

## 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)  $P(\text{Male})$

$$\frac{17}{31}$$

2)  $P(\text{Junior} | \text{Female})$

$$\frac{8}{14} = \frac{4}{7}$$

3)  $P(\text{Male} | \text{Sophomore})$

$$\frac{5}{7}$$

4)  $P(\text{Sophomore} | \text{Freshman})$

$$\frac{0}{7} = \boxed{0}$$

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)  $P(\text{male} | \text{right-handed})$

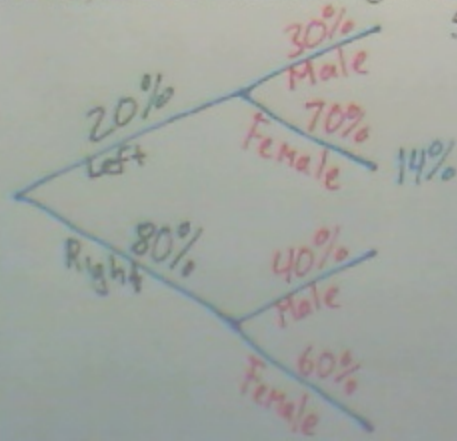
$$40\%$$

6)  $P(\text{left-handed female})$

$$\frac{20}{100} \cdot \frac{70}{100} = \frac{14}{100}$$

Left Female

14%



## 12-4 Standard Deviation

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

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

$$\text{Variance} = \sigma^2$$

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  A

Smallest  B

3. Variance:

10, 2, 7, 3, 13

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

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

$$9 + 25 + 0 + 16 = 40$$

$$\frac{40}{5} = 8$$

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

$$\frac{86}{5}$$

### 7-5 Solving Square Roots

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

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

$$2x-3 = 16$$

$$2x = 19$$

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

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

$$2x-3 = 16$$

## 9-7 Probability of Multiple Events

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

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.

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

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

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

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

$$P(\text{Black or Ace}) = \frac{1}{2} + \frac{1}{13} - \left(\frac{1}{26}\right)$$

$$P(A) = \frac{2}{5}, P(B) = \frac{80}{100} = \frac{4}{5}, P(C) = 0.20 = \frac{20}{100} = \frac{1}{5}$$

1) P(A and C)

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

$$\frac{2}{5} \cdot \frac{1}{5} = \left(\frac{2}{25}\right)$$

2) P(A or C) if Mutually Exclusive

$$P(A) + P(C)$$

$$\frac{2}{5} + \frac{1}{5} = \left(\frac{3}{5}\right)$$

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

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

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

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

$$\frac{30}{25} - \frac{8}{25} = \left(\frac{22}{25}\right)$$

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

$$\frac{12}{12} - \frac{2}{12} = \frac{10}{12} \left( \frac{5}{6} \right)$$

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

$$a^m \cdot a^n = a^{m+n} \quad x^3 \cdot x^2 = (\cancel{x} \cdot \cancel{x} \cdot \cancel{x})(x \cdot x) = x^5 \quad (-5x^3y^4)(6x^2y^7) = -30x^5y^8$$

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

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

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

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

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

$$a^0 = 1 \quad \frac{x^2}{x^2} = 1 \quad x^0 = 1 \quad 3x^0 = 3(1) = 3 \quad (-5x^7)^0 = 1$$

# 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 · x · x · x · 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 · x^2 · 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)

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

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

6x^2 - 10x^2y

$$9) (3x^5)(-4y^2)(6x^3y^4) - (-7y^6)(x^2y^9)$$

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

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

$$10) 2(-3x^6y^2)^2(xy^5)^3$$

2(-3)^2(x^6)^2(y^2)^2(x)^3(y^5)^3

· 9 · x^{12} · y^4 · x^3 · y^{15}

18x^{15}y^{19}



## Radical Expressions and Rational Exponents

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

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

1. Simplify and rewrite in

radical notation:  $x^{4/6}$

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

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

2. Simplify and rewrite in rational exponent notation:

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

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

$$(6^2)^{-3/2} \\ \frac{12 \cdot (-3)}{1} = -3$$

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

$$\frac{1}{216}$$

## Radical Expressions and Rational Exponents

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

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

1. Simplify and rewrite in

radical notation:  $x^{4/6}$

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

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

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

2. Simplify and rewrite in  
rational exponent notation:

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

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

$$(6^2)^{-3/2}$$
$$6^{2(-3/2)} = 6^{-3}$$
$$\frac{1}{6^3} = \frac{1}{216}$$