Graphs

Graphs display data as an easy-to-understand visual reference. Sometimes the translation of data into text becomes confusing. Graphs make it easier to understand complex information or view the results of an experiment.

SETTING UP A GRAPH

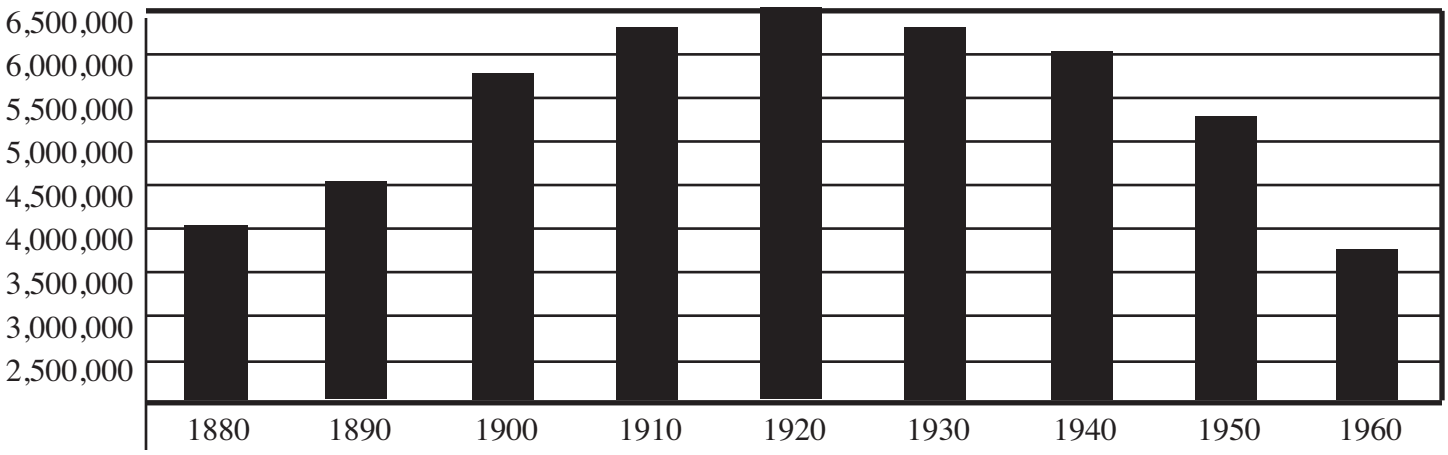
A bar or line graph requires a set of crossed lines or a grid. It becomes a "graph" when labels or details are given to the lines.

- Label the Axes: The reference lines on a graph are called axes. They are the horizontal (x) and vertical (y) lines that cross. If they have numbers, the lowest number is usually at the place where the axes cross. The data collected will determine how the axes are labeled.
- Choose the Scale: The numbers running along a side of the graph are the scale. The difference between numbers from one grid line to another is the interval. The interval will depend on the range of the data and the number of lines on the graph paper.
  —An interval of 1 will make the graph tall and skinny.
  —An interval of 100 will make the graph shorter and wider.
- Range: The range (difference between the highest and lowest numbers in the sample) will determine the interval. It is generally best to set the intervals at 1,10, 20, 100, etc.—base 10 numbers.

COMPARING GRAPHS

Graphs that illustrate how data compare are: single-bar graphs, double-bar graphs, pictographs, and circle graphs. These graphs can illustrate the same kind of data at different times or places, different sets of data at the same time or place, or different kinds of data that make up 100 percent of one group of data.

Single Bar Graph: Number of Farms in the US, 1880-1960

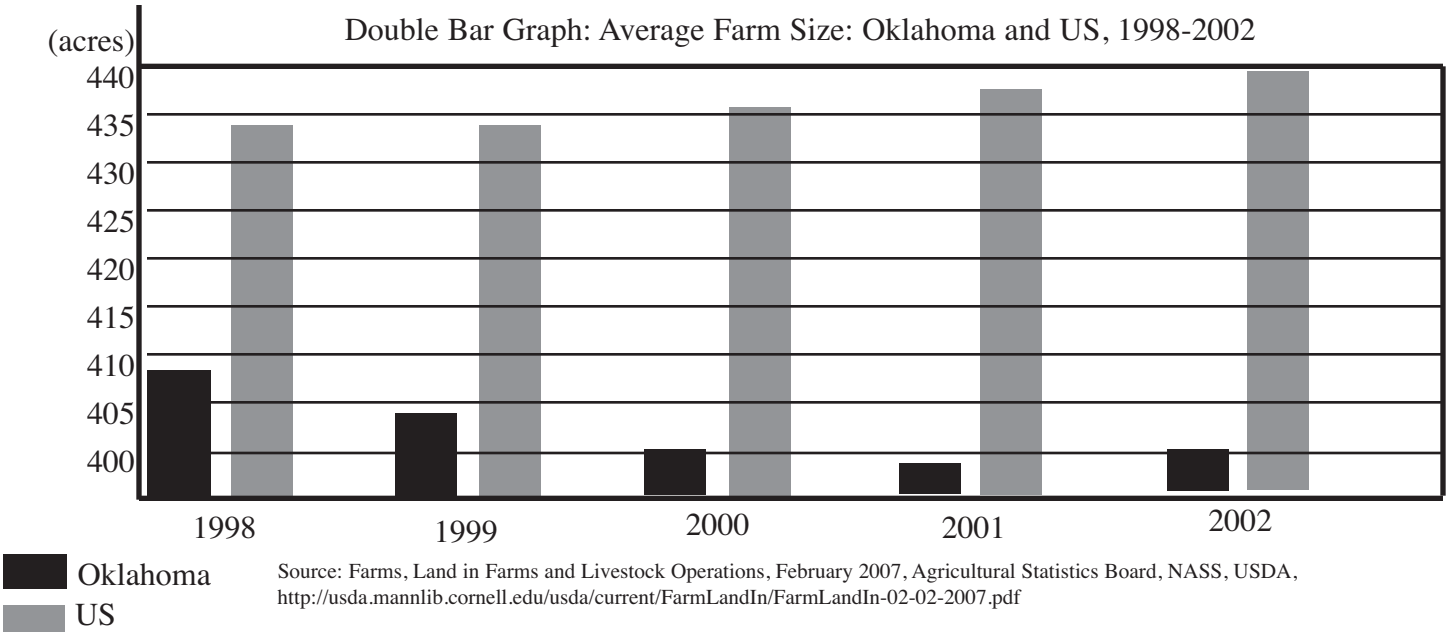


SINGLE-BAR GRAPH: In a bar graph, the length of bars represent numbers from the collected data.

- Title the graph.
- Draw and label the axes.
- Choose increments for the scale.
- Label the "y" axes with the range of numbers.
- Label the "x" axes with the titles or category of data.
- Draw a bar to the height of each category.

DOUBLE-BAR GRAPH: A double-bar graph compares sets of data. This graph saves space and time by combining the information on one graph.

- Follow the same instructions as for the single-bar graph.
- Include both sets of data for each category.
- Include a "key" next to the graph to explain the two or more sets of data displayed.

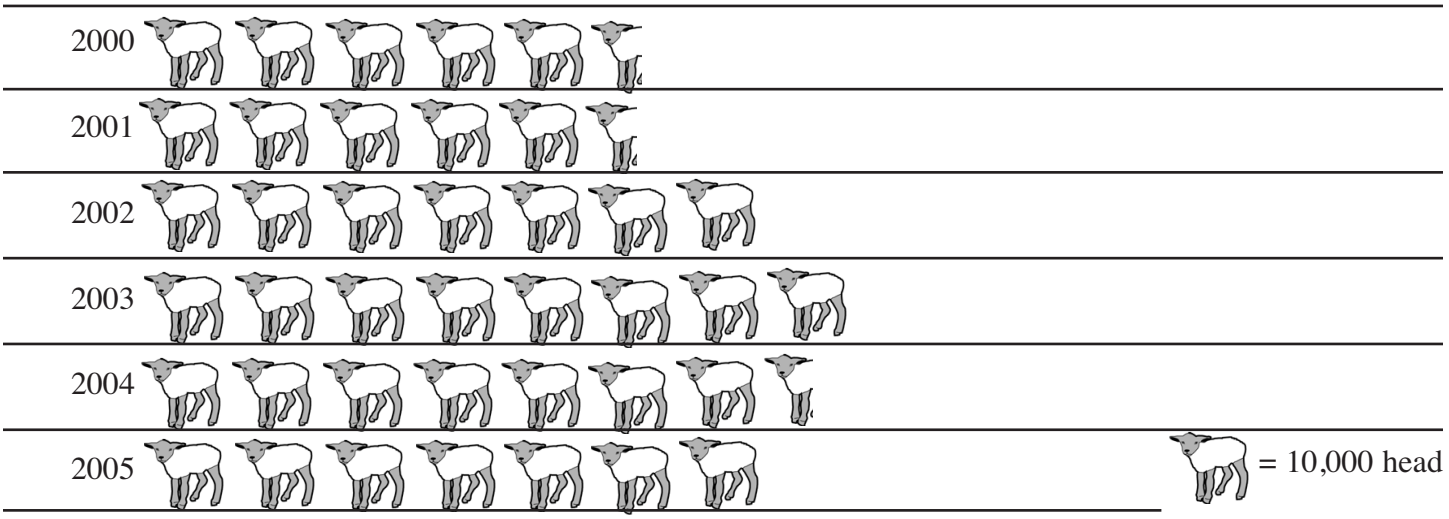


Source: Farms, Land in Farms and Livestock Operations, February 2007, Agricultural Statistics Board, NASS, USDA, http://usda.mannlib.cornell.edu/usda/current/FarmLandIn/FarmLandIn-02-02-2007.pdf

PICTOGRAPH: A pictograph is a visual tool which appeals to the eye while organizing data to be compared.

- Title the graph.
- Draw and label the axes.
- Choose a symbol for the data.
- Draw a key.
- Draw the appropriate number of symbols next to each item.

Pictograph: Sheep in Oklahoma, 2000-2005

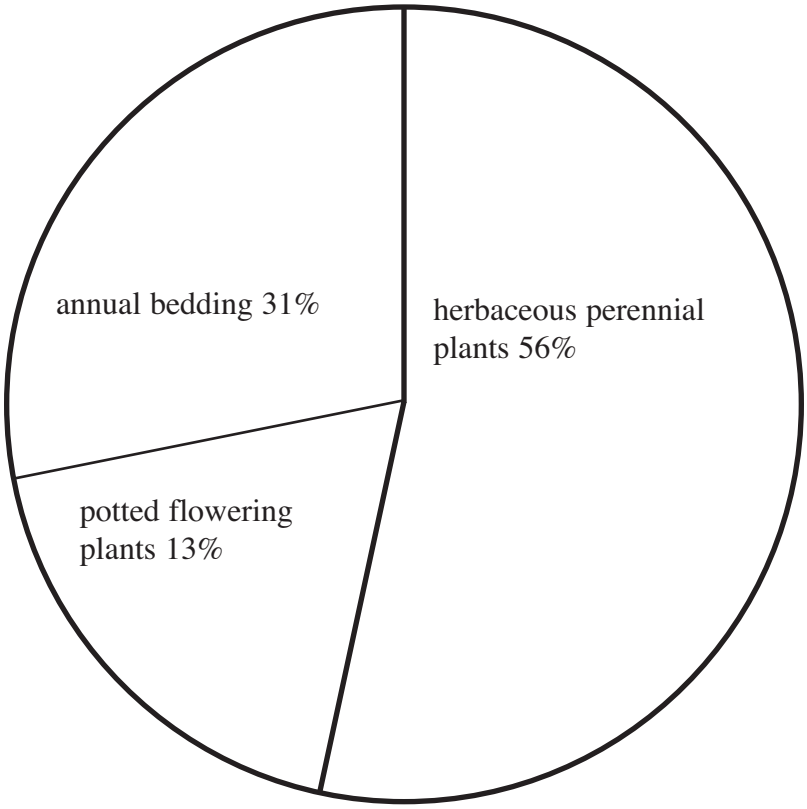


Source: Oklahoma Agricultural Statistics, 2006, USDA, Oklahoma Department of Agriculture, Food and Forestry, http://www.nass.usda.gov/ok/bulletin06/ok_annual_bulletin_2006.pdf

CIRCLE GRAPH: Circle graphs or pie charts represent 100 percent of a group of data. Circle graphs can use symbols, drawings, colors or labels to denote sections.

- Title the graph.
- Draw a circle and mark the center.
- For each symbol, color, and/or category, write a fraction that shows what part it represents.
- Multiply each fraction by 360º to find out how many degrees of the circle you'll need for each category.
- Use a protractor to draw a central angle for the first category. Make sure it is the size calculated from the last step. Example 7/15 x 360º= 168º.
- Draw angles for the rest of the categories.
- Label each section and/or include a key.

Circle Graph: Oklahoma Floriculture—Wholesale Value of Sales by Category, 2005



Source: Oklahoma Agricultural Statistics, 2006, USDA, Oklahoma Department of Agriculture, Food and Forestry, http://www.nass.usda.gov/ok/bulletin06/ok_annual_bulletin_2006.pdf

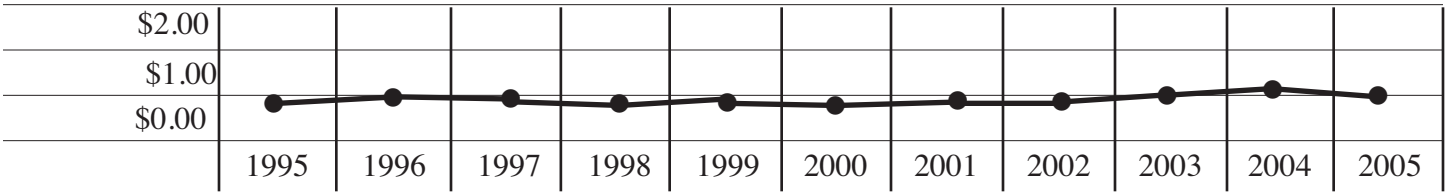
PROGRESSION OF TIME GRAPHS

Graphs can show a progression of change over time. The most widely used graphs are line graphs, multiple-line graph, and time lines.

SINGLE-LINE GRAPH: Time measurement, like minutes, days, or years, are on the horizontal (x) axis. The vertical (y) axis will have some other measurement (people, cars, animals, etc.) Increases, decreases, or flat lines are easy to distinguish by looking at this type of graph.

- Title the graph.
- Draw and label the axes.
- Label the years on the horizontal axis.
- Choose increments for the scale on the vertical axis.
- Estimate where each amount would fall on the vertical axis and place a dot at that point.
- Connect the dots.

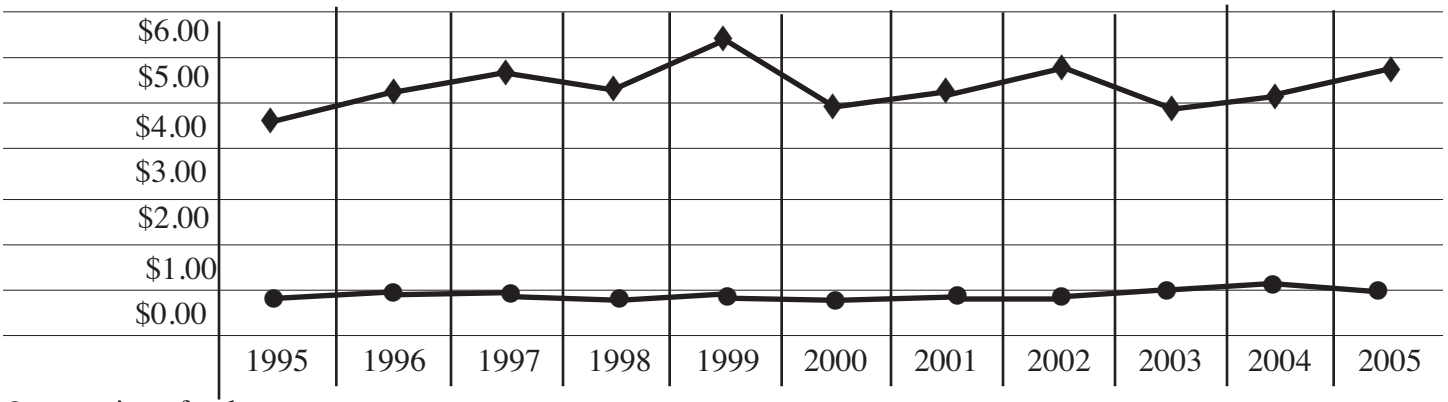
Single Line Graph: Price per Dozen Eggs, Oklahoma, 1995-2005



MULTIPLE-LINE GRAPH: A multiple-line graph compares two or more quantities that are increasing or decreasing over time. Each line shows one set of data.

- Follow all instructions for a single-line graph.
- After plotting and connecting the dots for the first set of data, continue with the next set/s, remembering to use a different color to connect the dots for each set.
- Include a "key" with the graph to explain the colors of the lines.

Multiple Line Graph: Price per Dozen Eggs vs. Value of Bird, Oklahoma, 1995-2005



● = price of a dozen eggs

♦ = value of bird

Produced by Oklahoma Ag in the Classroom, a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education, 2007.

History of Farm Machinery and Technology in America: 1790s-1870s

1790s	1800s	1810s	1820s	1830s	1840s	1850s	1860s	1870s
Invention of cotton gin (1793) Thomas Jefferson's plow with moldboard of least resistance (1794) Charles Newbold patents first cast-iron plow (1797)			Jethro Wood patents iron plow with interchangeable parts (1819) US food canning industry established (1819-25)	McCormick reaper patented (1834) John Deere and Leonard Andrus begin manufacturing steel plows Practical threshing machine patented. (1837)	First grain elevator (1842) Sir John Lawes founds the commercial fertilizer industry by developing a process for making superphosphate (1843)	Self-governing windmill perfected (1854) Two-horse straddle-row cultivator patented (1856) Mason jars, used for home canning, were invented 1858	Change from hand power to horses characterizes the first American agricultural revolution (1862-75) Steam tractors are tried out (1868) Spring-tooth harrow for seedbed preparation appears (1869)	Silos and deep-well drilling come into use Glidden barbed wire patented; fencing of rangeland ends era of unrestricted, open-range grazing (1874)

Time Line

Source: A History of American Agriculture, 1607-2000, Economic Research Service, 2000, http://www.agclassroom.org/gan/timeline/index.htm

TIME LINES: A time line is a graph. It includes a number line with numbers that are years or dates or times of day. Past and future events can be charted on a time line. Examples of future events are: a schedule for a day, week, or month.

- Title the graph.
- Draw a horizontal number line.
- Mark the increments of times that are included in the data.
- Place items where they belong on the time line.

GROUPED DATA GRAPHS

A Venn diagram shows which data belong together. The line plot shows whether the data is bunched or spread out. The graphs that show data groupings are often called plots. This is because there are no bars to draw or lines to connect. The information is plotted on the individual data points.

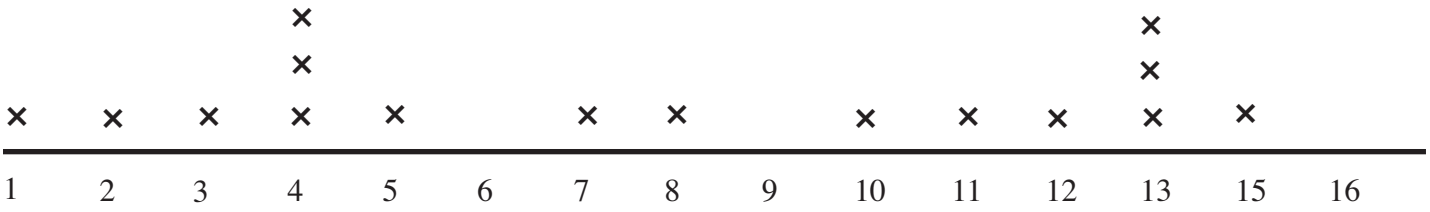
LINE PLOTS: Instead of comparing data or showing trends, the information shows the spread of the data. On a line plot, the range, mode, and any outliers can be quickly identified.

- Title the plot.
- Draw a number line on grid paper. The scale of numbers should include the greatest value and the least value in the set of data. (range)
- For each piece of data, draw an "x" above the corresponding number.

Oklahoma's Rank in the US by Commodity

CROP	RANK IN THE US	LIVESTOCK	RANK IN THE US
winter wheat	2	beef cows	3
grain sorghum	4	hogs	8
rye	1	broiler production	10
peanuts	7	calf crop	4
watermelon	11	all cows	4
cottonseed	12	all cattle and calves	5
all cotton	13	sheep operations	15
all hay	13	milk operations	13

Source: Oklahoma Agricultural Statistics, 2006, USDA, Oklahoma Department of Agriculture, Food and Forestry, http://www.nass.usda.gov/ok/bulletin06/ok_annual_bulletin_2006.pdf



Line Plot: Oklahoma's Rank in the US by Commodity

HISTOGRAM: A histogram is a graph used to show the frequencies of a value or range of values within a single field (variable) of data. An example would be the duration (in minutes) for eruptions of the Old Faithful geyser in Yellowstone National Park. The mean, median, mean, and range of the set of data can be calculated since the data is related to one field only.

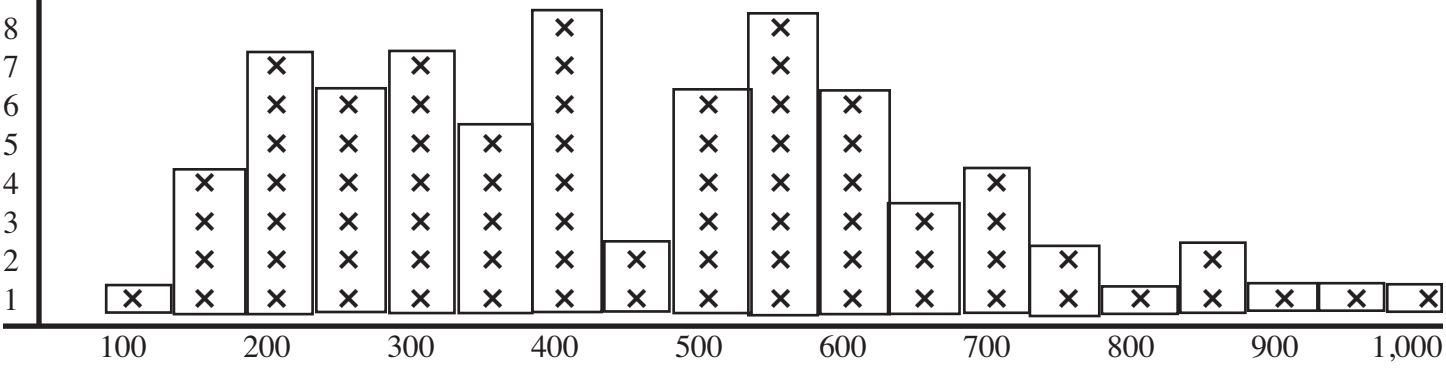
- Title the plot.
- Draw a number line on grid paper. The scale of numbers should include the greatest value and the least value in the set of data.
- For each piece of data, draw an "x" above the corresponding number.
- Draw bars to correct height, and show connection of data. May include a "y" axis.
- Calculate the mean (average), mode (most used number in the list of data), median (center number when the data is arranged from least to greatest), and range (difference between the least and greatest number).

Produced by Oklahoma Ag in the Classroom, a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education, 2007.

Oklahoma Women Farm Operators, by County, 2002

Adair, 471 • Alfalfa, 174 • Atoka, 552 • Beaver, 387 • Beckham, 378 • Blaine, 232 • Bryan, 674 • Caddo, 506
Canadian, 529 • Carter, 538 • Cherokee, 568 • Choctaw, 470 • Cimarron, 237 • Cleveland, 629 • Coal, 275
Comanche, 516 • Cotton, 160 • Craig, 611 • Creek, 859 • Custer, 201 • Delaware, 673 • Dewey, 281
Ellis, 281 • Garfield, 378 • Garvin, 653 • Grady, 745 • Grant, 224 • Greer, 194 • Harmon, 92 • Harper, 191
Haskell, 406 • Hughes, 400 • Jackson, 257 • Jefferson, 178 • Johnston, 290 • Kay, 390 • Kingfisher, 342
Kiowa, 206 • Latimer, 375 • LeFlore, 893 • Lincoln, 1,052 • Logan, 525 • Love, 297 • McClain, 474
McCurtain, 873 • McIntosh, 410 • Major, 264 • Marshall, 184 • Mayes, 686 • Murray, 247 • Muskogee, 800
McIntosh, 410 • Major, 264 • Marshall, 184 • Mayes, 686 • Murray, 247 • Muskogee, 800 • Noble, 306
Nowata, 387 • Okfuskee, 388 • Oklahoma, 631 • Okmulgee, 555 • Osage, 628 • Ottawa, 532 • Pawnee, 405
Payne, 677 • Pittsburg, 718 • Pontotoc, 605 • Pottawatomie, 778 • Pushmataha, 778 • Roger Mills, 289
Rogers, 888 • Seminole, 538 • Sequoyah, 489 • Stephens, 572 • Texas, 354 • Tillman, 167 • Tulsa, 563
Wagoner, 552 • Washington, 359 • Washita, 290 • Woods, 278 • Woodward, 321

Source: Oklahoma Agricultural Statistics, 2006, USDA, Oklahoma Department of Agriculture, Food and Forestry, http://www.nass.usda.gov/ok/bulletin06/ok_annual_bulletin_2006.pdf

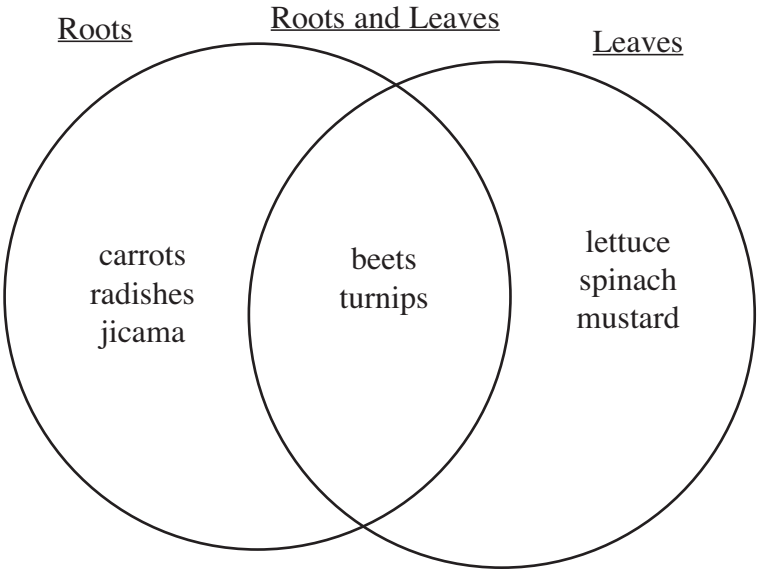


Histogram of Oklahoma Women Farm Operators

VENN DIAGRAM: A Venn diagram is a group of intersecting circles. It can have a few as 2 circles. Each circle is named for the data in it. Data that belong in more than one circle are placed where the circles overlap. Some information may fall outside the circles.

- Choose a title for the diagram.
- Decide how many groups of data were collected.
- Draw a circle for each group.
- Place each piece of data in the proper circle.
- If a piece fits in more than one circle, place it where the circles overlap.

Venn Diagram: Plant Parts We Eat



Produced by Oklahoma Ag in the Classroom, a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education, 2007.

Region	Field Worker dollars per hour	Livestock Worker dollars per hour	All Workers dollars per hour
Northeast I	10.10	9.59	10.77
Northeast II	10.34	8.56	10.55
Appalachian I	8.46	9.22	9.32
Appalachian II	8.64	9.07	9.77
Southeast	8.00	9.04	8.83
Florida	9.20	9.00	10.01
Lake	10.11	9.99	11.08
Cornbelt I	9.86	9.16	10.17
Cornbelt II	9.60	10.46	10.63
Delta	8.54	8.00	8.80
Northern Plains	10.04	9.75	10.63
Southern Plains	8.35	9.41	9.22
Mountain I	8.79	9.01	9.35
Mountain II	9.16	9.75	9.97
Mountain III	8.25	8.88	9.28
Pacific	9.39	9.70	10.24
California	9.62	10.90	10.63

Source: "Farm Labor, May 2007, Agricultural Statistics Board, NASS, USDA, http://usda.mannlib.cornell.edu/usda/current/FarmLabo/FarmLabo-05-18-2007.pdf

Wages for Hired Farm Workers by Region

Dollars	Cents
8	80 83
9	22 28 32 35 77 97
10	01 17 24 55 63 63 77
11	08
12	85

Stem and Leaf

Double Stem and Leaf: Wages for Hired Farm Workers by Region

Field Workers		Livestock Workers
cents	dollars	cents
79 64 54 45 35 25 00	8	00 56 88
86 62 60 39 20 16	9	00 04 07 16 22 59 70 75 99
34 11 10 04	10	46 90

STEM-AND-LEAF PLOT: Stem-and-leaf plots allow for the organization of numbers so that the numbers themselves make the display. The stem-and-leaf plot summarizes the shape of a set of data (the distribution) and provides extra detail regarding individual values. The data is arranged by place value. The digits in the largest place are referred to as the stem and the digits in the smallest place are referred to as the leaf (leaves). The leaves are always displayed to the right of the stem. Stem-and-leaf plots are great organizers for large amounts of information such as test scores, scores on sports teams, and series of temperatures or rainfall over a period of time. A stem-and-leaf plot is similar to a histogram but shows more information.

- Choose a title for the plot.
- Write the data in order from least to greatest.
- Find the least and greatest values.
- Choose the stems. Each digit in the tens place in the data list is a stem.
- Write the stems by a vertical number line, least to greatest.
- The leaves are all the ones digits in your list. Write them next to the stems that match their tens digits.
- Write a key that explains how to read the stems and leaves.
- If needed, calculate the range, mean, median, and mode for the set of data.

DOUBLE STEM-AND-LEAF PLOT: To compare two sets of data, use a back to back plot. A comparison is now possible for two sets of test scores, sport's teams or games, and possibly temperatures or rainfall.

- Follow the same procedure for the stem-and-leaf plot.
- Insert the second set of data to the left of the stem. The tens column is now in the middle and the ones column is to the right and left of the stem.
- Give each (leaf) column a title.

Sources: *A Mathematics Handbook: Math at Hand*, Great Source Education Group, A Houghton Mifflin Company, 1999.

"About: Mathematics," http;//www.math.about.com; "Math in Sight," www.mathinsight.ctl.sri.com; Landwehr, James M., and Ann E. Watkins, *Exploring Data*, Dale Seymour Publications, 1986; National Agricultural Statistics Service, USDA