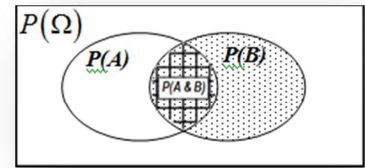


Section 6-4

Conditional Probability

Name: _____

$P(A | B)$ asks that we find the probability of A given that we know B has or already occurred. Using a formula find the probability of A given B can be found using $P(A | B) = \frac{P(A \text{ and } B)}{P(B)}$



CONDITIONAL PROBABILITY



1. Determine the following **conditional** probabilities.

Consider a bag with marbles, 3 blue marbles, 2 red marbles, and 5 green marbles. Three marbles are drawn in sequence and are taken without replacement.

i. $P(\text{2nd draw: blue} | \text{1st draw: red}) =$

Reduced Fraction:

$$\frac{3}{9} = \frac{1}{3}$$

ii. $P(\text{2nd draw: blue} | \text{1st draw: blue}) =$

Reduced Fraction:

$$\frac{2}{9}$$

iii. $P(\text{3rd draw: blue} | \text{1st draw: red, 2nd draw: blue}) =$

Reduced Fraction:

$$\frac{2}{8} = \frac{1}{4}$$

ii. $P(\text{1st draw: blue} | \text{1st draw: red}) =$

Reduced Fraction:

$$0$$

2. Determine the following **conditional** probabilities.

Consider drawing 1 card from a standard deck of shuffled cards:

i. $P(\text{Queen} | \text{Face Card}) =$

Reduced Fraction:

$$\frac{4}{12} = \frac{1}{3}$$

$$\frac{P(A \text{ and } B)}{P(B)} = \frac{\left(\frac{4}{52}\right)}{\left(\frac{12}{52}\right)} = \frac{4}{12} \cdot \frac{52}{52}$$

ii. $P(\text{Ace} | \text{Lettered Card}) =$

Reduced Fraction:

$$\frac{4}{16} = \frac{1}{4}$$

iii. $P(\text{Heart with a Number} | \text{Red Card}) =$

Reduced Fraction:

$$\frac{9}{26}$$

v. $P(\text{number less than 6} | \text{Face Card}) =$

Reduced Fraction:

$$\frac{0}{12} = 0$$

iv. $P(\text{Card with a Letter} | \text{King}) =$

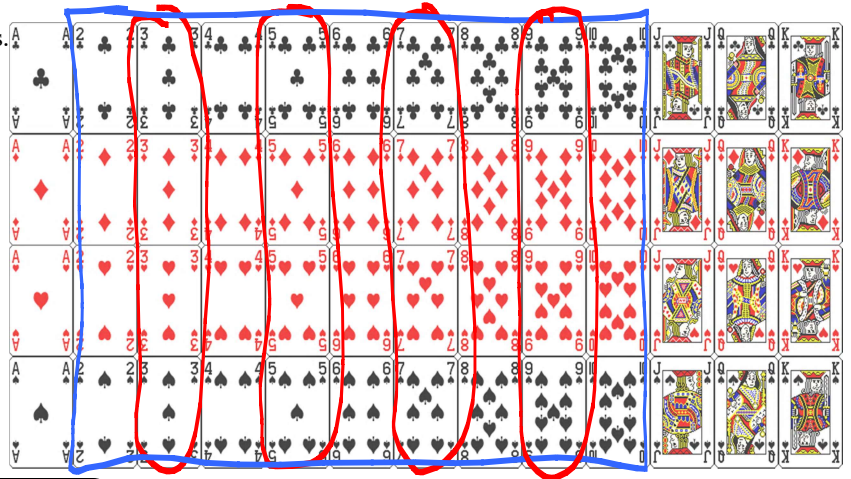
Reduced Fraction:

$$\frac{4}{4} = 1$$

vi. $P(\text{Odd Number} | \text{Numbered Card}) =$

Reduced Fraction:

$$\frac{16}{36} = \frac{4}{9}$$



3. Consider the following table with information about all of the students taking Statistics at Phoenix High School.

A. $P(\text{Full-time} | \text{Male}) =$

Reduced Fraction:

$$\frac{12}{40} = \frac{3}{10}$$

C. $P(\text{Female} | \text{Part-time}) =$

Reduced Fraction:

$$\frac{15}{31} = \frac{15}{31}$$

B. $P(\text{Male} | \text{Full-time}) =$

Reduced Fraction:

$$\frac{12}{40} = \frac{3}{10}$$

D. $P(\text{Full-time} | \text{Part-time}) =$

Reduced Fraction:

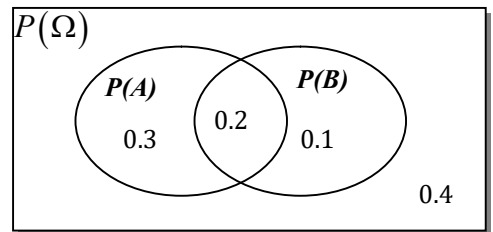
$$\frac{0}{31} = 0$$

	Full-time	Part-Time	Total
Female	28	15	43
Male	12	16	28
Total	40	31	71

4. Given the following VENN Diagram answer the following.

A. $P(A|B) = \frac{0.2}{0.3} = .\overline{6}$

B. $P(B|A) = \frac{0.2}{0.5} = 0.4$



$0.1 + 0.2 = 0.3$

C. $P(A|B') = \frac{0.3}{0.7} \approx 0.429$

D. $P(B|A') = \frac{0.1}{0.5} = 0.2$

5. Given the $P(B) = 0.6$ and $P(A|B) = 0.2$, determine the $P(A \text{ and } B)$.

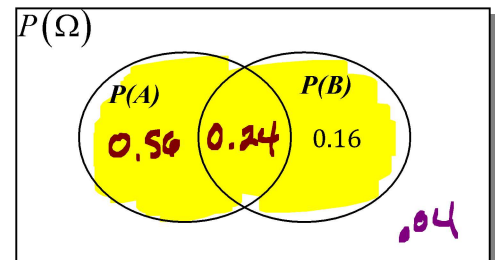
$P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$

$\frac{0.2}{1} \times \frac{x}{0.6}$
 $x = 0.12$

6. Given the VENN Diagram and $P(A) = 0.8$ and $P(B|A) = 0.3$

A. Determine the $P(A \text{ and } B)$

$P(B|A) = \frac{P(B \text{ and } A)}{P(A)}$
 $\frac{0.3}{1} \times \frac{x}{0.8}$
 $x = 0.24$



B. Determine the $P(B)$

$= 0.16 + 0.24$
 $= 0.40$

$y + 0.24 = 0.8$
 $- 0.24 \quad 0.24$
 $y = .56$

$0.56 + 0.24 + 0.16 = .96$
 $1 - .96 = 0.04$

C. Determine the $P(B' \cap A)$

0.56

D. Determine the $P((A \cup B)')$

0.04

7. Also, two events can be determined to be independent if $P(A|B) = P(A)$ and $P(B|A) = P(B)$. Can you explain why?

$\frac{P(A \text{ and } B)}{P(B)} = P(A) \cdot P(B)$

$\frac{P(B \text{ and } A)}{P(A)} = P(B) \cdot P(A)$

$P(A \text{ and } B) = P(A) \cdot P(B) \xleftrightarrow{\text{INDEPENDENT}} P(B \text{ and } A) = P(B) \cdot P(A)$