AP Stat Handout: Probability Rules Name ______________________

Ch 6.3: General Probability Rules

EQ:

Important Recall: Complete each Statement

- For any event A and its ______________________, __________ = ______________.
- When two events, A and B, are _____________________, then ________= _____________________.
- If two events, A and B, are ________________, then _____________= ______________________.
- Given two events, A and B, then _________________= ____________________________
- <u>Contingency Tables</u> --- two-way tables giving ___________________ for categorical variables
- <u>Joint Probabilities</u> --- _______________________ occurrence of ___________ events

Ex. The following information was given about the success of an ad campaign.

P(heard ad) = 0.35 P(bought product) = 0.23 P(heard ad and bought product) = 0.15

Complete the contingency table.

BOUGHT PRODUCT	HEARD AD: YES	NO	TOTAL
YES			
NO			
TOTAL			

1. Find P(did not hear ad) = ________ 2. Find P(did not buy product) = __________

- **Assignment: p. 440 #65 - 68**

- <u>Conditional Probability</u> --- probability of one event _________________________ we know __________________________

____________ read " probability _____________________" FORMULA: ___________ = ___________

** If ________________ = ______________ = _______________what can we say about events A and B?

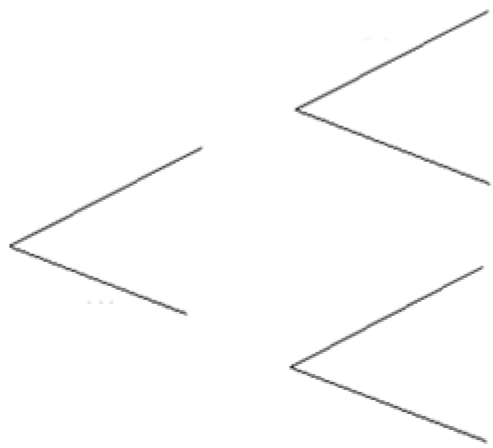
Why?

Recall: Independent Events

If events A and B are ______________, then the probability of B happening ________________ **depend** upon whether A has happened or not. Therefore

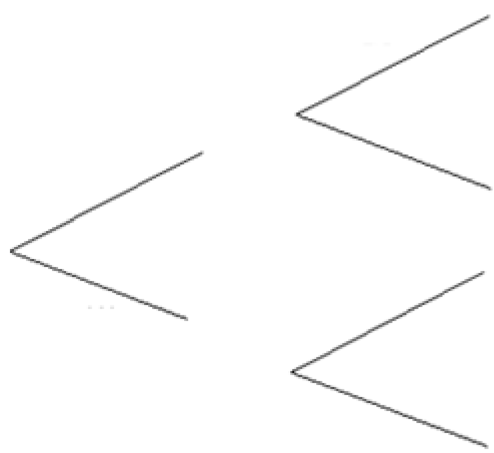
P (____ | ____) = P (____ | ____)=P (___)

Probability of _____ given that _____ has occurred



Recall: Not Independent Events

If A and B are ___________________ events, the probability of B happening ________**depend upon** whether A has happened or not. We therefore have to introduce conditional probabilities in the tree diagram (as shown below):



Recall:

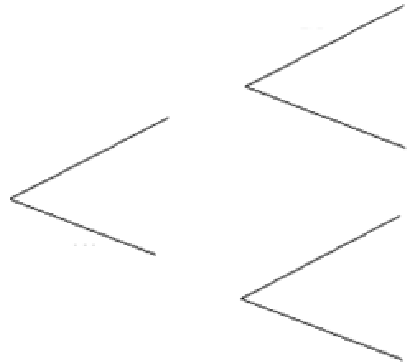
The rule for combining probabilities for **Not Independent Events is:**

P(______________) = P(______) × P(_____ | _______)

This is equivalent to saying

$$P(\_\_\_\_\_\_ \mid \_\_\_\_\_\_\_) = \frac{P(\_\_\_\_\_ \text{ and } \_\_\_\_\_)}{P(\_\_\_\_)}$$

Example 1:
Every morning I buy either The Times or The Mail. The probability that I buy The Times is ¾ and the probability that I buy The Mail is ¼. If I buy The Times, the probability that I complete the crossword is $\frac{2}{5}$. If I buy The Mail the probability that I complete the crossword is $\frac{4}{5}$.



a) Find the probability that I complete the crossword on any particular day.

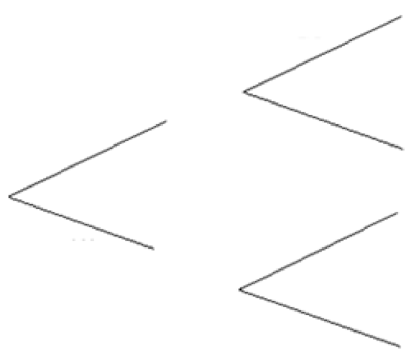
From the tree diagram, P(complete crossword) =

b) If I have completed the crossword, find the probability that I bought The Mail.

P(____ | ____) = $\frac{\text{P(\_\_\_ and \_\_\_)}}{\text{P(\_\_\_)}}$ =

Example 2:
0.1% of the population carries a particular faulty gene. A test exists for detecting whether an individual is a carrier of the gene. In people who actually carry the gene, the test provides a positive result with probability 0.9. In people who don't carry the gene, the test provides a positive result with probability 0.01. If someone gives a positive result when tested, find the probability that they actually are a carrier of the gene.

Use the following notation: G = person carries gene P = test is positive for gene



We want to find P(_____ | _____) = $\frac{P(\_\_\_\_ \text{ and } \_\_\_\_)}{P(\_\_\_\_)}$

However, P(_____) = P(_____ and _____) + P_____ and _____) = _________ + ________ = _____________

Therefore, P(____ | ____) = ———— = _____________

So there is a very _______________chance of actually having the gene even if the test says that you have it.

Note: This example highlights the difficulty of detecting rare conditions or diseases.

- **RECALL: Multiplication Rule for Independent Events:**

If events A and B are ___________________ evens, then we can say _______________ =___________

- **The Converse Statement of This Rule Says:**

If ___________________ = _________ then we can assume A and B are ___________________ events.

- USE THIS STATEMENT TO __________________________INDEPENDENCE!!!

- ***Assignment: Conditional Probability Worksheet***

- ***Assignment: Examples Section 6.3 Worksheet***

- ***Assignment:*** **p. 446 #71 – 76, p. 452 #79 – 84**