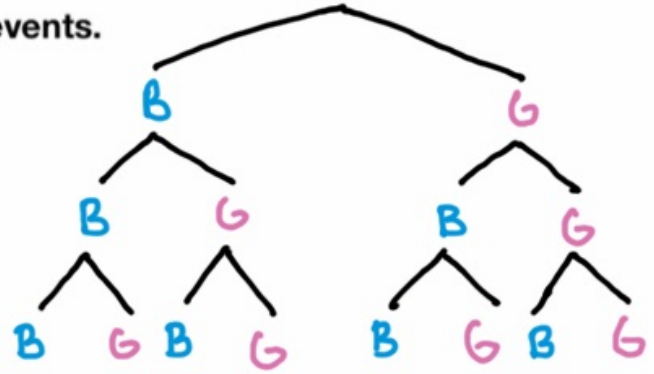
Math II | Independent and Dependent Events | Part 2

Suppose that a married couple will have 3 children and suppose that having a boy or girl is equally likely each time. Consider the following events.

A: At least 2 consecutive children are of the same gender.

B: Exactly 2 consecutive children are of the same gender.

C: No 2 consecutive children are of the same gender.



For each pair of events, determine if the events are independent.

A and *B* {BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG}

A and *C* {BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG}

B and *C* {BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG}

$P(A \cap B) = P(A) \cdot P(B)$ Dependent

$\frac{4}{8} = \frac{6}{8} \cdot \frac{4}{8} \rightarrow \frac{1}{2} \neq \frac{3}{8}$

$P(A \cap C) = P(A) \cdot P(C)$ Dependent

$\frac{0}{8} = \frac{6}{8} \cdot \frac{2}{8} \rightarrow 0 \neq \frac{3}{16}$

$P(B \cap C) = P(B) \cdot P(C)$ Dependent

$\frac{0}{8} = \frac{4}{8} \cdot \frac{2}{8} \rightarrow 0 \neq \frac{1}{8}$

Gamestop hired a consultant That surveyed 535 people who played four particular video games.

The survey indicated the following

A= Super Squish Ball Hamster Extreme Zero
B= Flabby Birds: Hit the Gym
C= Learning is Fun!
D= 8-ball pool (Get a life ed)

- 35% liked the game Super Squish Ball Hamster Extreme Zero.
- 61% liked the game Flabby Birds: Hit the Gym!
- 18% liked the game Learning is Fun! AND Eight-Ball Pool (Get a Life Edition)
- 58% Liked the game Learning is Fun!

Assume all "liking" of each game is INDEPENDENT and answer the questions below. State your answers as percents and show ALL work!

1. What is the Probability someone liked **Super Squish Ball Hamster Extreme Zero** *AND* **Flabby Birds: Hit the Gym!**

$P(A \cap B) = P(A) \cdot P(B) \rightarrow P(A \cap B) = (0.35)(0.61) = 0.2135$ or 21.35%

2. What is the Probability someone liked **Eight-Ball Pool (Get a Life Edition)?**

$P(C \cap D) = P(C) \cdot P(D) \rightarrow 0.18 = 0.58 \cdot P(D)$

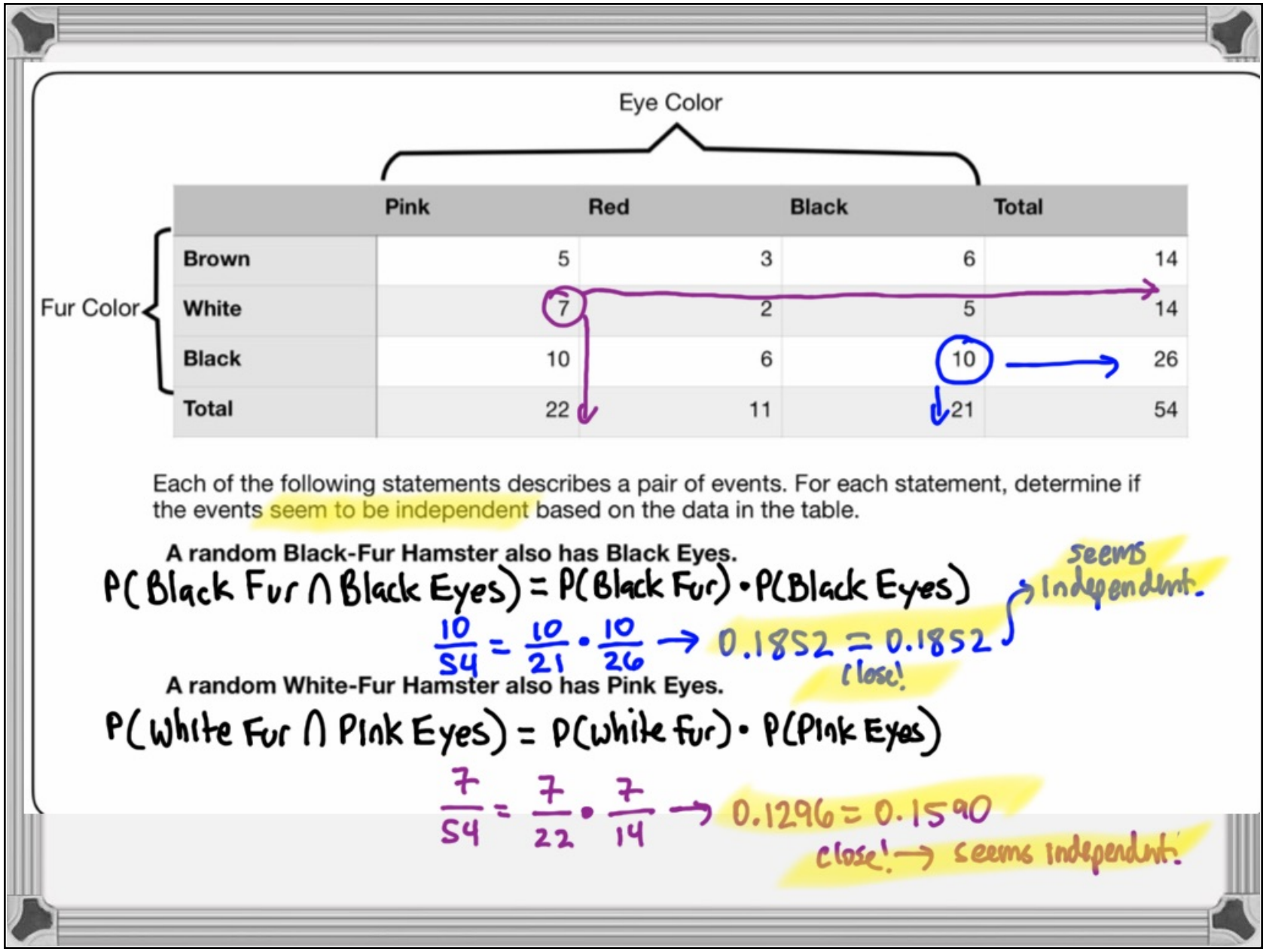
$P(D) = \frac{0.18}{0.58} = 0.3103$ or 31.03%

3. What is the Probability someone liked **Learning is Fun!** *OR* **Eight-Ball Pool (Get a Life Edition)?**

$P(C \cup D) = P(C) + P(D) - P(C) \cdot P(D)$

$P(C \cup D) = 0.58 + 0.3103 - (0.58)(0.3103)$

$P(C \cup D) = 0.7103$ or 71.03%



Eye Color

Fur Color	Pink	Red	Black	Total
Brown	5	3	6	14
White	7	2	5	14
Black	10	6	10	26
Total	22	11	21	54

Each of the following statements describes a pair of events. For each statement, determine if the events seem to be independent based on the data in the table.

A random Black-Fur Hamster also has Black Eyes.

$P(\text{Black Fur} \cap \text{Black Eyes}) = P(\text{Black Fur}) \cdot P(\text{Black Eyes})$

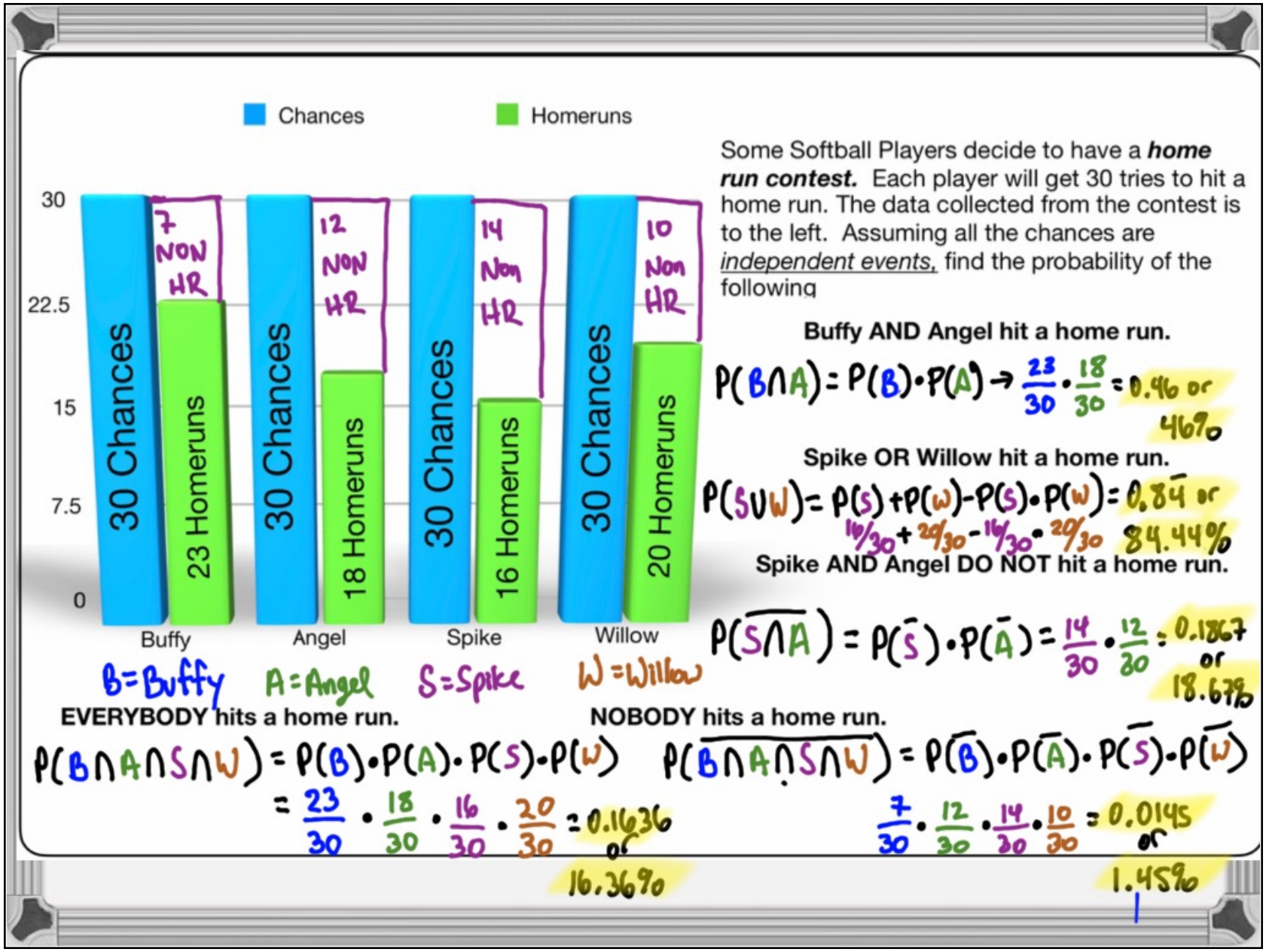
$\frac{10}{54} = \frac{10}{21} \cdot \frac{10}{26} \rightarrow 0.1852 = 0.1852$ (close!) → seems independent.

A random White-Fur Hamster also has Pink Eyes.

$P(\text{White Fur} \cap \text{Pink Eyes}) = P(\text{white fur}) \cdot P(\text{Pink Eyes})$

$\frac{7}{54} = \frac{7}{22} \cdot \frac{7}{14} \rightarrow 0.1296 = 0.1590$

close! → seems independent.


Chances
Homeruns
30
22.5
15
7.5
0
30 Chances
23 Homeruns
7 NON HR
30 Chances
18 Homeruns
12 NON HR
30 Chances
16 Homeruns
14 Non HR
30 Chances
20 Homeruns
10 Non HR
Buffy
Angel
Spike
Willow
B=Buffy
A=Angel
S=Spike
W=Willow
Some Softball Players decide to have a **home run contest.** Each player will get 30 tries to hit a home run. The data collected from the contest is to the left. Assuming all the chances are *independent events,* find the probability of the following
Buffy AND Angel hit a home run.
$P(B \cap A) = P(B) \cdot P(A) \rightarrow \frac{23}{30} \cdot \frac{18}{30} = 0.46$ or 46%
Spike OR Willow hit a home run.
$P(S \cup W) = P(S) + P(W) - P(S) \cdot P(W) = 0.8\bar{4}$ or 84.44%
$\frac{16}{30} + \frac{20}{30} - \frac{16}{30} \cdot \frac{20}{30}$
Spike AND Angel DO NOT hit a home run.
$P(\overline{S \cap A}) = P(\bar{S}) \cdot P(\bar{A}) = \frac{14}{30} \cdot \frac{12}{20} = 0.1867$ or 18.67%
EVERYBODY hits a home run.
$P(B \cap A \cap S \cap W) = P(B) \cdot P(A) \cdot P(S) \cdot P(W)$
$= \frac{23}{30} \cdot \frac{18}{30} \cdot \frac{16}{30} \cdot \frac{20}{30} = 0.1636$ or 16.36%
NOBODY hits a home run.
$P(\overline{B \cap A \cap S \cap W}) = P(\bar{B}) \cdot P(\bar{A}) \cdot P(\bar{S}) \cdot P(\bar{W})$
$\frac{7}{30} \cdot \frac{12}{30} \cdot \frac{14}{30} \cdot \frac{10}{30} = 0.0145$ or 1.45%