**The Five-Number Summary**

We often are interested in how much *spread* there is in a data set. The spread, or variability, of data describes how far apart the data values are. A set of statistics that help us see the amount of spread in a data set is the **five-number summary.** The five-number summary consists of the minimum, Q1, median, Q3, and maximum. Q1 and Q3 are the first and third quartiles. The median equals Q2. Quartiles divide a data set into four quarters.



Minimum Q1 Median Q3  Maximum

To create the five-number summary of a data set, start by ordering the data set into increasing or decreasing order. Then, find the median (middle) of your data set. The median divides the data set into two halves. To find the quartiles, find the median of the lower half and find the median of the upper half.

Example: Below are the arm-spans (in cm) of 15 Algebra I students:

148 152 152 152 154 154 154 162 163 164 164 170 172 180 181

Solution: The data values are already ordered. There are an odd number of values, so the median is the middle number in the list. The lower half and upper half are shown in boxes. Each half has 7 data values. The median of the lower half is 152, and the median of the upper half is 170.

148 152 152 152 154 154 154 162 163 164 164 170 172 180 181

Median of the lower half (Q1)Median of the upper half (Q3)

Middle of the data set (Median = Q2)

1. Use the statistics above and the minimum and maximum to complete the table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | minimum | Q1 | median | Q3 | maximum |
| **Arm-spans** |  |  |  |  |  |

1. Find the five-number summary for the maximum wind speeds of the named hurricanes in 2005.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Max Wind Speed**  **(mph)** |  | **Name** | **Max Wind Speed**  **(mph)** |
| Cindy | 75 |  | Philippe | 80 |
| Dennis | 150 |  | Rita | 180 |
| Emily | 160 |  | Stan | 80 |
| Irene | 105 |  | Vince | 75 |
| Katrina | 175 |  | Wilma | 185 |
| Maria | 115 |  | Beta | 115 |
| Nate | 90 |  | Epsilon | 85 |
| Ophelia | 85 |  |  |  |

1. Write the maximum wind speeds in increasing order.
2. Fill in the five-number summary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | minimum | Q1 | median | Q3 | maximum |
| **Maximum**  **Wind Speeds** |  |  |  |  |  |

**Rules for Finding the Median & Quartiles**

When you have an even number of data values, the **median equals the average of the middle two numbers**. If the lower half and upper half of the data set also have an even number of values, Q1 and Q3 will be the average of the middle two numbers in the lower half and upper half, respectively.

1. Find the five-number summary of the speeds of the land animals below.

|  |  |
| --- | --- |
| **Land Animals** | **Speed (mph)** |
| Cheetah | 70 |
| Pronghorn antelope | 61 |
| Thomson’s gazelle | 50 |
| Quarter horse | 48 |
| Elk | 45 |
| Coyote | 43 |
| Ostrich | 40 |
| Greyhound | 39 |
| Rabbit(domestic) | 35 |
| Giraffe | 32 |
| Reindeer | 32 |
| Cat(domestic) | 30 |
| Grizzly bear | 30 |
| White-tailed deer | 30 |
| Human | 28 |
| Elephant | 25 |
| Black mamba snake | 20 |
| Squirrel | 12 |
| Pig (domestic) | 11 |
| Chicken | 9 |

1. Write the speeds in increasing order.
2. Fill in the five-number summary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | minimum | Q1 | median | Q3 | maximum |
| **Speeds of Land Animals** |  |  |  |  |  |

1. The following table lists the top 25 all-time highest grossing movies as of 9/16/11. Find the five-number summary of the 25 highest box office revenues (in millions of dollars).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Movie Title and Year** | **$** |  | **#** | **Movie Title and Year** | **$** | |
| 1 | Avatar (2009) | 761 |  | 14 | The Lord of the Rings: Return of King (2003) | 377 | |
| 2 | Titanic (1997) | 601 |  | 15 | Spider-Man 2 (2004) | 373 | |
| 3 | The Dark Knight (2008) | 533 |  | 16 | The Passion of the Christ (2004) | 370 | |
| 4 | Star Wars: Episode IV (1977) | 461 |  | 17 | Jurassic Park (1993) | 357 | |
| 5 | Shrek 2 (2004) | 436 |  | 18 | Transformers: Dark of the Moon (2011) | 351 | |
| 6 | E.T.: The Extra-Terrestrial (1982) | 435 |  | 19 | The Lord of the Rings: 2 Towers (2002) | 340 | |
| 7 | Star Wars: Episode I (1999) | 431 |  | 20 | Finding Nemo (2003) | 340 | |
| 8 | Pirates of the Caribbean (2006) | 423 |  | 21 | Spider-Man 3 (2007) | 337 | |
| 9 | Toy Story 3 (2010) | 415 |  | 22 | Alice in Wonderland (2010) | 334 | |
| 10 | Spider-Man (2002) | 404 |  | 23 | Forrest Gump (1994) | 330 | |
| 11 | Transformers (2009) | 402 |  | 24 | The Lion King (1994) | 328 | |
| 12 | Star Wars: Episode III (2005) | 380 |  | 25 | Shrek the Third (2007) | 321 | |
| 13 | Harry Potter - Deathly Hallows (2011) | 377 |  |  | | |

1. Write the movie revenues in increasing order.
2. Fill in the five-number summary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | minimum | Q1 | median | Q3 | maximum |
| **Movie Revenues**  **(in millions)** |  |  |  |  |  |