

A.2 Frequency Tables, Histograms, Bar Charts, and Dot Plots

Getting Started

- In order to analyze data (and make meaning of the story that is being told), one of the first steps to take is to represent the data visually in a manner that helps us to quickly see what values of the variable have been measured and how often each value has occurred.
- There are many techniques that can be used to organize and present data. In our course, we will focus on the following methods: **Lists, Frequency Tables, Dot Plots, Histograms/Bar Charts and Box and Whisker Plots.**

Frequency Tables

A frequency distribution table is a table which lists the data values in the left-hand column and the **frequency** (or **number of observations** of that value) in the right column.

A group of 32 students took a test with maximum mark 10. Their scores are listed below:

0, 1, 1, 2, 2, 2, 3, 3, 4, 4, 5, 5, 5, 5, 6, 6, 6, 6, 7, 7, 7, 7, 7, 7, 8, 8, 8, 9, 10.

Score	f
0	1
1	2
2	3
3	2
4	3
5	5
6	4
7	6
8	4
9	1
10	1

Example #1

The data below represent the number of days it takes for different tomato plants to produce tomatoes.

47 52 53 55 57 60 61 62 63 65 65 65 65
68 70 72 72 75 75 76 77 78 80 81 82
85 88 89 90

# Days to Produce Fruit (x)	Frequency
$40 \leq x < 50$	
$50 \leq x < 60$	
$60 \leq x < 70$	
$70 \leq x < 80$	
$80 \leq x < 90$	
$90 \leq x < 100$	

a) Use the information to complete the frequency table.

Turn and Talk

In which ways is the frequency table a **better** representation of the data than the simple list? In which ways is it **worse**?

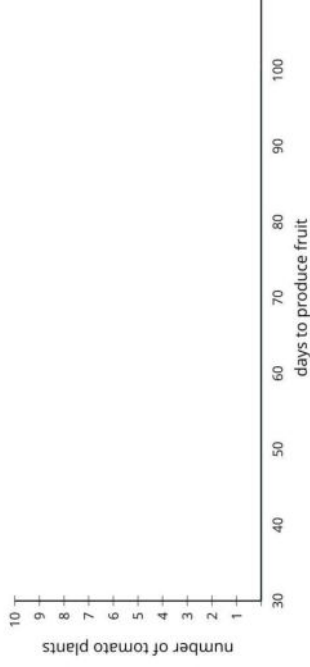
Notice -> the **Class** or **Bin Width** = 10

Example #1 Continued

b) Use the set of axes and the information in your table to create a histogram.

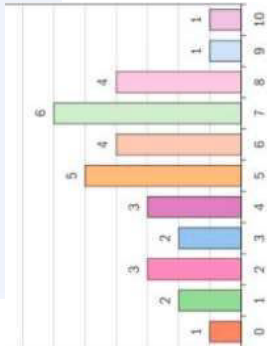
The **mode** is the **single value** with the greatest frequency.
 Mode: _____

The **modal class** is the **class or interval** with the greatest frequency.
 Modal Class: _____

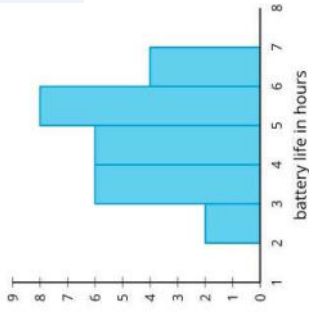


Bar Graphs & Histograms

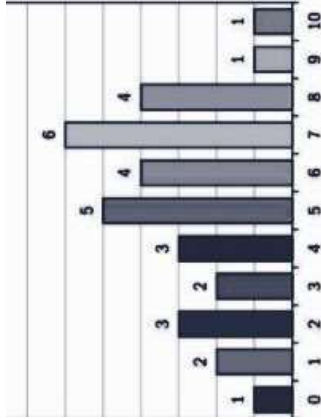
- A **Bar Graph** is a graphical representation of a frequency table for discrete data whereas a **Histogram** is a graphical representation of a frequency table for continuous data.



A bar chart is suitable for discrete data and may have gaps between the bars.
 A histogram is suitable for continuous data and has no gaps between the bars.



Example #2 - Bar Chart Skills

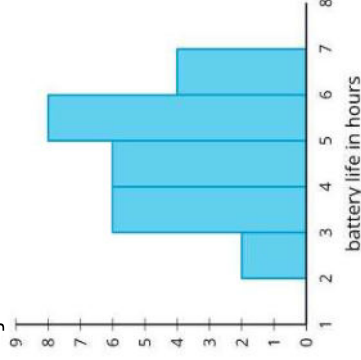


Ages of Children at a Daycare

- How many children were there total at this daycare?
- How many children were there who are **at least** 8 years old? What percentage is this?
- What percentage of children are **at most** 3 years old?
- What percentage of children are **between** 5 and 7 years old, **inclusive**?
- Which age represents the **mode**?
- The youngest 25% of children qualify for help from an additional daycare aide. How many children qualify?

Practice

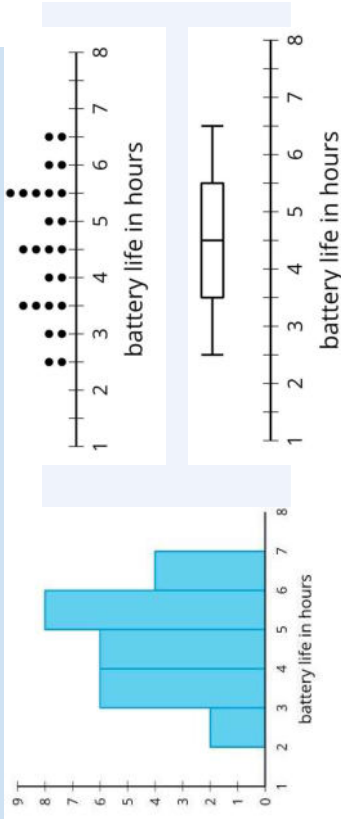
This **histrogram** represents the battery life, in hours, of several phones under heavy use.



- How many phones are there total?
- How many phones have **less than** 5 hours of battery life? What percentage is this of the total?
- What percentage of phones have at least 5 hours of battery life?
- What percentage of phones are **between** 2 and 7 hours of battery life, **inclusive**?
- State the **modal class**. Use algebraic notation.
- Do we know if any one phone has **exactly 5 hours** of battery life? Explain your thinking.

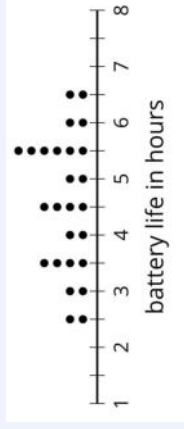
Notice & Wonder

The dot plot, histogram, and box plot summarize the hours of battery life for 26 cell phones constantly streaming video. What do you notice? What do you wonder?



Dot Plots

A dot plot is a graphical representation which shows us the frequency of **each data piece**. It consists of a horizontal axis representing each data piece and columns of vertically stacked dots where each dot represents one occurrence of that piece of data.



Turn and Talk

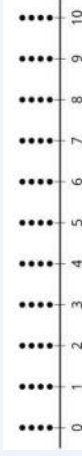
1. Compare and contrast this dot plot from the histogram.
2. Is one representation more clear or "better" than the other? Explain.

Shapes of Distributions

A lot of information can be obtained from looking at visual representations and the shape of a distribution. Typically we describe the shape of distributions as *symmetric*, *skewed*, *bell-shaped*, *bimodal*, or *uniform*.

UNIFORM DISTRIBUTION

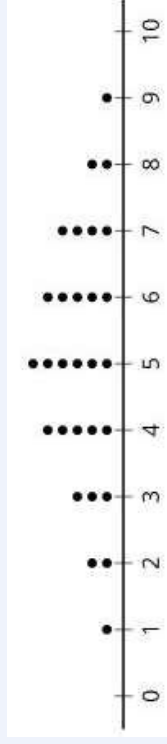
A distribution is uniform if the data values are **perfectly** distributed throughout the range of the data. It doesn't have to be "considered" uniform though!



Shapes of Distributions Continued

BELL SHAPED / NORMAL DISTRIBUTION

A distribution is bell-shaped (or normal) if the dot plot or histogram takes the form of a bell with most of the data clustered near the center and fewer points farther from the center.

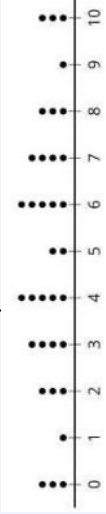


Notice how the **mode** is 5. Because there is **one clear mode**, this distribution is also called **unimodal**.

Shapes of Distributions Continued

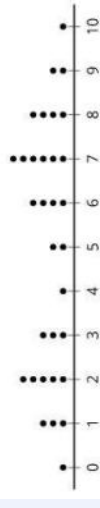
SYMMETRIC DISTRIBUTION

A distribution is **symmetric** if the mean is equal to the median (we'll cover this more in a future lesson!) and there is a vertical line of symmetry in the center of the graphical representation. In the dot plot shown, the distribution is symmetric about the data value 5.



BIMODAL DISTRIBUTION

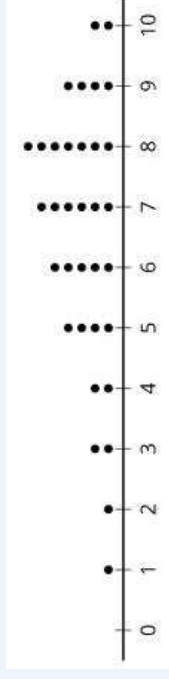
A distribution is **bimodal** if the distribution has two very common data values seen in a dot plot or histogram as distinct peaks. In the dot plot shown, the two common data values are 2 and 7.



Essential Understanding: Skewness

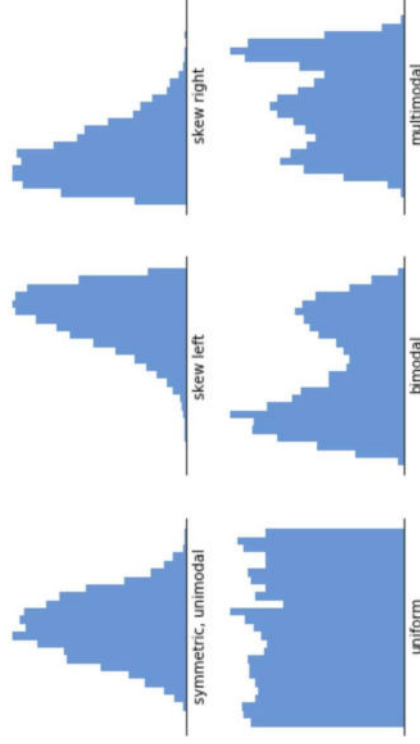
SKEMED DISTRIBUTION

A distribution is **skewed** if one side of the distribution has more values farther from the bulk of the data than the other side, so that the mean is not equal to the median. In the dot plot shown, the data values on the left, such as 1, 2, and 3, are further from the bulk of the data than the data values on the right.



This data is **skewed left** or **skewed negatively** since the data are bunched on the right side and the tail is on the left side. What would data that is **skewed right** or **skewed positively** look like?

Shapes of Distributions Summary



Practice

Sketch a data representation (any that we have learned) that has the following **skews**

Negatively Skewed
(Skewed Left)

Positively Skewed
(Skewed Right)

Bimodal, Symmetric

Multimodal, Symmetric

Uniform

Unimodal, Symmetric