L2. Numerical Measures of Data (Cont'd) - Relative Standing

Example 1: Jelly Beans

Jelly Belly is basically the mad scientist of the candy world, whipping up over 100 flavors—some delightful, some downright questionable. The all-time MVPs? Very Cherry, Buttered Popcorn, and Juicy Pear. But not every bean gets to live the sweet life forever. Retired flavors, affectionately (or tragically) known as "has-beans," include Buttered Toast, Draft Beer, Moldy Cheese, and Toothpaste.

At a contest, contestant were asked to guess, how many jelly beans were in a kilogram. Their answers are shown below:

$$
\begin{array}{cccccccccc}
852 & 861 & 862 & 862 & 863 & 865 & 868 & 871 & 878 & 880 \\
882 & 882 & 888 & 891 & 891 & 894 & 894 & 895 & 898 & 899 \\
899 & 903 & 907 & 909 & 919 & 926 & 926 & 934 & 937 & 948
\end{array}
$$

a. Calculate the median.

b. Calculate the 25th percentile.

c. Calculate the 75th percentile.

d. Calculate the 55th percentile.

e. Calculate the 30th percentile.

Solution

Example 2: Grading

Academic marking was invented in Cambridge in 1792 - until then no one had thought to assign a numerical value to a piece of work. The grades (out of 100) for the first Class Exercise in this course are shown below:

$$
\begin{array}{cccccccccc}
21 & 22 & 22 & 25 & 25 & 25 & 25 & 26 & 32 & 32 \\
34 & 37 & 41 & 42 & 42 & 46 & 49 & 59 & 63 & 67 \\
71 & 72 & 73 & 73 & 74 & 77 & 78 & 82 & 82 & 83 \\
83 & 89 & 92 & 92 & 94 & 95 & 95 & 97 & 98 & 100
\end{array}
$$

a. Calculate the median and interpret its meaning in the context of the problem.

b. Calculate the interquartile range (IQR) and interpret it in the context of the problem.

c. Calculate the 99th percentile.

d. Calculate the 80th percentile.

e. Calculate the 90th percentile.

f. Calculate the 20th percentile.

Solution

Example 3: The Horlicks Mountains

Horlicks, the malted milk drink best known for knocking people out before bedtime, once had a much grander legacy. In 1930, explorer Richard Byrd, powered by Horlicks (and probably a lot of frostbite), decided to name an entire Antarctic mountain range "Horlick Mountains" in honor of the company that kept his expedition both hydrated and funded during his trek to the South Pole.

Several people were asked how many cups of Horlicks they drank in the past week to help them get to sleep. There responses are shown below:

Cups of Horlicks	Number of People
2	12
4	17
6	15
8	21
10	19
12	16
14	20

a. Calculate the median and interpret its meaning in the context of the problem.

b. Calculate the first quartile.

c. Calculate the third quartile.

d. Calculate the interquartile range and interpret it in the context of the problem.

e. Calculate the 98th percentile.

f. Calculate the 60th percentile.

g. Calculate the 5th percentile.

Solution

Example 4: Tortoises

In 2011, a celebrity pair of Galápagos tortoises broke up in spectacular fashion. Though the couple had happily cohabitated for about 90 years, they suddenly could no longer stand each other. They now live on opposite sides of a glass wall and Bibi hisses whenever she spots her ex.

Galápagos tortoises can weigh between $135\,kg$ to $400\,kg$ depending on their age, gender, and whether they are living in their natural habitat or in captivity. The table below shows the weights of several Galápagos tortoises:

Weight (kg)	Number of Tortoises
$135 - 164$	19
$165 - 194$	16
$195 - 224$	36
$225 - 254$	44
$255 - 284$	22
$285 - 314$	21
$315 - 344$	11
$345 - 374$	20
$375 - 404$	22

a. Calculate the 90th percentile and interpret its meaning in the context of the problem.

b. Calculate the median and interpret its meaning in the context of the problem.

c. Calculate the first quartile.

d. Calculate the third quartile.

e. Calculate the 40th percentile.

f. Calculate the 15th percentile.

Solution

Example 5: Men in Grey Suits

'Men in grey suits' is Australian slang for sharks. Surfers use it to alert people to their presence without causing too much anxiety. The lifespans of several male and female great white sharks are shown below:

Male Great White Sharks:

$$
\begin{array}{cccccccccc}
24 & 30 & 31 & 31 & 31 & 32 & 33 & 33 & 33 & 33 \\
34 & 34 & 34 & 36 & 37 & 38 & 38 & 39 & 39 & 40 \\
40 & 41 & 41 & 42 & 43 & 43 & 43 & 44 & 45 & 47
\end{array}
$$

Female Great White Sharks:

$$
\begin{array}{cccccccccc}
30 & 31 & 31 & 32 & 33 & 35 & 35 & 36 & 36 & 36 \\
36 & 38 & 39 & 39 & 39 & 39 & 39 & 41 & 41 & 41 \\
42 & 43 & 43 & 43 & 43 & 44 & 45 & 52 & 53 & 55
\end{array}
$$

a. Compute and interpret the IQR for the male great white shark data.

b. Identify any outlier in the male great white shark data if they exist.

c. Compute and interpret the IQR for the female great white shark data.

d. Identify any outlier in the female great white shark data if they exist.

e. Compare and contrast the two datasets.

Solution