

C. Subjective probability

1. Classical and empirical probability are objective because they are based upon long-run observations of repeatable events.
2. Some events occur only once. Probability statements concerning these events are based upon personal beliefs and are called subjective probability.
3. Example: With the economy coming out of a recession, Linda feels there is an 80% chance this year's sales will be up 10%. This is subjective probability because this recession has never happened before.

V. Probability rules

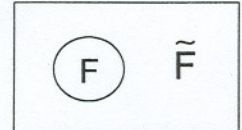
A. Introduction

1. $0 \leq P(A) \leq 1$ is a range for all probability statements. It means that probability can't be negative or greater than one.
2. The **complement** of an event is everything from the sample space that is not the event.
 - a. If F stands for female then \bar{F} , read not F, would be the symbol for male.
 - b. $P(\bar{F}) = 1 - P(F)$
 - c. If 45% of Linda's customers are female, the probability of \bar{F} (male) would be calculated as follows:

$$P(\bar{F}) = 1 - P(F) = 1 - .45 = .55 = 55\%$$

d. **Venn diagrams** are drawings of probability statements.

- 1) A rectangle represents the sample space (everything that can happen).
- 2) A circle represents an event.



3. The page 40 advertising and sales data can each be divided into 2 events.
 - a. Advertising will now be months of less than or equal to \$5,000 and months of greater than \$5,000.
 - b. Sales will now be months of less than or equal to \$50,000 and months of greater than \$50,000.

	Sales	Less than or equal to \$50,000 (≤ 50)	Greater than \$50,000 (> 50)	Totals
Advertising				
Less than or equal to \$5,000 (≤ 5)		4	1	5
Greater than \$5,000 (> 5)		1	4	5
Totals		5	5	10

B. Addition rule for adding two events

1. Addition is used to determine the probability of A or B. It is the **union** of two events.

2. **General rule for addition is** $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.

a. $P(A \text{ and } B)$ is called the **intersection** or **joint probability** because it represents how some outcomes overlap and are common to both events.

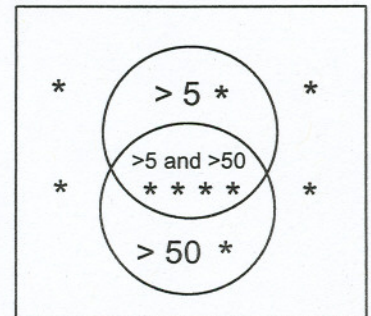
b.

$$P(> 5 \text{ or } > 50)$$

$$P(> 5) + P(> 50) - P(> 5 \text{ and } > 50)$$

$$\frac{5}{10} + \frac{5}{10} - \frac{4}{10} = \frac{6}{10} = \frac{3}{5}$$

Please locate the 6 out of 10 outcomes in the above table and in the Venn diagram to the right.



3. **Special rule for addition**

a. When the two events being combined do not contain common outcomes, there isn't an intersection. These events are **mutually exclusive** because they cannot happen at the same time. When adding mutually exclusive events, there isn't an intersection to subtract.

b.

$$P(A \text{ or } B) = P(A) + P(B)$$

$$P(\leq 5 \text{ or } > 5) = P(\leq 5) + P(> 5)$$

$$= \frac{5}{10} + \frac{5}{10}$$

$$= 1 = 100\%$$

