NAME:______________________ DATE:__________

Probability Notes

1. In a family of 3 children, excluding multiple births, what is the sample space if birth order is considered (i.e., BBG is different from BGB)?

$S = \{ BBB,\ GBB,\ GBG,\ BBG,\ GGG,\ BGG,\ BGB,\ GGB \}$

2. In problem #1, what is the probability of having two girls and a boy, in that order? Of having 2 girls and a boy in any order?

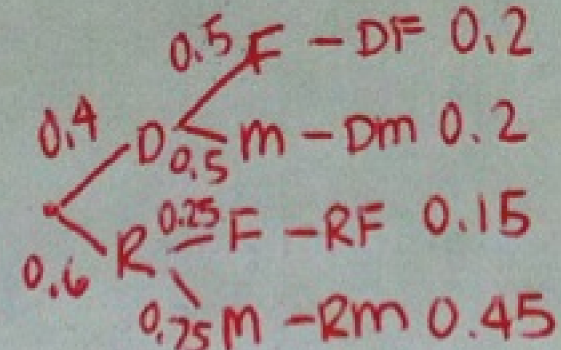
$P(GGB) = 1/8$

$P(GGB \cup GBG \cup BGG) = 3/8$

could use a table!

	D	R	
F	20	15	35
m	20	45	65
	40	60	100

3. A pollster surveys 100 people consisting of 40 Democrats (half of whom are women) and 60 Republicans (25% are females). What is the probability of randomly selecting one of the 100 people and getting:



a) a Democrat

$P(D) = 0.4$

b) a female

$P(F) = 0.35$

c) a female and a Democrat

$P(F \cap D) = 0.2$

d) a Republican male

$P(R \cap m) = 0.45$

e) a Democrat or a male

$P(D \cup m) = 0.2 + 0.2 + 0.45 = 0.85$

f) a Republican or a female

$P(R \cup F) = 0.2 + 0.15 + 0.45 = 0.8$

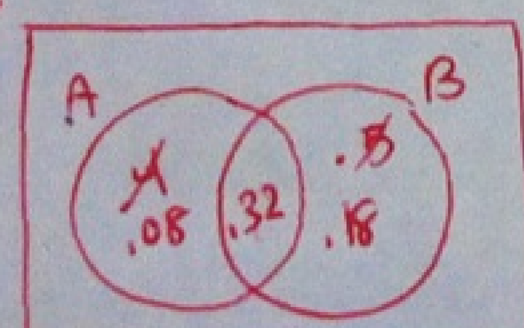
4. Given that P(A) = .4, P(B) = .5, and P(B | A) = .8, find the following probabilities:

a) P(A and B) $= P(A)P(B|A) = (0.4)(0.8) = 0.32$

b) P(A or B) $= P(A) + P(B) - P(A \cup B) = 0.4 + 0.5 - 0.32 = 0.58$

c) P(A | B) $= \dfrac{P(A \cap B)}{P(B)} = \dfrac{0.32}{0.5} = 0.64$

Could be used instead of formulas



5. Below is a table of past records giving probability data for a driver having an accident (A) and whether or not is was raining.

	Rain	No Rain	
Accident	0.025	0.015	0.04
No Accident	0.335	0.625	0.96
	0.36	0.64	1

a) What is P(rain)? $P(\text{Rain}) = 0.36$

b) What is P(accident)? $P(\text{accident}) = 0.4$

c) What is the probability of an accident given it is raining?

$P(\text{accident} \mid \text{raining}) = \dfrac{0.025}{0.36} = 0.0694$

d) What is the probability of an accident if it is not raining?

$P(\text{accident} \mid \text{raining}^c) = \dfrac{0.015}{0.64} = 0.023$

e) Are rain and having an accident independent?

$P(A \cap B) = 0.625$ from table $P(A) \cdot P(B) = 0.36 * 0.4 = 0.144$

$0.025 \neq 0.144$

NOT INDEPENDENT

6. A particular trait of excellence (the Pryor trait) is found in only 2 percent of the population. I have developed a low cost test for identifying the existence of the trait in a human. Unfortunately, the test gives a positive result 5 percent of the time for people who do not have the trait. Moreover, the test gives a negative result 0.3 percent of the time for people who in fact have the trait. Use a probability tree to help you answer the following questions.

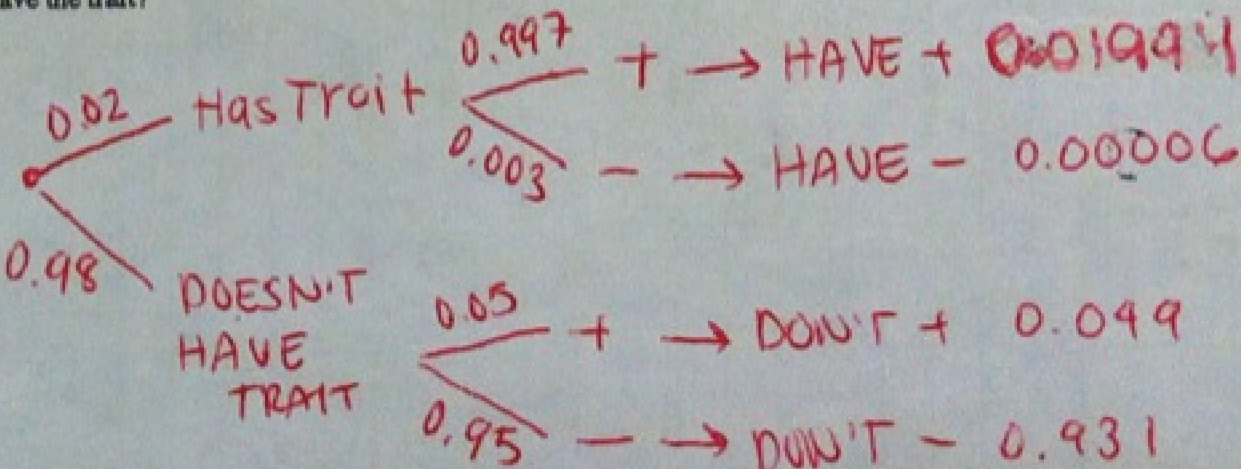
$P(T) = 0.01994 + 0.00006 = 0.02$

a) What is the probability that a person selected at random has the trait?

b) What is the probability that a person chosen at random would test positive for the trait?

$P(+) = 0.01994 + 0.049 = 0.06894$

c) What is the probability that a randomly selected person who tests positive for the trait does not have the trait?



$P(\text{doesn't have} \mid \text{tested} +) = \dfrac{0.049}{0.01994 + 0.049} = \boxed{0.71}$