# Math-2

Lesson 8-8

-Tree Diagrams

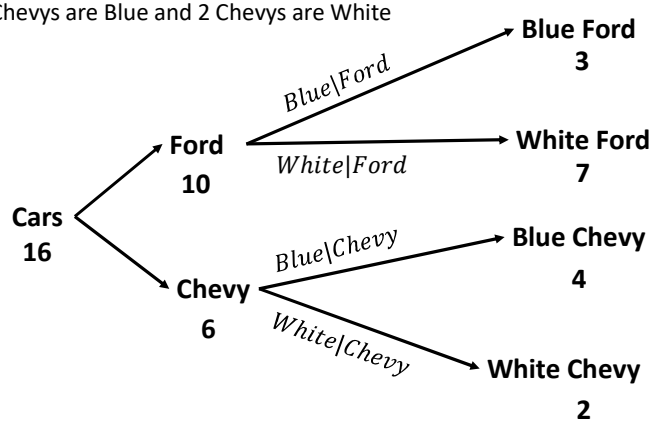
-Venn Diagrams

-Logical word "AND"

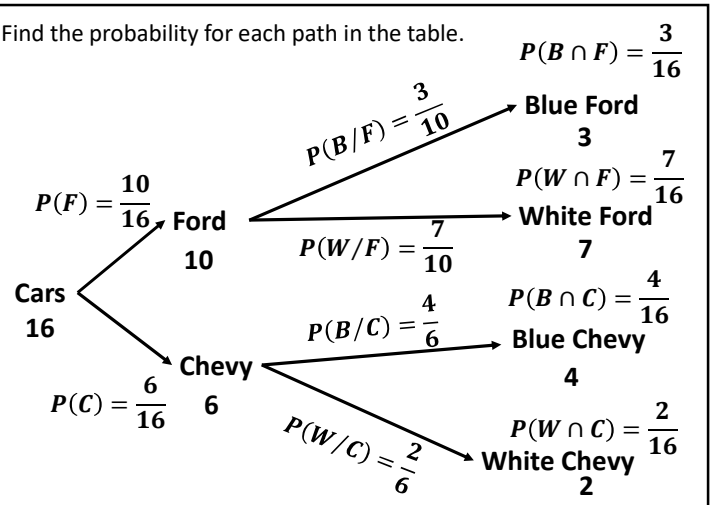
-Logical word "OR"

-Probability of Sequential Events

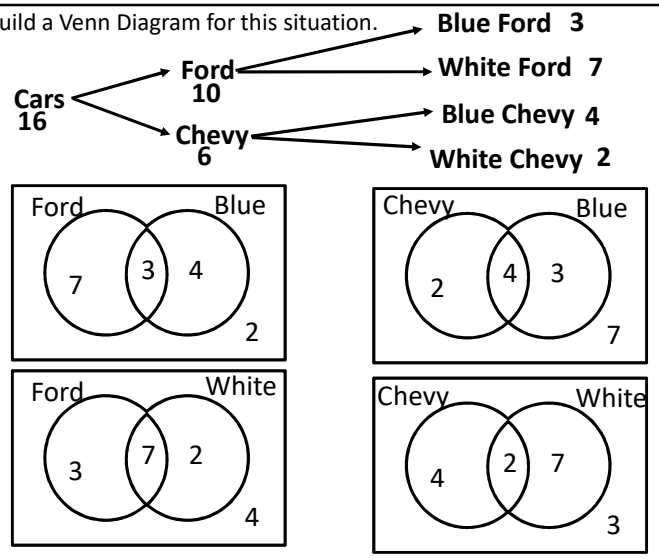
A car dealer has 16 cars. 10 are Fords and 6 are Chevys.
3 Fords are Blue and 7 Fords are White
4 Chevys are Blue and 2 Chevys are White



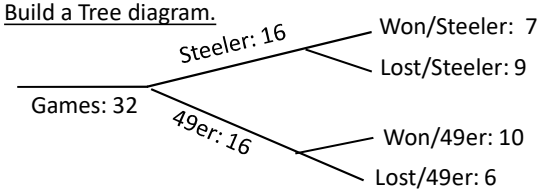

Find the probability for each path in the table.

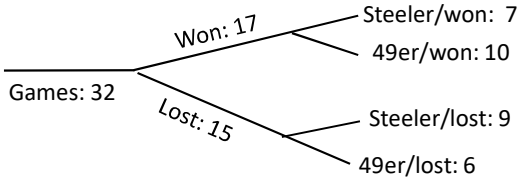



Build a Venn Diagram for this situation.

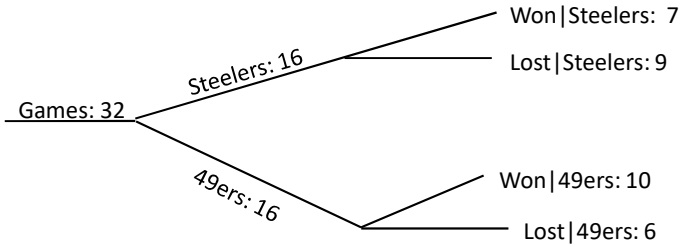


32 games were played by the Steelers and 49ers. They each played 16 games. The Steelers won 7 and lost 9. The 49ers won 10 and lost 6.
Build a Tree diagram.



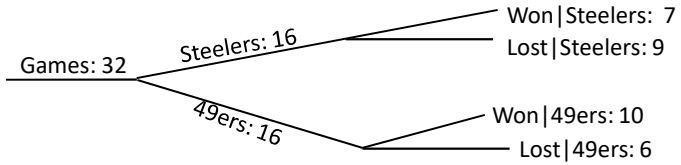




**We can build it either way. Which way do you think is better?**




Find:

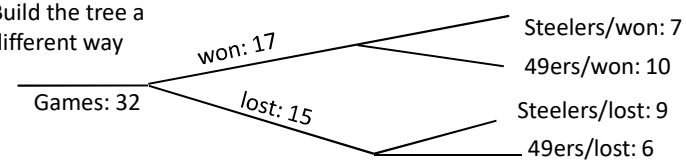
1. $P(Lost \cap Steelers) = \frac{9}{32}$
2. $P(49ers) = \frac{16}{32}$
3. $P(Won|Steelers) = \frac{7}{16}$
4. $P(Won|49ers) = \frac{10}{16}$
5. $P(Won) = \frac{17}{32}$
6. $P(Won \cap 49ers) = \frac{10}{32}$




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



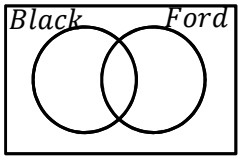

## Logical Words

AND 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




AND means both conditions must be met

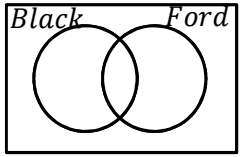
## Logical Words

OR 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




OR means if the group meets one of the two conditions 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).

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

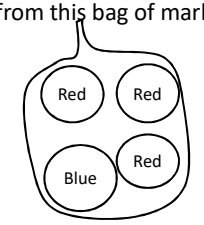
$$= \frac{1}{2} * \frac{1}{2} * \frac{1}{2} = \frac{1}{8}$$

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.

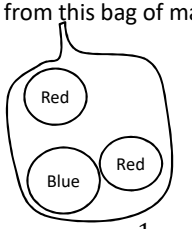
The probability of the second event depends upon the first event → since there will be one fewer red marble when we pick the second marble. We say the second is NOT independent of the 1st event.

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




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

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

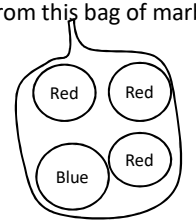



$P(B/R) = \frac{1}{3}$

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

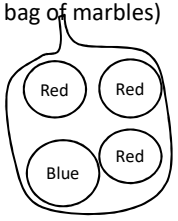
Calculate the probability of picking a red marble followed by a blue marble with replacement.

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)




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

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)

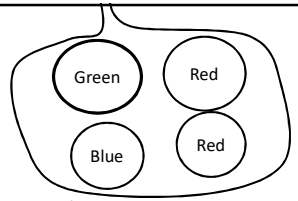
Are these independent events?

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 OR means add (the individual probabilities).

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

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

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

$$P(\text{B} \cap \text{G}) = P(B) * P(G) = \frac{1}{4} * \frac{1}{3} = \frac{1}{12}$$ W/o "rplcmnt"

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