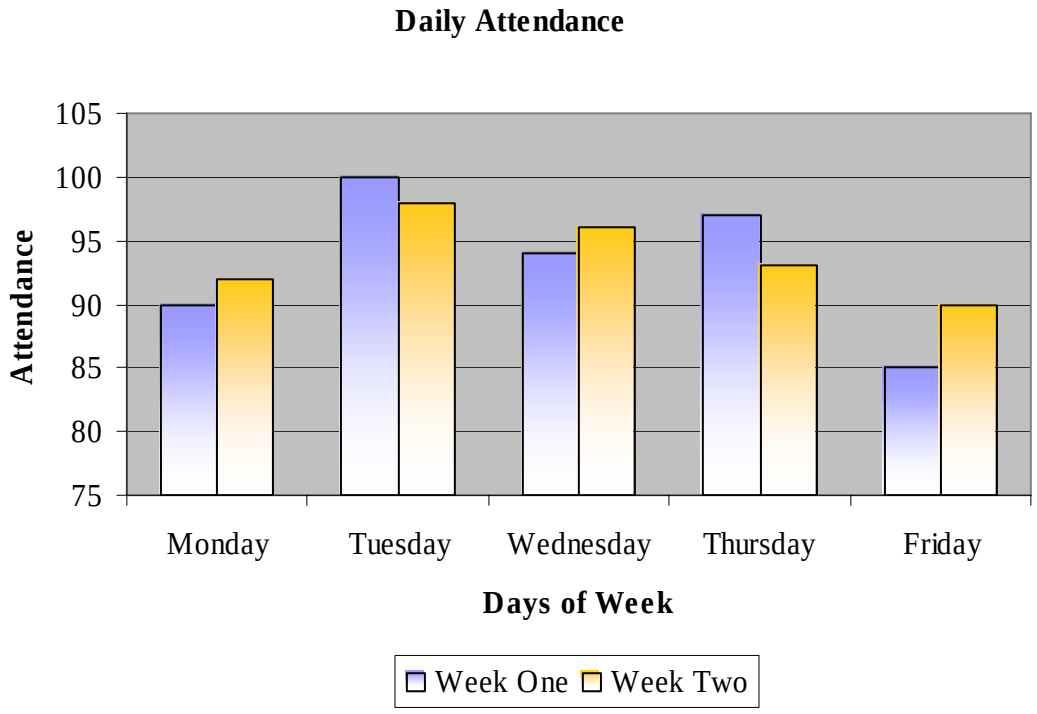
Year	Number
1985	125
1990	130
1995	115
2000	100



Beth is examining the daily attendance of the 9th grade class. She wanted to see which day of school students attend best. She selected a bar graph to compare the data for two weeks. She found that the daily attendance is best on Tuesday.

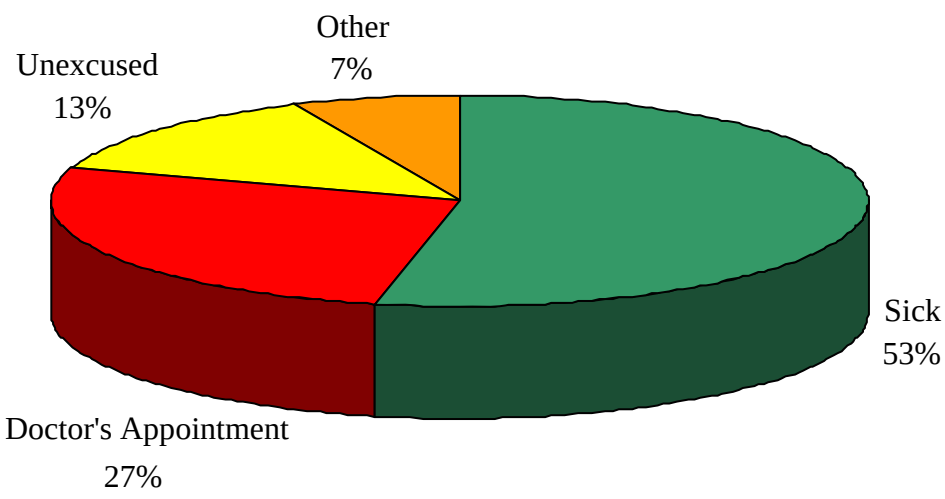
Daily Attendance of 9th Grade Class

	Week One	Week Two
Monday	90	92
Tuesday	100	98
Wednesday	94	96
Thursday	97	93
Friday	85	90



Beth is examining the reasons for student absences on Friday. She decided to display the information in a circle graph to show percentages of the whole group.

Reasons for Absences	
Sick	8
Doctor's Appointment	4
Unexcused	2
Other	1



Constructing a Circle Graph

Madison recently surveyed her classmates to find out what color was their favorite? She gave them four choices: blue, green, yellow, red.

First she made a **tally** chart to keep track of their responses, and the decided that a **circle graph** would display the data most effectively.

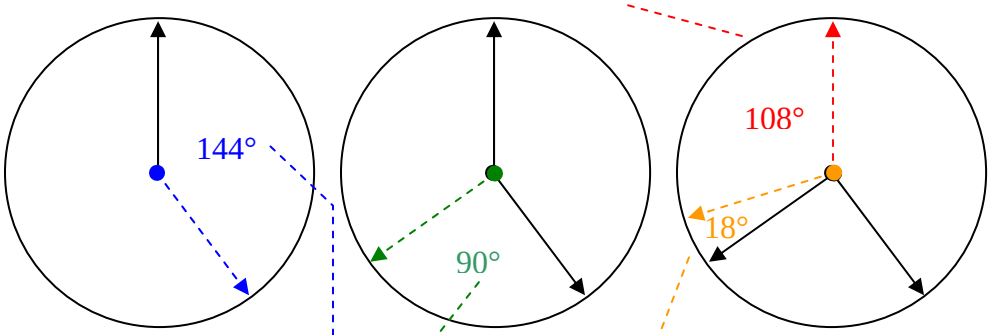
She then made another chart to organize her calculations for drawing the graph. Madison made fractions based on 20 (total responses) then reduced them. She multiplied the fractional part of the whole group by 360 since there are 360° in a circle.

Tally of Favorite Color		
Blue	𝍸 | | |	**8**
Green	𝍸	**5**
Yellow	|	**1**
Red	𝍸 |	**6**

Favorite Color		
Blue	$\frac{8}{20} = \frac{2}{5}$	$\frac{2}{5} \times 360 = 144°$
Green	$\frac{5}{20} = \frac{1}{4}$	$\frac{1}{4} \times 360 = 90°$
Yellow	$\frac{1}{20}$	$\frac{1}{20} \times 360 = 18°$
Red	$\frac{6}{20} = \frac{3}{10}$	$\frac{3}{10} \times 360 = 108°$
Check	$\frac{20}{20}$	*360°*

To check the calculations, Madison adds the results to check. The fractions **total 20/20,** which makes **1 whole** circle and the degrees total **360 (whole circle)**.

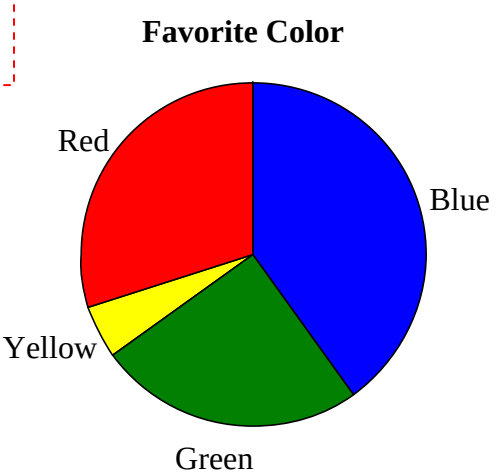
Madison will not have to draw the last angle, but will measure it. It should measure 108° (red).



Madison draws a circle with one radius. She places a protractor on the radius, using the center of the circle as the vertex, and draws the first angle (blue).

She then moves the protractor to rest on the ray she just drew and proceeds to make the second angle (green).

Madison then moves the protractor to rest on the ray she drew and proceeds to make the third angle (yellow).

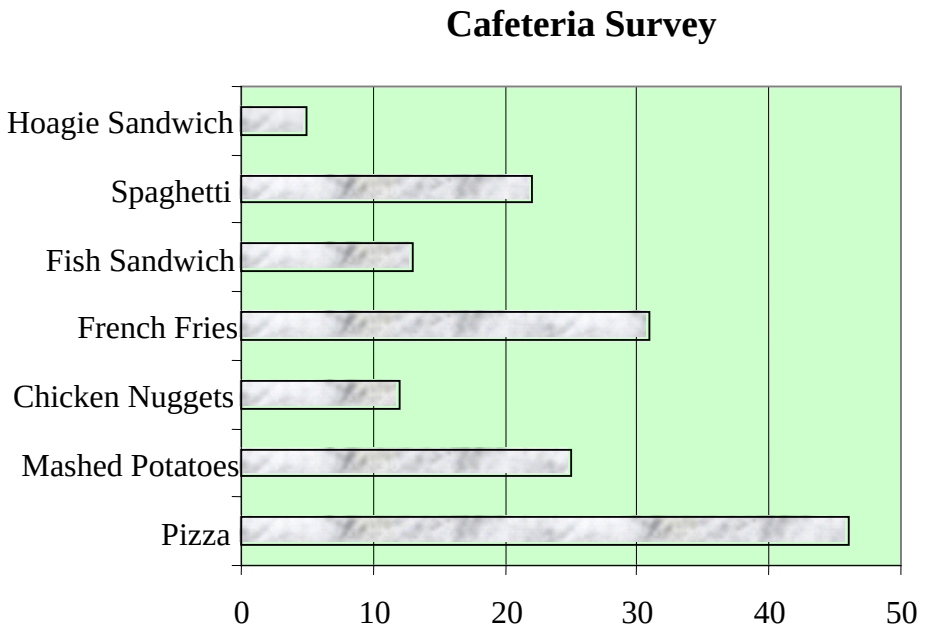


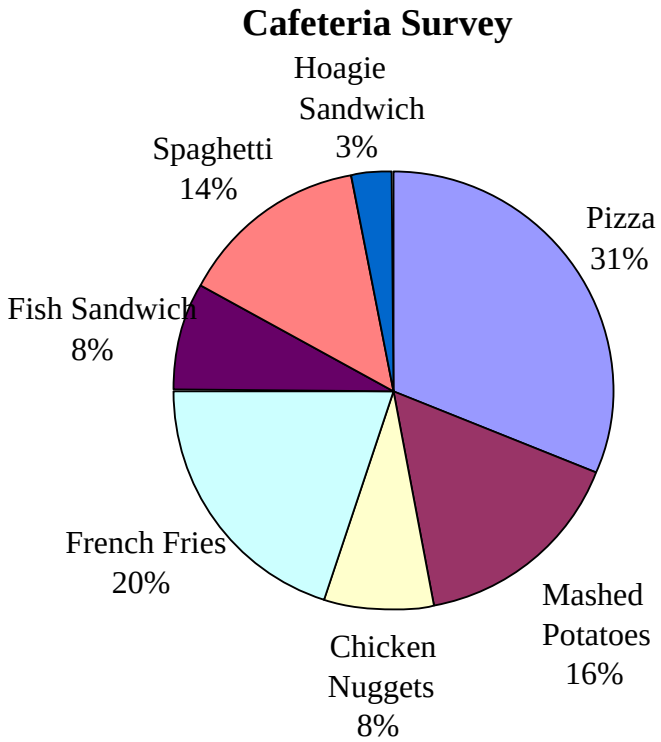
Madison completes the graph by adding category labels, a title, and color to correspond to the survey topic.

Same Data in Different Graphs

Jennifer surveyed the ninth grade students to determine the favorite food in the school cafeteria with these results: Pizza (46), Mashed Potatoes (25), Chicken Nuggets (12), French Fries (31), Fish Sandwich (13), Spaghetti (22), Hoagie Sandwich (5). She made a table to display her results.

Jennifer then decided to compare her results in two different types of graphs. In the bar graph, the number of students surveyed can be determined. In the circle graph, the percent of students is shown rather than the number. In both graphs, pizza is clearly the favorite choice of the students. *Which graph would you use to display the results to the student body?*





Pictographs

A **pictograph** is a graph that shows numerical information by using picture symbols to represent the data sets. Examine the scenario below to understand the construction and interpretation of pictographs.

California is the world's largest producer of strawberries. Mr. Bradford, a county extension agent, was giving a presentation on the number of harvested acres used in California to produce strawberries. Look over the data collected and draw a pictograph to summarize the information in the table.

Number of Acres in California Used for Strawberry Production	
Year	**Acreage**
1998	24,200
1999	28,500
2000	27,600
2001	26,400
2002	28,500
2003	29,600
2004	33,200

http://www.usda.gov/nass/

Method:

Step 1: Label the graph with a title and write the scale on the vertical axis.

Step 2: Choose a symbol of what it will represent. Write a definition of the symbol at the bottom of the graph.

Step 3: Determine how many symbols will be used for each item by dividing.

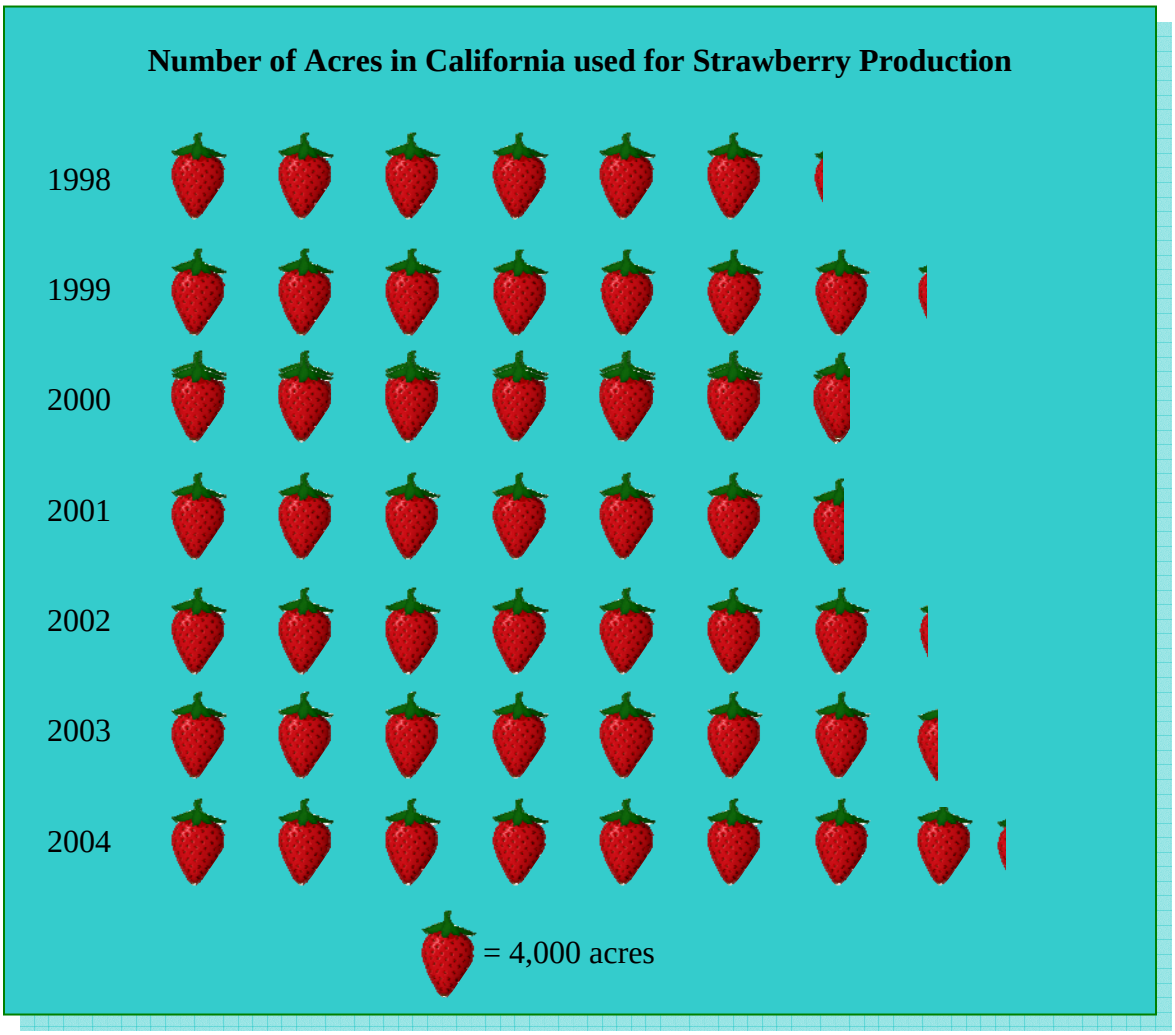
Step 4: Draw the symbols.

***Since the data ranges from about 24,000 through 36,000, one strawberry symbol could represent 4,000 acres. So, we will proceed with constructing the pictograph based on the premise that one strawberry in the graph represents 4000 acres.

Divide 24,200 by 4,000. The result is 6.1 rounded to the nearest tenth. Draw 6.1 symbols next to 1998.

Divide 25,800 by 4,000. The result is 7.1 rounded to the nearest tenth. Draw 7.1 symbols next to 1999.

Repeat the above process for the years of 2000 through 2004.



Use the above pictograph to answer each question.

1. How many acres does each symbol represent? *Each symbol represents 4,000 acres.*

2. In which year were the most acres used for producing strawberries in California? *In year 2004 the most acres were used.*

3. In which two-years were the same amount of acres used? *In the years 1999 and 2002, the same amount of acres were used for strawberry production.*

4. Use the pictograph to determine how many more acres were used in 2004 than in 1998? Explain your work. *There were 8000 more acres used in 2004 than in 1999. (2 berries × 4000 = 8000)*

5. Use the table of data to determine how many more acres were used in 2004 than in 1998? Explain your work. *There were 8000 more acres used in 2004 than in 1999. (34,200 – 24,200 = 8000)*

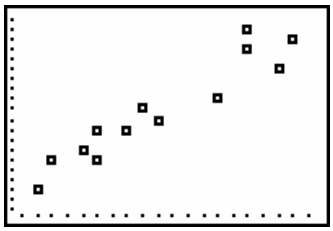
6. Use the pictograph and compare the years 2000 and 2001 to determine in which year more acreage was used for strawberry production in California. *In the year 2000, a little more acreage was used for strawberry production than in the year 2001.*

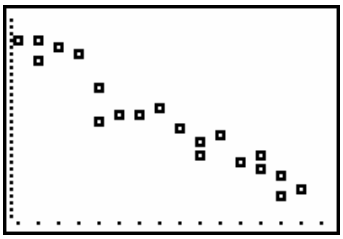
7. Use the table and compare the years 2000 and 2001 to determine in which year more acreage was used for strawberry production in California. State the difference in the amount of acres. *In the year 2000, 1200 more acres was used for strawberry production than in the year 2001. (27,600 – 26,400)*

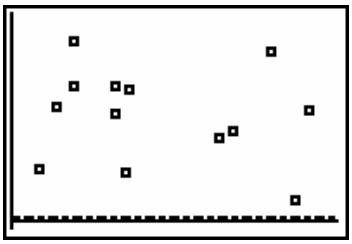
Scatter Plots

Scatter plots are an easy way of determining if there is a relationship between two variables. This relationship is called a **correlation**. A correlation is based on the slope of the line of best fit. (We will discuss how to find the line of best fit later in the lesson).

There are three possible types of correlation; a) positive, b) negative, or c) no correlation. The illustrations below show the graph of each correlation.

a) 

b) 

c) 

In graph "a" notice how the points cluster in a rise to the right. Recall from a previous lesson that this suggests a **positive slope**. Graph "b" shows points that cluster in a fall to the right, which suggests a **negative slope,** and graph "c" shows no cluster pattern and suggests the two variables have **no relationship** to each other.

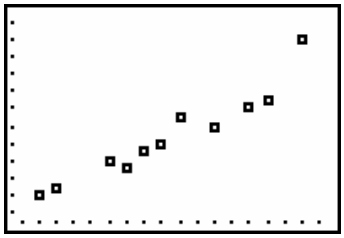
Let's take a look at a few examples and determine if each situation has a positive, negative, or no correlation.

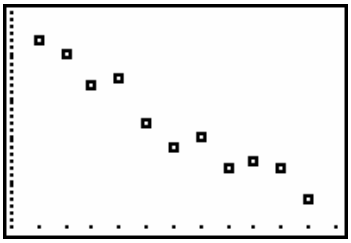
Example: Determine which scatter plot represents each situation.

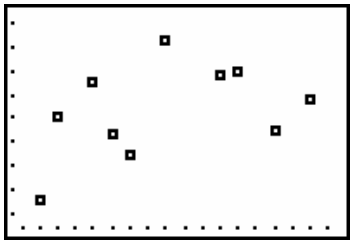
a) your height and your hourly wage

b) your height and your shoe size

c) your age and the time needed to run 100 yards

1) 

2) 

3) 

Scatter plot 1 shows a strong positive correlation. A **positive correlation** occurs when **both variables increase**. As you grow taller your shoe size increases; therefore plot 1 represents situation b.

Scatter plot 2 shows a strong negative correlation. A **negative correlation** occurs when **one variable increases as the other variable decreases**. In situation c as your age increases, the time it takes you to run 100 yards decreases.

The third scatter plot shows **no correlation** because the data points are **randomly scattered**. Your height has no relationship with your hourly wage; therefore this plot represents situation a.

Misleading Statistics

Example 1: Timothy purchased five raffle tickets that cost $1 each based on the sales promotion that the top prize was $400 and the average award amount was $20. What the salesperson failed to mention to Timothy is that the rest of the prize awards were for $1.

This promotion was mathematically correct but if Timothy won, most likely his prize would be $1, not $400.

The Math

1 prize of $400 = 400
20 prizes of $1 = 20
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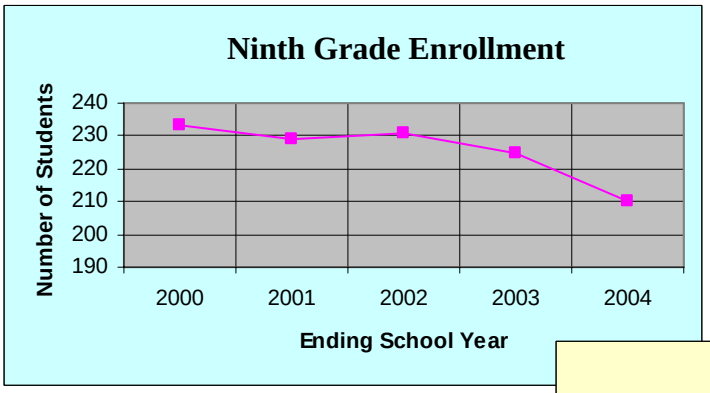
21 prizes = 420

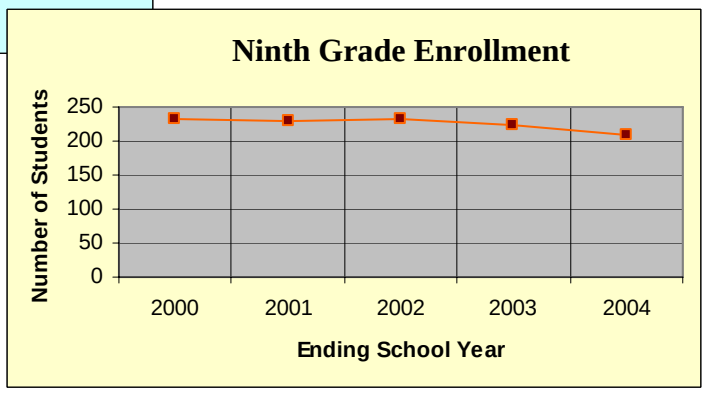
Average prize amount is $\frac{420}{21} = \$20$

Example 2: Graphs may be constructed in a way to emphasize certain data presented. Here are two graphs that show the enrollment of a ninth grade class over the school years 2000 through 2004.



In this graph an overall decline in enrollment is shown with a sharp decline in the year 2004.

In this graph the enrollment looks pretty steady with a small decline in the year 2004.



The different appearance of these two graphs was simply achieved by making changes in the beginning and ending values of the vertical axis and also the amount of increments in the scale of the vertical axis.