Solution *Section* **1.7 – Misrepresentations of Data**

Exercise

Assume that, as a newspaper reporter, you must graph data showing that increased smoking causes an increased risk of lung cancer. Given that people might be helped and lives might be saved by creating a graph that exaggerates the risk of lung cancer, is it ethical to construct such a graph?

Solution

No. Results should be presented in a way that is fair and objective so that the reader has the reliable information necessary to reach his own conclusion.
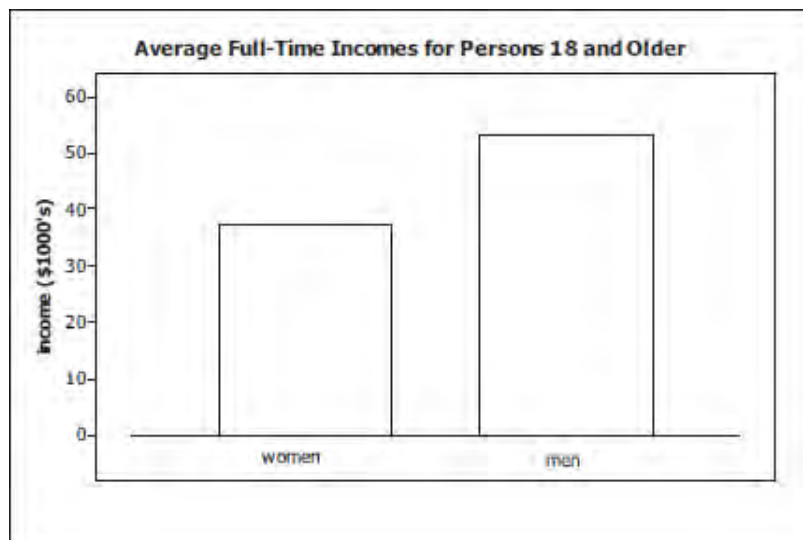
Exercise

The accompanying graph depicts average full-time incomes of women and men aged 18 and over. For a recent year, those incomes were $37,197 for women and $53,059 for men (based on data from the U.S. Census Bureau). Does the graph make a fair comparison of the data? Why or why not? If the graph distorts the data, construct a fair graph.
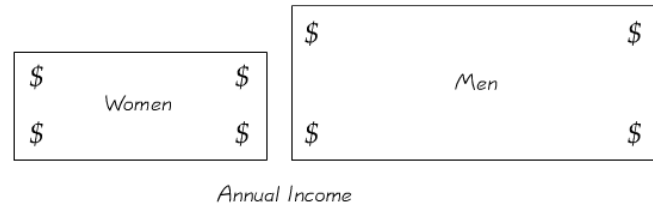
Solution

The average income for men is about 1.4 times the average income for women. Making the men's pictograph 1.4 times as wide and 1.4 times as high as the women's produces a men's image with $1.4^2 = 1.96$ *times* the areas of the women's image. Since it is the area that gives the visual impression in a two-dimensional figure, the men's average income appears to be almost twice that of the women's average income.
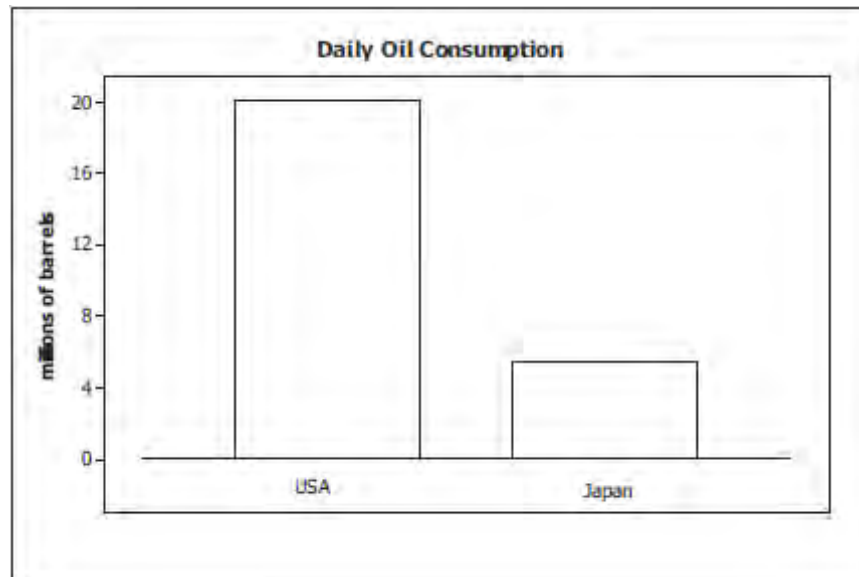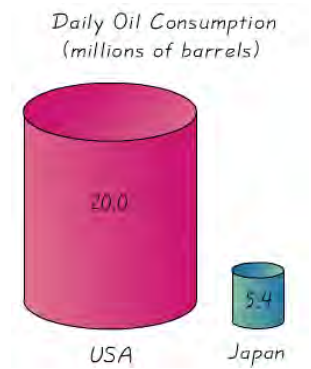
Exercise

The accompanying graph uses cylinders to represent barrels of oil consumed by the U.S. and Japan. Does the graph distort the data or doe it depict the data fairly? Why or why not? If the graph distorts the data, construct a graph that depicts the data fairly.


Daily Oil Consumption
(millions of barrels)

Solution

The oil consumption for the USA is about 3.7 times the oil consumption for Japan. Making the USA's pictograph 3.7 times larger than Japan's in three dimensional produces an image for the US with $3.7^3 = 50$ times the volume of the image for Japan. Since it is perceived volume that gives the visual impression in the figure, the consumption for US appears 50 times that for Japan.
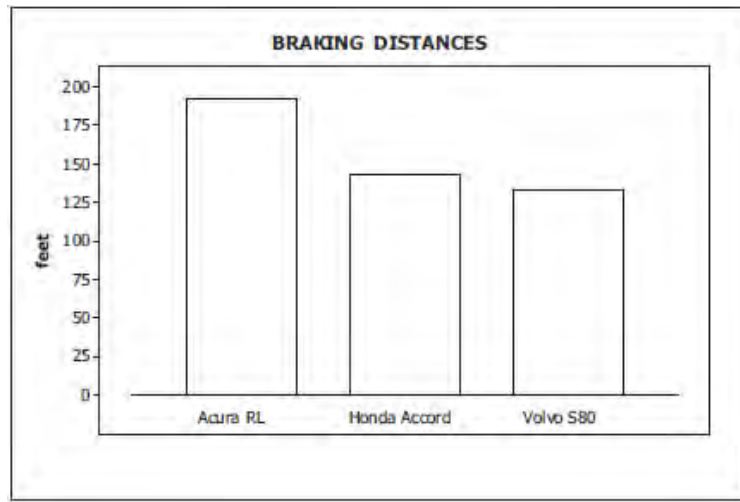

Exercise

The accompanying graph shows the braking distances for different cars measured under the same conditions. Describe the ways in which this graph might be deceptive. How much greater is the braking distance of the Acura RL than the braking distance of the Volvo S80? Draw the graph in a way that depicts the data more fairly.
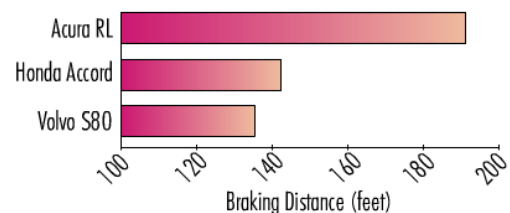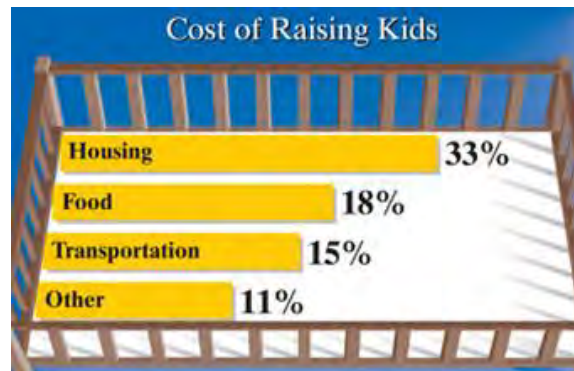

Solution

It appears that the braking distance for the Acura RL is more than twice that of the Volvo S80. The actual difference is about 60 ft., and the Acura RL distance is about $\frac{192}{133} = 1.44$ times that of the Volvo. The exaggeration of differences is caused by the fact that the distance scale dies not start at zero.

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BRAKING DISTANCES

Exercise

The graph represents the percentage of income a middle-income family will spend on their children

Cost of Raising Kids

Housing 33%
Food 18%
Transportation 15%
Other 11%

  a) How is the graphic misleading?
  b) What could be done to improve the graphics?

Solution

  a) The graphic is misleading because the bars are not proportional. The bar for housing should be a little more than twice the length of the bar for transportation, but it is not.
  b) The graphic could be improved by adjusting the bars so that their lengths are proportional

Cost of Raising Kids

Other 11%
Transportation 15%
Food 18%
Housing 33%

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