12-2 Conditional Probability

P(B | A) = Probability of event B, given event A

	Male	Female
Fresh.	3	1
Soph.	5	2
Juniors	6	8
Seniors	3	3

Total 31

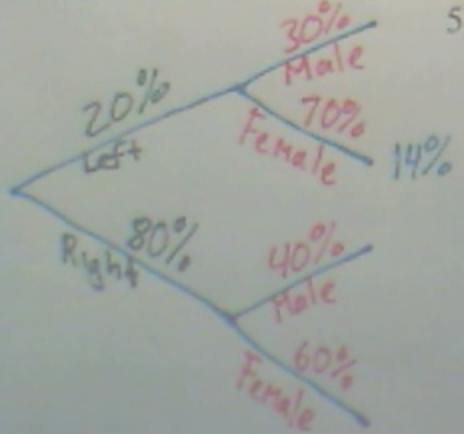
1) P(Male) $\frac{17}{31}$

2) P(Junior | Female) $\frac{8}{14} = \frac{4}{7}$

3) P(Male | Sophomore) $\frac{5}{7}$

4) P(Sophomore | Freshman) $\frac{0}{?}$ 0

Survey: 20% of the people were left-handed, 30% of the left-handed people are males, and 60% of the right-handed people are females.



5) P(male | right-handed) 40%

6) P(left-handed female) $\frac{20}{100} \cdot \frac{70}{100} = \frac{14}{100}$

Left Female

14%

12-4 Standard Deviation

Standard Deviation: How much values in a data set vary (deviate) from the mean.

$$\sigma = \sqrt{\frac{(1^{st}\#-Mean)^2+(2^{nd}\#-Mean)^2+\ldots(Last\#-Mean)^2}{n}},\ n = \#\ of\ terms$$

$Variance = \sigma^2$

1. Standard Deviation:
7, 12, 1, 4

$\frac{7+12+1+4}{4} = \frac{24}{4} = 6$

$\sqrt{\frac{(7-6)^2+(12-6)^2+(1-6)^2+(4-6)^2}{4}}$

$\sqrt{\frac{(1)^2+(6)^2+(-5)^2+(-2)^2}{4}}$

$\sqrt{\frac{1+36+25+4}{4}}$

$\sqrt{\frac{66}{4}} = \sqrt{\frac{33}{2}}$

2. Which of the following set of data will probably have the ***largest*** standard deviation and which will have the ***smallest***?

a) 13, 20, 10, 5, 27, 12
b) 26, 21, 24, 23, 25, 17
c) 10, 15, 30, 41, 2, 1
d) 18, 90, 87, 31

Largest D
Smallest B

3. Variance:
10, 2, 7, 3, 13

$\frac{10+2+7+3+13}{5} = \frac{35}{5} = 7$

$(10-7)^2+(2-7)^2+(7-7)^2+(3-7)^2+(13-7)^2$

$(3)^2+(-5)^2+(0)^2+(-4)^2+(6)^2$

$\frac{9+25+0+16+36}{5}$

$\frac{86}{5}$

7-5 Solving Square Roots

Solve: $\sqrt{2x-3}+7=11$

$-7 \quad -7$

$(\sqrt{2x-3})^2 = (4)^2$

$2x-3 = 16$

$+3 \quad +3$

$\frac{2x}{2} = \frac{19}{2}$

$x = \frac{19}{2}$

$((2x-3)^{\frac{1}{2}})^2 = (4)^2$

$2x-3 = 16$

9-7 Probability of Multiple Events

P(A and B) = P(A) · P(B)

Dependant Events: First event affects the outcome of a second event.

Drawing 2 cards from a deck

$\frac{4}{52} \cdot \frac{3}{51}$

Independent Events: First event does ***not*** affect the outcome of a second event. (Replacement)

Rolling dice or flipping a coin

$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$

Mutually Exclusive Events: Two events ***cannot*** happen at the same time.

P(A or B) = P(A) + P(B)

P(spade or heart) $= \frac{1}{4} + \frac{1}{4}$

Not Mutually Exclusive Events: Two events ***can*** happen at the same time.

P(A or B) = P(A) + P(B) – P(A and B)

P(Black or Ace) $= \frac{1}{2} + \frac{1}{13} - \left(\frac{1}{2} \cdot \frac{1}{13}\right)$

$P(A) = \frac{2}{5}$, $P(B) = 80\%$, $P(C) = 0.20$

$\frac{80}{100} = \frac{4}{5}$ $\frac{20}{100} = \frac{1}{5}$

1) P(A and C)

$P(A) \cdot P(C)$

$\frac{2}{5} \cdot \frac{1}{5} = \frac{2}{25}$

2) P(A or C) if Mutually Exclusive

$P(A) + P(C)$

$\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$

3) P(A or B) if ***not*** Mutually Exclusive

$P(A) + P(B) - P(A \& B)$

$\frac{2}{5} + \frac{4}{5} - \left(\frac{2}{5} \cdot \frac{4}{5}\right)$

$\frac{5}{5} \cdot \frac{6}{5} - \frac{8}{25}$

$\frac{30}{25} - \frac{8}{25} = \frac{22}{25}$

12 Marbles

3 Large Blue Marbles, 2 Large Green Marbles, 2 Small Blue, and 5 Small Green Marbles

4) P(Large or Green)

$\frac{5}{12} + \frac{7}{12} - \frac{2}{12}$

Large Green Lg Green

$\frac{12}{12} - \frac{2}{12} = \frac{10}{12} = \frac{5}{6}$

5) With Replacement:
P(a Blue then a Small)

$\frac{5}{12} \cdot \frac{7}{12} = \frac{35}{144}$

6) Without Replacement:
P(Two Blue)

$\frac{5}{12} \cdot \frac{4}{11} = \frac{20}{132} = \frac{5}{33}$

Blue Blue

7) Without Replacement:
P(a Large then a Small)

$\frac{5}{12} \cdot \frac{7}{11} = \frac{35}{132}$

Lg. Sm.

Exponent Properties

$a^m \cdot a^n = a^{m+n}$ $x^3 \cdot x^2 = (x \cdot x \cdot x)(x \cdot x) = x^5$ $(-5x^3y^5)(6x^2y^7) = -30x^5y^8$

$(a^m)^n = a^{m \cdot n}$ $(x^2)^3 = (x^2)(x^2)(x^2) = x^6$ $3x^7(x^5)^2 = 3x^7 \cdot x^{10} = 3x^{17}$

$\frac{a^m}{a^n} = a^{m-n}$ $\frac{x^5}{x^3} = \frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x} = x^2$ $\frac{6x^6y^8}{9x^3y^7} = \frac{2}{3}x^3y = \frac{2x^3y}{3}$

$a^{-n} = \frac{1}{a^n}$ $\frac{x^2}{x^5} = \frac{x \cdot x}{x \cdot x \cdot x \cdot x \cdot x} = \frac{1}{x^3}$ $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$ $5x^{-4}y = \frac{5y}{x^4}$

$(ab)^n = a^n \cdot b^n$ $(-2x)^3 = (-2x)(-2x)(-2x) = -8x^3$ $(x^5y^{-3})^{-4} = x^{-20}y^{12} = \frac{y^{12}}{x^{20}}$

$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ $\left(\frac{x}{5}\right)^2 = \left(\frac{x}{5}\right)\left(\frac{x}{5}\right) = \frac{x^2}{25}$ $\left(\frac{x^3}{y}\right)^{-5} = \frac{x^{-15}}{y^{-5}} = \frac{y^5}{x^{15}}$

$a^0 = 1$ $\frac{x^2}{x^2} = 1$ $x^0 = 1$ $3x^0 = 3(1) = 3$ $(-5x)^0 = 1$

Exponent Properties

$a^m \cdot a^n = a^{m+n}$	$(a^m)^n = a^{m \cdot n}$	$(ab)^n = a^n \cdot b^n$	$a^0 = 1$

1) $x^3 \cdot x^2 = x^{3+2} = x^5$

$x \cdot x \cdot x \quad x \cdot x$

2) $(-5x^3y^1)(6x^2y^7) = -30x^{3+2}y^{1+7}$

$-30x^5y^8$

4) $(x^2)^3 = x^{2 \cdot 3} = x^6$

$x^2 \cdot x^2 \cdot x^2$

5) $(3x^7)(x^5)^2 = (3x^7)(x^{10}) = 3x^{17}$

6) $(-2x)^3 = (-2)^3(x)^3 = -8x^3$

$(-2x)(-2x)(-2x)$

7) $(x^5y^3)^4 = (x^5)^4(y^3)^4 = x^{20}y^{12}$

8) $5x^2 - 4x^2y + 1x^2 - 6x^2y$

$6x^2 - 10x^2y$

9) $(3x^5)(-1y^2)(6x^3y^1) - (-7y^6)(1x^2y^1)$

$(-18x^8y^3) - (-7x^2y^7)$

$-18x^8y^3 + 7x^2y^7$

10) $2(-3x^6y^2)^2(xy^4)^3$

$2(-3)^2(x^6)^2(y)^2(x)^3(y^4)^3$

$\cdot 9 \quad x^{12} \quad y^2 \quad x^3 \quad y^{12}$

$18x^{15}y^{14}$

Radical Expressions and Rational Exponents

$x^{a/b} = \sqrt[b]{x^a} = \left(\sqrt[b]{x}\right)^a$

Radical Notation: $\sqrt[b]{x^a}$

Rational Exponent Notation: $x^{a/b}$

1. Simplify and rewrite in radical notation: $x^{4/6}$

$x^{2/3} = \sqrt[3]{x^2} = \left(\sqrt[3]{x}\right)^2$

2. Simplify and rewrite in rational exponent notation: $\sqrt[4]{x^{10}}$

$\sqrt[4]{x^{10}} = x^{10/4} = x^{5/2}$

3. Simplify: $36^{-3/2}$

$(6^2)^{-3/2}$

$\frac{2}{1} \cdot \left(\frac{-3}{2}\right) = -3$

$6^{-3} = \frac{1}{6^3}$

$\frac{1}{216}$

Radical Expressions and Rational Exponents

$$x^{a/b} = \sqrt[b]{x^a} = \left(\sqrt[b]{x}\right)^a$$

Radical Notation: $\sqrt[b]{x^a}$

Rational Exponent Notation: $x^{a/b}$

1. Simplify and rewrite in radical notation: $x^{4/6}$

$x^{2/3} = \sqrt[3]{x^2}$

$\left(\sqrt[3]{x}\right)^2$

2. Simplify and rewrite in rational exponent notation: $\sqrt[4]{x^{10}}$

$\sqrt[4]{x^{10}} = x^{10/4} = x^{5/2}$

3. Simplify: $36^{-3/2}$

$(6^2)^{-3/2}$

$6^{2\left(\frac{-3}{2}\right)} = 6^{-3}$

$\frac{1}{6^3} = \frac{1}{216}$