Math-2

Lesson 8-8

-Tree Diagrams

-Venn Diagrams

-Logical word “AND”

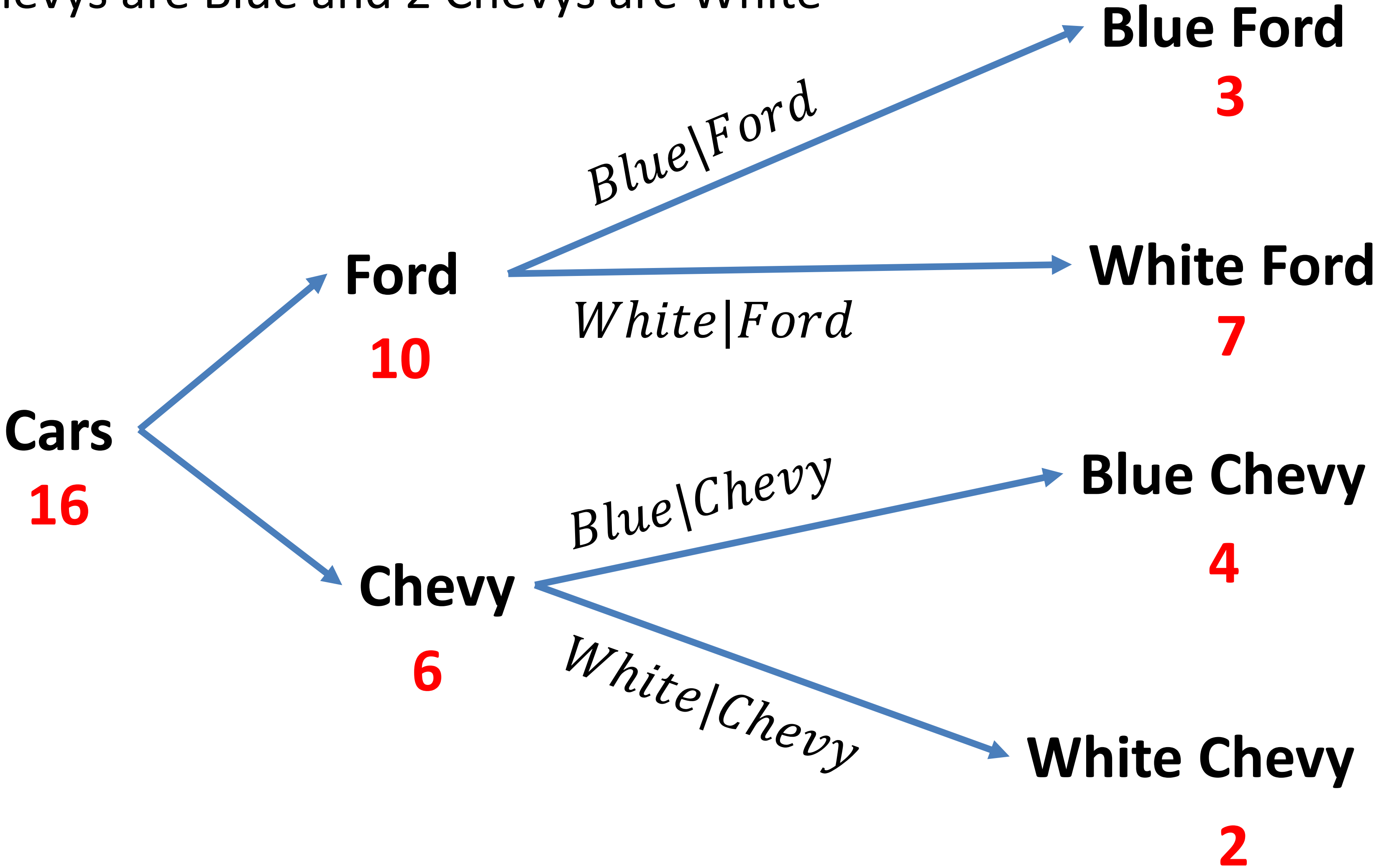
-Logical word “OR”

-Probability of Sequential Events

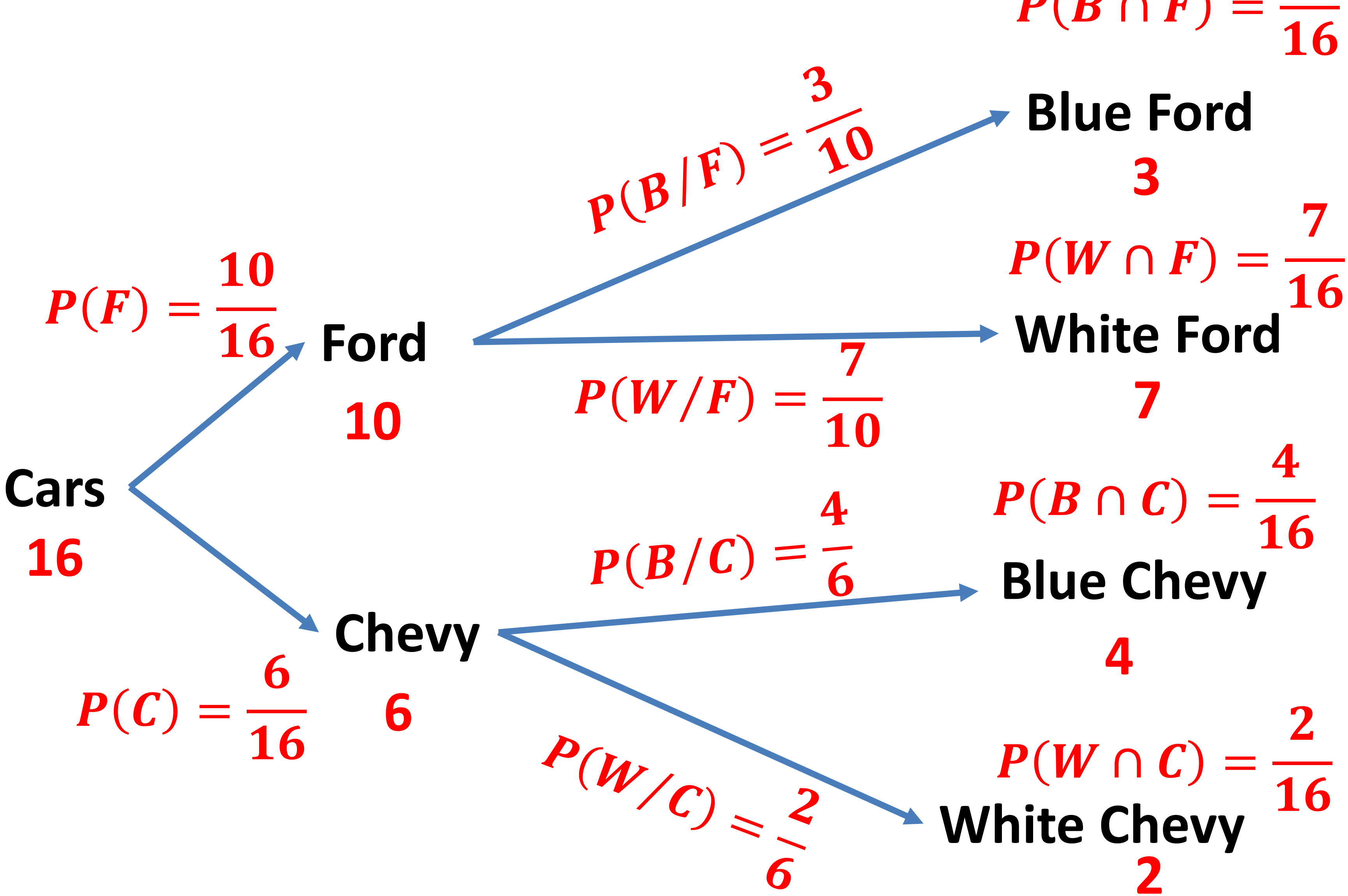
A car dealer has 16 cars. 10 are Fords and 6 are Chevys.

3 Fords are Blue and 7 Fords are White

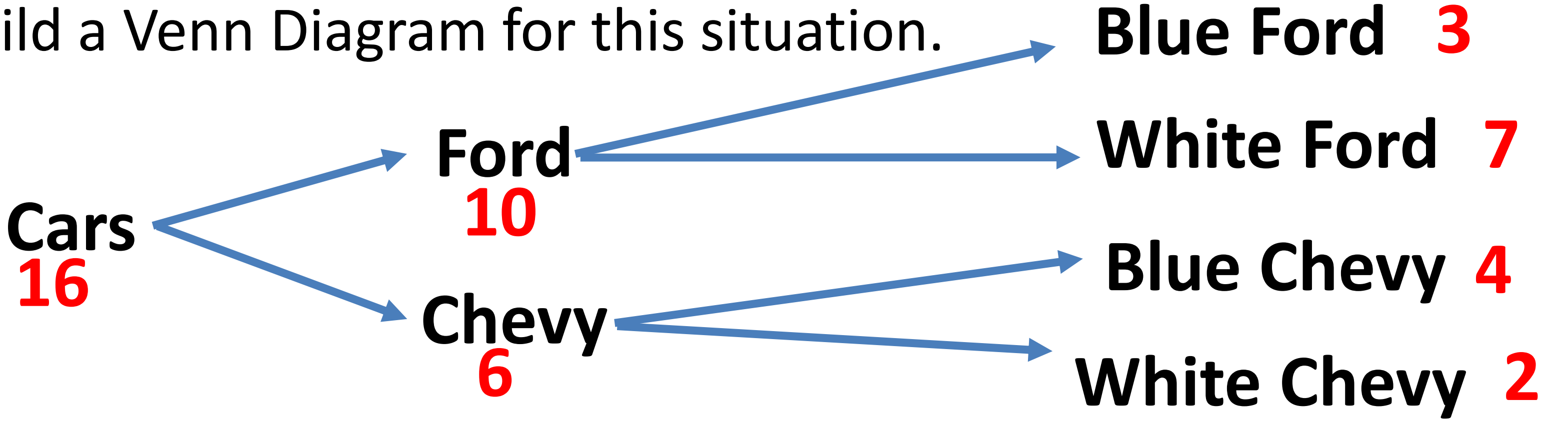
4 Chevys are Blue and 2 Chevys are White

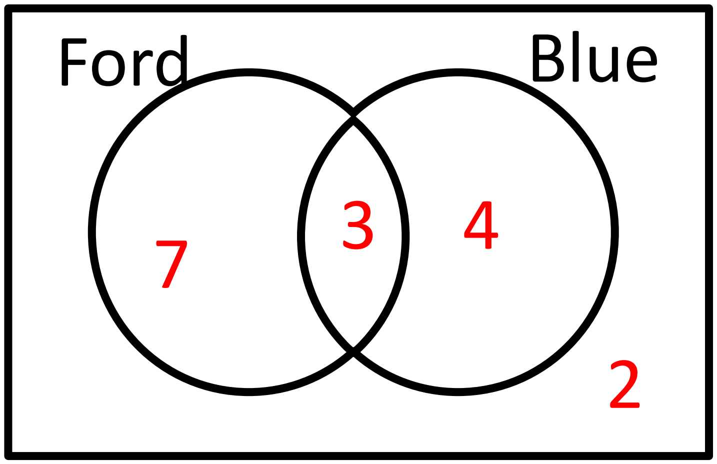


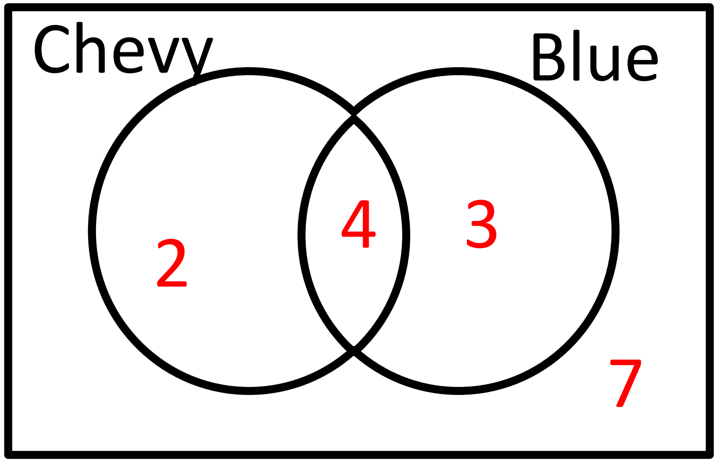
Find the probability for each path in the table.

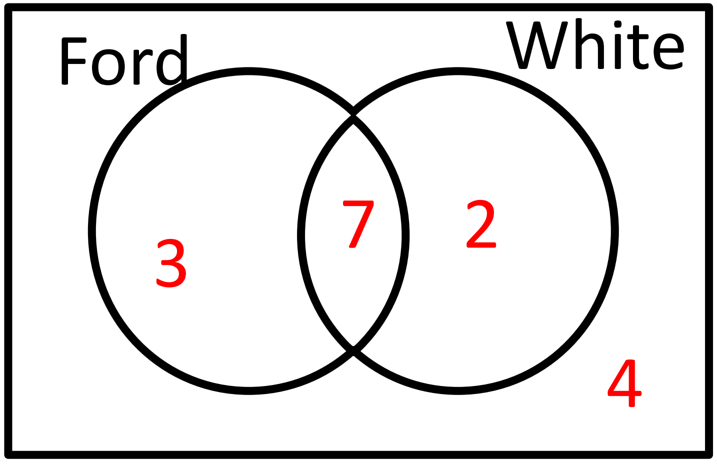


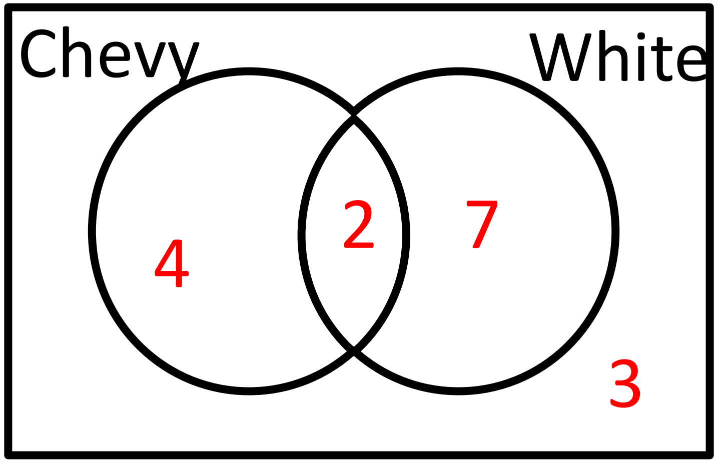
Build a Venn Diagram for this situation.





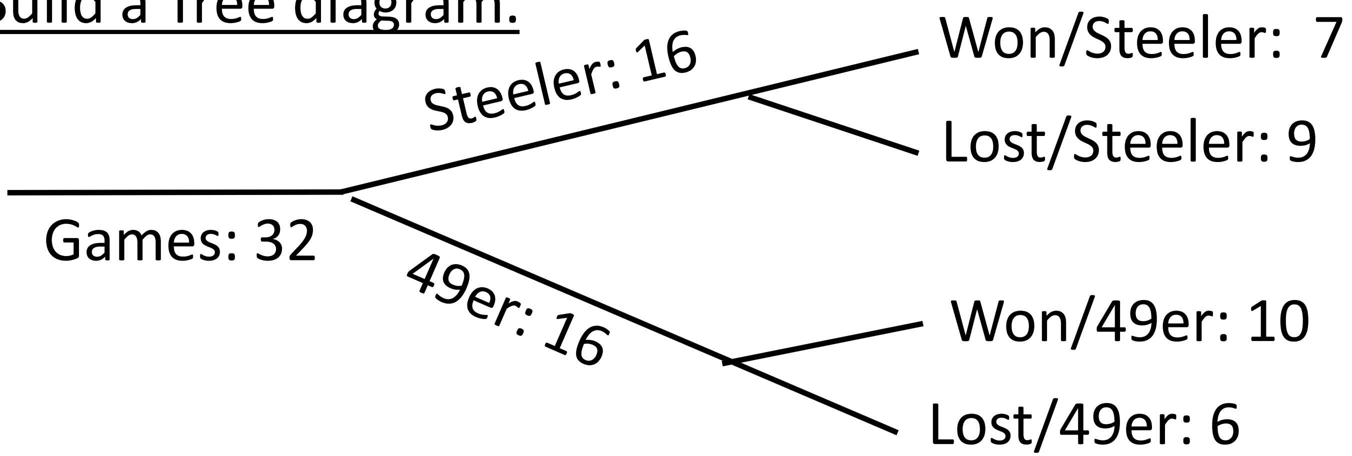


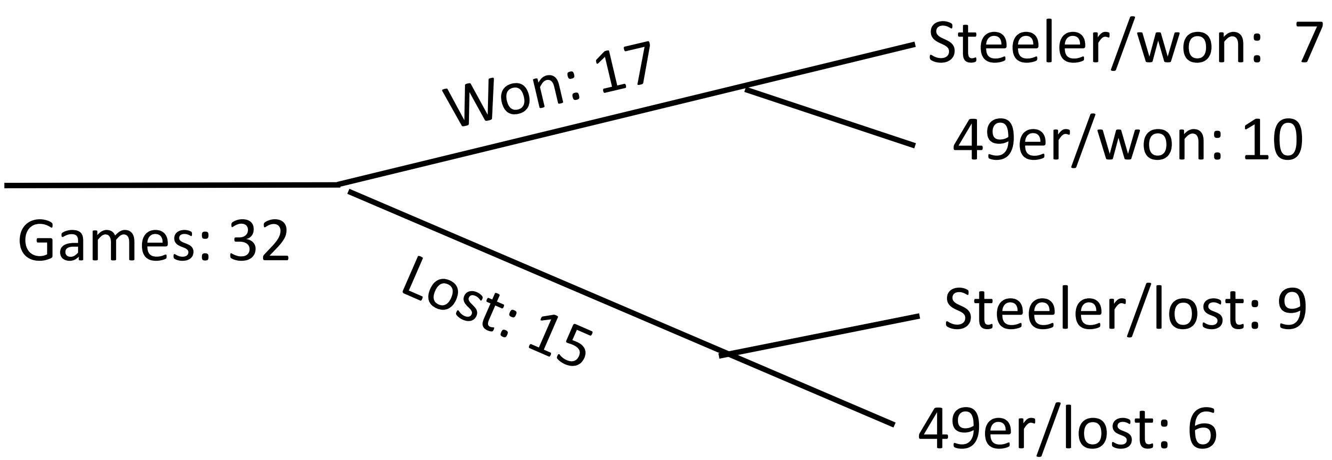




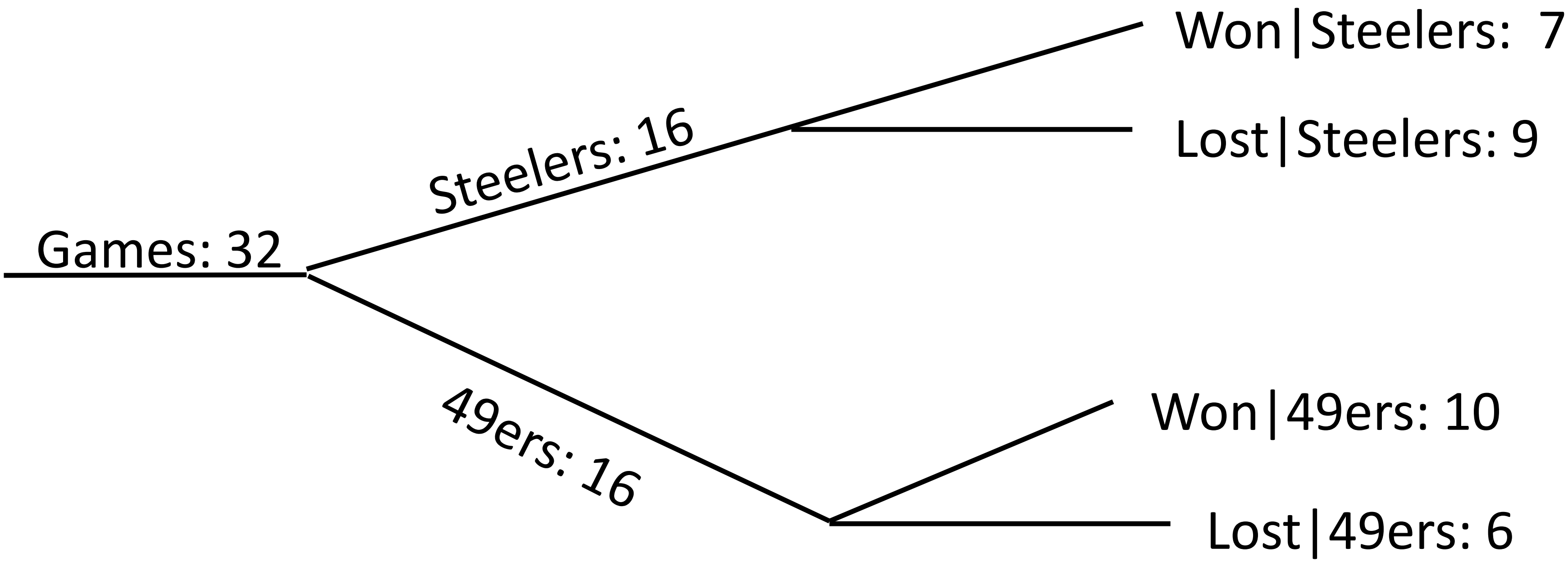
32 games were played by the Steelers and 49ers. They each played 16 games. The Steelers won 7 and lost 9. The 49ers won 10 and lost 6.

Build a Tree diagram.



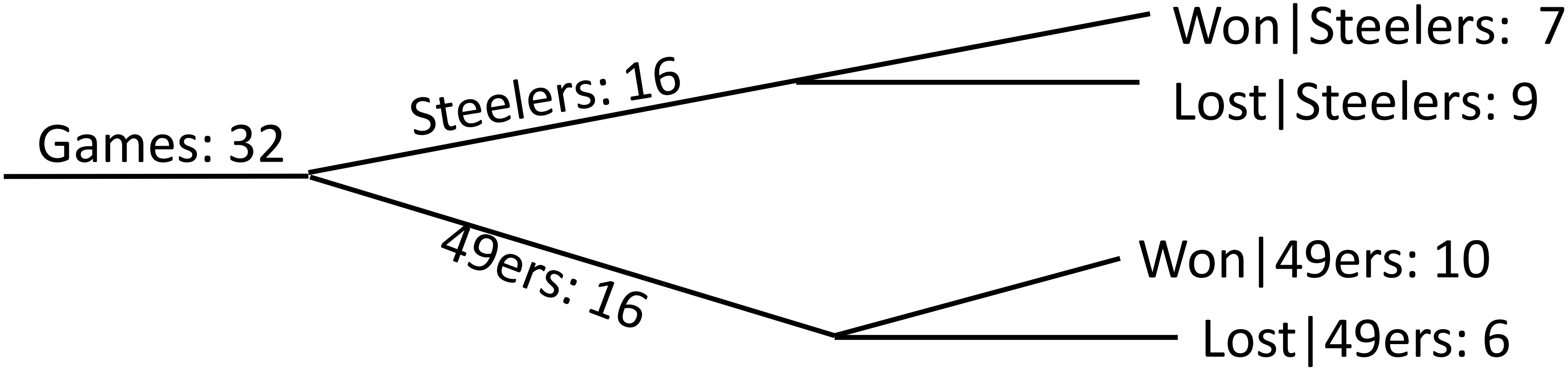


We can build it either way. Which way do you think is better?



Find:

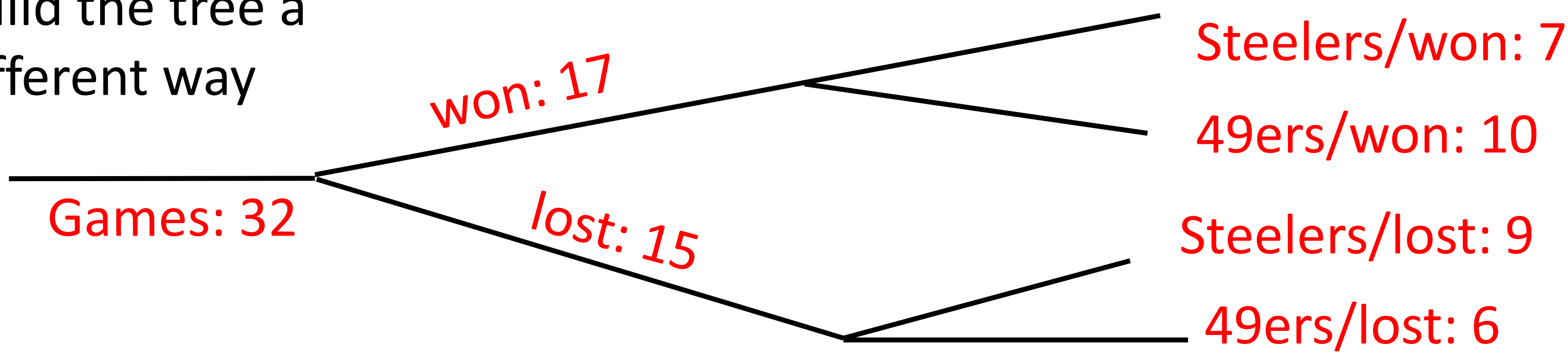
1. $P(Lost \cap Steelers) = \frac{9}{32}$
2. $P(49ers) = \frac{16}{32}$
3. $P(Won|Steelers) = \frac{7}{16}$
4. $P(Won|49ers) = \frac{10}{16}$
5. $P(Won) = \frac{17}{32}$
6. $P(Won \cap 49ers) = \frac{10}{32}$



Build a 2-way table

	Won	Lost	Totals
Steelers	7	9	16
49ers	10	6	16
Totals	17	15	32

Build the tree a different way



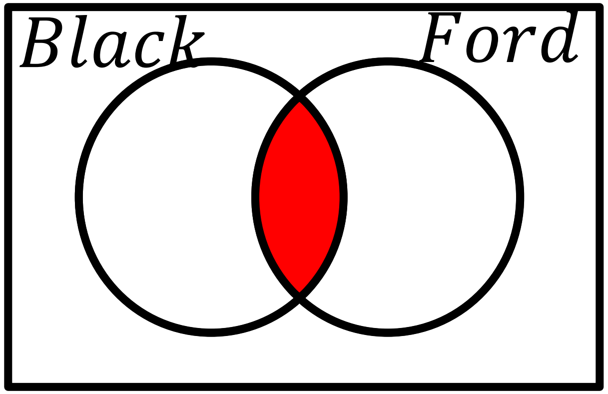
Logical Words

<u>AND</u> Comes up in many contexts:

(1) Inequalities $x > 5\ AND\ x < 8$

(2) 2-Way Tables $B \cap F \rightarrow Black\ AND\ Ford$

(3) Venn Diagrams



<u>AND</u> means <u>both conditions must be met</u>

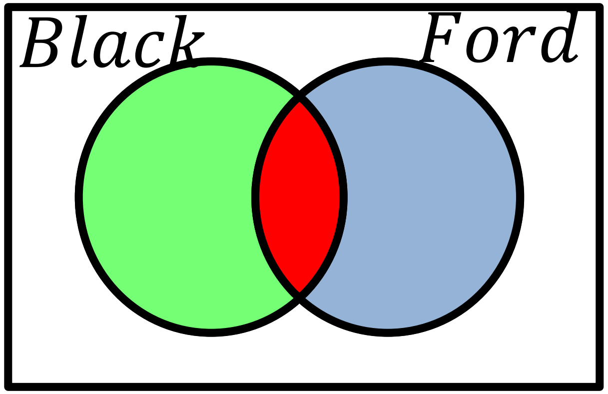
Logical Words

<u>OR</u> Comes up in many contexts:

(1) Inequalities $x < 2 \; OR \; x > 7$

(2) 2-Way Tables $B \cup F \;\; \rightarrow Black \; OR \; Ford$

(3) Venn Diagrams



<u>OR</u> means <u>if the group meets one of the two conditions</u> then that group is included.

How many cars are Fords or Black? $3 + 8 + 4 = 15$

How many cars are Fords or not black? $3 + 8 + 2 = 13$

How many cars are not Fords or black? $4 + 2 + 3 = 9$

How many cars are not Fords or not black? $4 + 2 + 8 = 14$

	Ford	Not Ford	**Totals**
Black	3	4	7
Not Black	8	2	10
Totals	11	6	17

The symbol for OR is "U"

Find:

1. $P(Ford \cup Black) = \frac{15}{17}$
2. $P(\bar{F} \cup \bar{B}) = \frac{14}{17}$
3. $P(F \cap \bar{B}) = \frac{8}{17}$
4. $P(F / B) = \frac{3}{7}$

Sequential Events (one event followed by another event):

$(Coin\ toss){:}\ \ P(H\ and\ H)$

For sequential events AND means multiply (the individual probabilities).

$(Coin\ toss){:}\ \ P(H\ and\ H) = P(H) * P(H) = \frac{1}{2} * \frac{1}{2} = \frac{1}{4}$

$(Coin\ toss){:}\ \ P(H\ and\ H\ and\ T)$

For sequential events AND means multiply (the individual probabilities).

$(Coin\ toss){:}\ \ P(H\ and\ H\ and\ T) = P(H) * P(H) * P(T)$

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

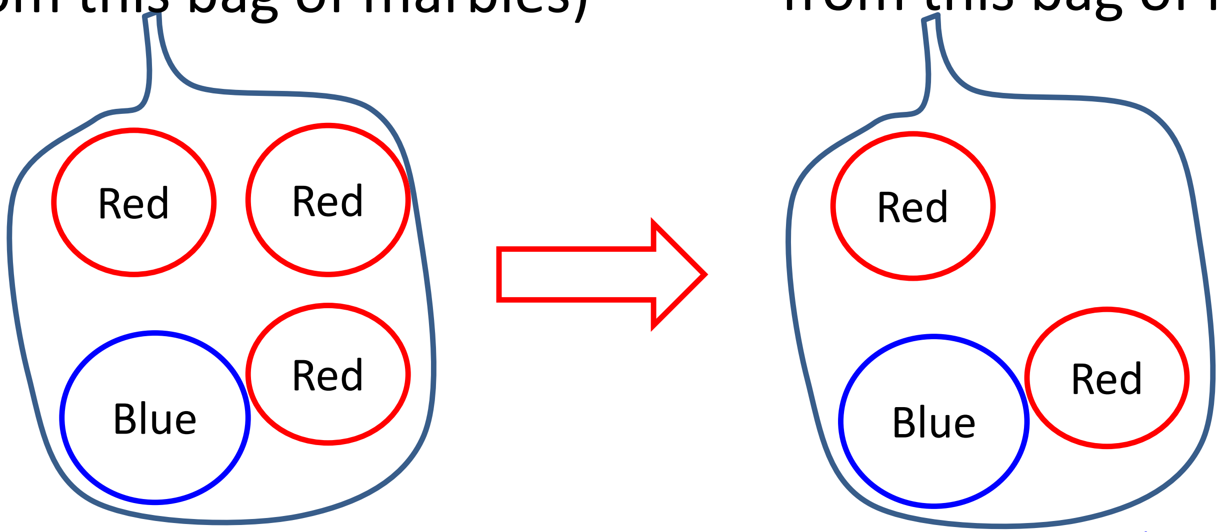
Tossing coins → The two events are independent (determining what the second probability is does not depend upon what happened in the first event).

Calculate the probability of drawing a Red marble followed by a blue marble without replacement.

The probability of the second event depends upon the first event → since there will be one fewer red marble when we pick the second marble. We say the second is NOT independent of the 1st event.

1st event Pick a Red marble from this bag of marbles)

2nd event Pick a blue marble from this bag of marbles)



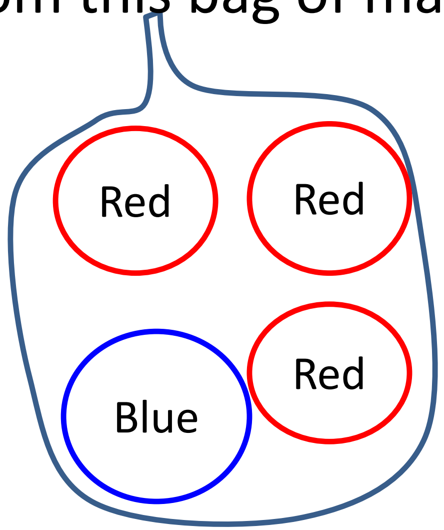
$$P(R) = \frac{3}{4}$$

$$P(B/R) = \frac{1}{3}$$

$$P(R\ and\ \boldsymbol{B}) = P(R) * P(B/R) = \frac{3}{4} * \frac{1}{3} = \frac{1}{4}$$

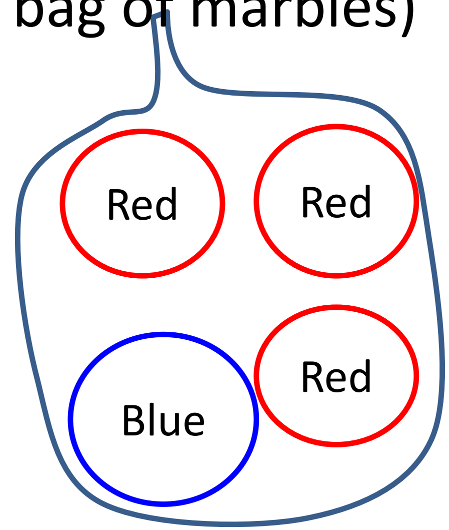
Calculate the probability of picking a red marble followed by a blue marble with replacement.

1st event Pick a Red marble from this bag of marbles



Replace the red marble

2nd event Pick a blue marble from this bag of marbles)



$$P(R\ and\ \boldsymbol{B}) = P(R) * P(B/R) = \frac{3}{4} * \frac{1}{4} = \frac{3}{16}$$

The second event DOES NOT depend upon the first event→ independent.

Sequential Events (one event followed by another event):

$(drawing\ cards)$: $P(K\ and\ K)$ (without replacement)

Are these independent events?

NO. There will be one fewer king (card) in the deck for the second event.

$$P(K\ and\ K) = P(K) * P(K\ /\ K) \quad = \frac{4}{52} * \frac{3}{51}$$

$(drawing\ cards)$: $P(Q\ and\ Q)$ (with replacement)

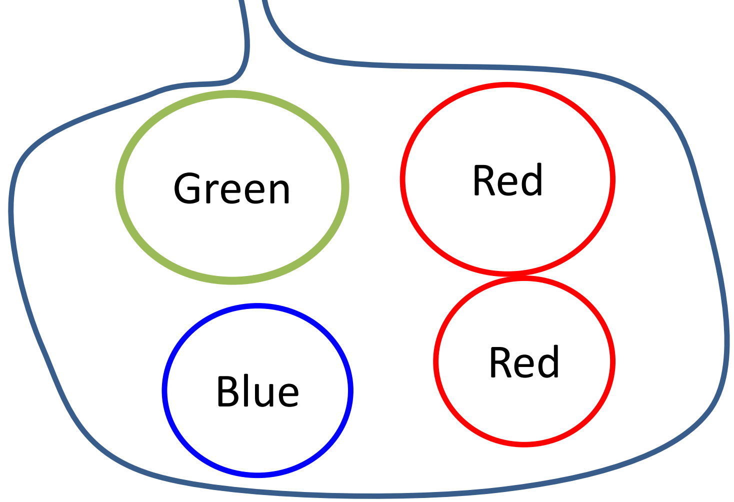
Are these independent events?

YES. There will be the same number of cards to choice from in both the 1st and 2nd events.

$$P(Q\ and\ Q) = P(Q) * P(Q\ /\ Q) \quad = \frac{4}{52} * \frac{4}{52}$$

Replacement→ The two events are independent (determining what the second probability is does not depend upon what happened in the first event).

(Bag of marbles)



For probabilities <u>OR</u> means add (the individual probabilities).

$$P(R \text{ or } \boldsymbol{B}) = P(R) + P(B) = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$$

$$P(\mathrm{G} \cup \mathrm{R}) = P(G) + P(R) = \frac{1}{4} + \frac{2}{4} = \frac{3}{4}$$

$$P(B \cup G) = P(B) + P(G) = \frac{1}{4} + \frac{1}{4} = \frac{2}{4}$$

$$P(\mathrm{B} \cap \mathrm{G}) = P(B) * P(G)$$

$$= \frac{1}{4} * \frac{1}{3} = \frac{1}{12}$$ W/o “rplcmnt”

$$= \frac{1}{4} * \frac{1}{4} = \frac{1}{16}$$ W/ “rplcmnt”