Math 2311

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Office Hours: MW 11am to 12:45pm in 639 PGH

Online Thursdays 4-5:30pm

And by appointment

Class webpage: http://www.math.uh.edu/~bekki/Math2311.html

Math 2311
Class Notes for Section 1.5 – 2.2

Last week:

- Population
- Sample
- Mean
- Median
- Mode
- Five number summary
- IQR
- Variance
- Standard Deviation

We also talked about some graphs:

- Bar plot
- Histogram
- Stem and leaf plot
- Dot plot

1.5 continued:

Boxplots not only help identify features about our data quickly (such as spread and location of center) but can be very helpful when comparing data sets.

How to make a box plot:

1. Order the values in the data set in ascending order (least to greatest).
2. Find and label the median.
3. Of the lower half (less than the median—do not include), find and label Q1.
4. Of the upper half (greater than the median—do not include), find and label Q3.
5. Label the minimum and maximum.
6. Draw and label the scale on an axis.
7. Plot the five number summary.
8. Sketch a box starting at Q1 to Q3.
9. Sketch a segment within the box to represent the median.
10. Connect the min and max to the box with line segments.

Note: If data contains outliers, a **box and whiskers plot** can be used instead to display the data. In a box and whiskers plot, the outliers are displayed with dots above the value and the segments begin (or end) at the next data value within the outlier interval.

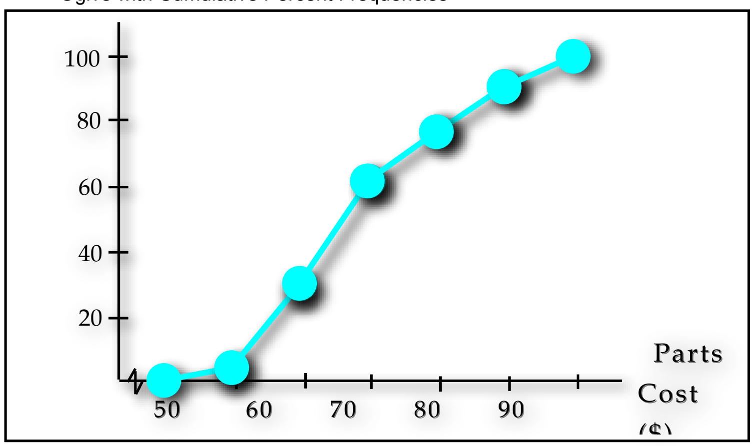
A **pie chart** is a circular chart, divided into sectors, indicating the proportion of each data value compared to the entire set of values. Pie charts are good for categorical data.

A **cumulative frequency plot** of the percentages (also called an **ogive**) can be used to view the total number of events that occurred up to a certain value.

Example: Here is an ogive for Hudson Auto Repair’s cost of parts sold:

Example: Hudson Auto Repair

- Ogive with Cumulative Percent Frequencies



Where is the median of this data?

Patterns and shapes:

Uniform graphs

Symmetric graphs

Some other features

Bell Shaped

Skewed right

Skewed left

2.1 - Counting Techniques

Combinatorics is the study of the number of ways a set of objects can be arranged, combined, or chosen; or the number of ways a succession of events can occur. Each result is called an **outcome**. An **event** is a subset of outcomes. When several events occur together, we have a **compound event**.

The **Fundamental Counting Principle** states that the total number of a ways a compound event may occur is $n_1 \cdot n_2 \cdot n_3 \cdot \ldots \cdot n_i$ where n_1 represents the number of ways the first event may occur, n_2 represents the number of ways the second event may occur, and so on.

Example:
How many ways can you create a pizza choosing a meat and two veggies if you have 3 choices of meats and 4 choices for veggies?

A **permutation** of a set of n objects is an ordered arrangement of the objects.

$${}_{n}P_{n} = n(n-1)(n-2)\ldots.3\cdot 2\cdot 1 = n!$$

$${}_{n}P_{r} = \frac{n!}{(n-r)!}$$

Examples:

In how many ways can 6 people be seated in a row?

In how many ways can 3 of the six symbols, &^%$#@ be arranged?

When we allow repeated values, The number of orderings of n objects taken r at a time, with repetition is n^r.

Example:

In how many ways can you write 4 letters on a tag using each of the letters C O U G A R with repetition?

The number of permutations, P, of *n* objects taken n at a time with *r* objects alike, *s* of another kind alike, and *t* of another kind alike is

$$P = \frac{n!}{r!s!t!}$$

Example:

How many different words (they do not have to be real words) can be formed from the letters in the word MISSISSIPPI?

The number of circular permutations of n objects is $(n-1)!$

Example:

In how many ways can 12 people be seated around a circular table?

A **combination** gives the number of ways of picking *r* unordered outcomes from *n* possibilities. The number of combinations of a set of *n* objects taken *r* at a time is

$$ {}_nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!} $$

Example:

In how many ways can a committee of 5 be chosen from a group of 12 people?

Section 2.2 – Sets and Venn Diagrams

A set is a collection of objects. Two sets are equal if they contain the same elements. Set *A* is a subset of set *B* if every element that is in set *A* is also in set *B*. The notation for this is $A \subseteq B$.

Set *A* is a proper subset of set *B* if every element that is in set *A* is also in set *B* *and* there is at least one element in set *B* that is not in set *A*. The notation for this is $A \subset B$.

The union of *A* and *B*, which is written as $A \cup B$, is the set of all elements that belong either to set *A* or to set *B* (or that belong to both *A* and *B*).

The intersection of *A* and *B*, which is written as $A \cap B$, is the set of all elements that belong to both to set *A* and set *B*. If the intersection of two sets is empty (the empty set is denoted by $\varnothing$, then the sets are disjoint or mutually exclusive and we write $A \cap B = \varnothing$.

The complement of set *A*, which is written as A^c, is the set of all elements that are in the universal set but are not in set *A*.

Examples:

Use the following information to answer the questions:

$\boldsymbol{U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}}$

$\boldsymbol{A = \{1, 2, 5, 6, 9, 10\}}$

$\boldsymbol{B = \{3, 4, 7, 8\}}$

$\boldsymbol{C = \{2, 3, 8, 9, 10\}}$

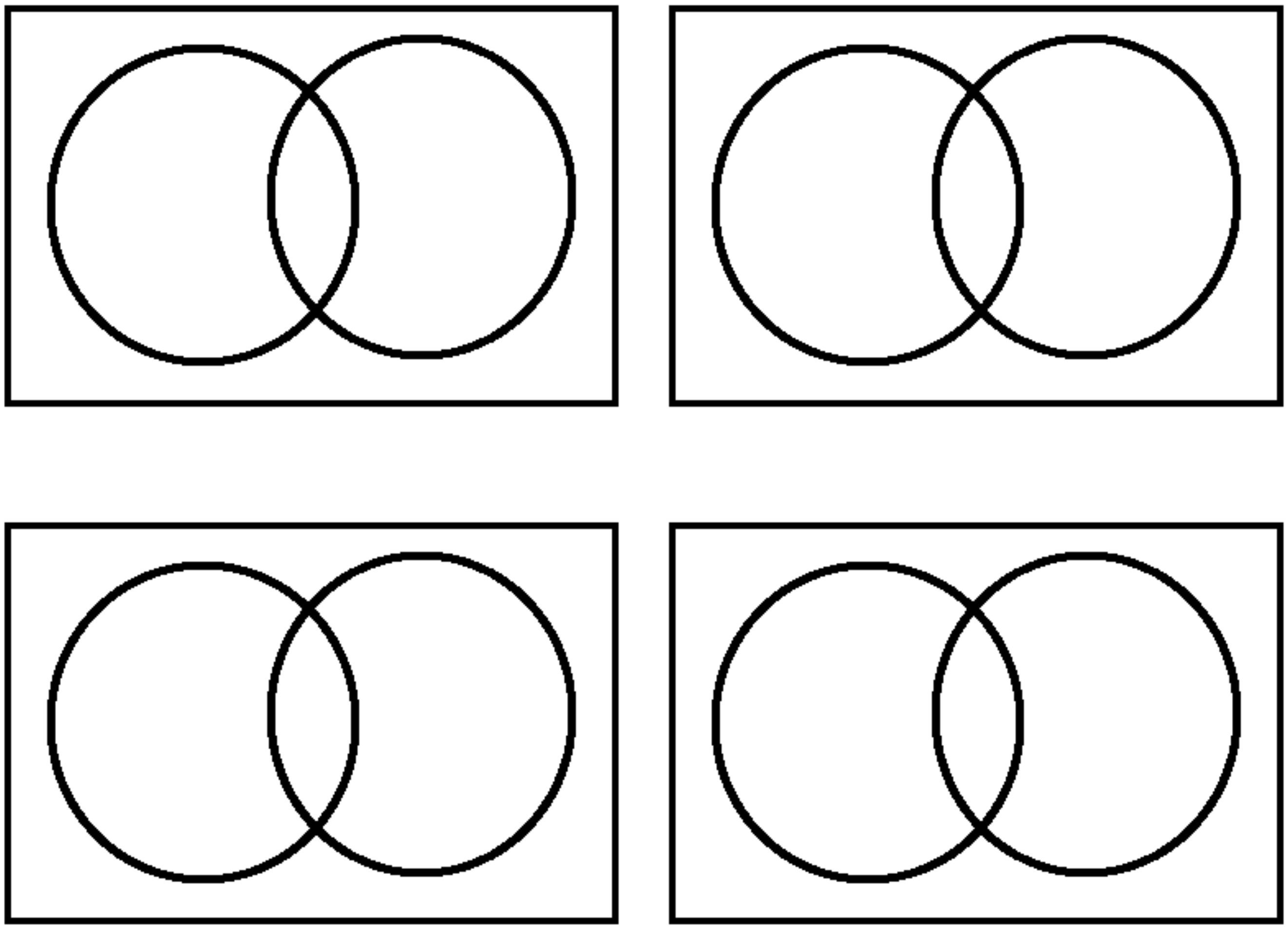
Find:

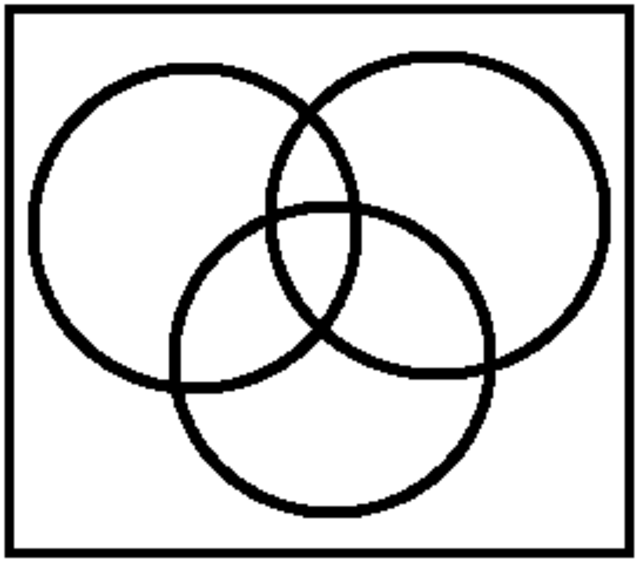
A^c $\qquad$ $A \cup C$ $\qquad$ $A \cap B$ $\qquad$ $A^c \cap C$

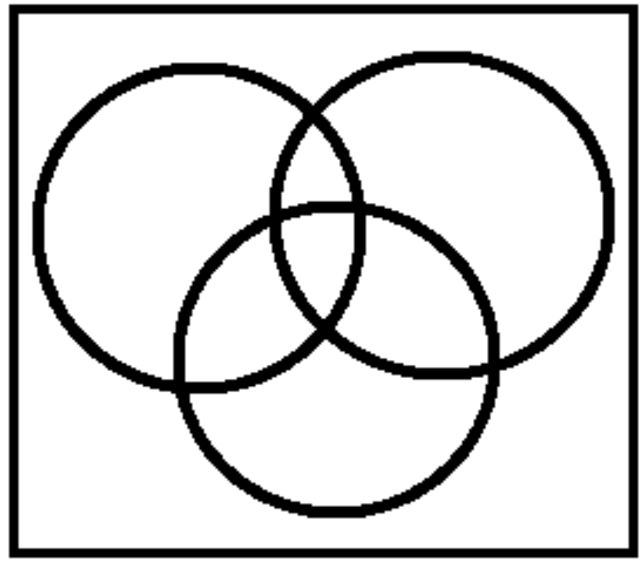
$(B \cup C)^c$ $\qquad$ $A \cap B \cap C$

Venn diagrams can be used to represent sets.

Examples:







Draw a Venn Diagram for the following situation: A group of 100 people are asked about their preference for soft drinks. The results are as follows:

55 Like Coke

25 Like Diet Coke

45 Like Pepsi

15 like Coke and Diet Coke

5 Like all 3 soft drinks

25 Like Coke and Pepsi

5 Only like Diet Coke