AP Statistics 5.3 QUICK QUIZ	Name:	Date:

Show work clearly. You will be graded on the correctness of your methods as well as on the accuracy and completeness of your results.

***For probability questions**, provide (1) a probability statement, (2) clearly show numbers used, and (3) show probabilities in decimal form. Rounded to 3-decimals.*

P( ) = / =

3 PTS 4 PTS 3 PTS

1) 25 of a sample of 275 students say they are vegetarians. Of the vegetarians, 14 eat fish, 12 eat eggs, and 8 eat neither. Define events E: Eats eggs, and F: Eats fish. Choose one of the vegetarians at random:

Tip: Create a Table or Venn Diagram

	EGG	NO E	
FISH	9	5	14
NO F	3	8	11
	12	13	25

a) What is the probability that the chosen student eats both fish and eggs? 10

$P(E \cap F) = \frac{9}{25} = .36$

b) What is the probability that the chosen student eats either fish or eggs? 10

$P(E \cup F) = \frac{14+12-9}{25} = \frac{17}{25} = .68$

2) ***A Titanic disaster*** In 1912 the luxury liner *Titanic*, on its first voyage across the Atlantic, struck an iceberg and sank. Some passengers got off the ship in lifeboats, but many died. The two-way table gives information about adult passengers who lived and who died, by class of travel. Suppose we choose an adult passenger at random.

	Survival Status		
Class of Travel	**Survived**	**Died**	
First class	197	122	319
Second class	94	167	
Third class	151	476	
	442		

2a) Given that the person selected was in first class, what's the probability that he or she survived? 10

$P(\text{SURVIVED} \mid 1^{ST} \text{ CLASS}) = .618$

$\frac{197}{319}$

2b) If the person selected survived, what's the probability that he or she was a third-class passenger? 10

$P(\text{3RD CLASS} \mid \text{SURVIVED}) = \frac{151}{442} = .342$

3) **Who eats breakfast?** The two-way table describes the 595 students who responded to a school survey about eating breakfast. Suppose we select a student at random. Consider events *B*: eats breakfast regularly, and *M*: is male.

	Male	Female	Total
Eats breakfast regularly	190	110	**300**
Doesn't eat breakfast regularly	130	165	**295**
Total	**320**	**275**	**595**

3) Are events *B* and *M* independent? Justify your answer. 10

$P(B) = \frac{300}{595} = .504$

$P(B \mid M) = \frac{190}{320} = .594$

$\neq$

$P(M) = \frac{320}{595} = .537$

$P(M \mid B) = \frac{190}{300} = .633$

$\neq$

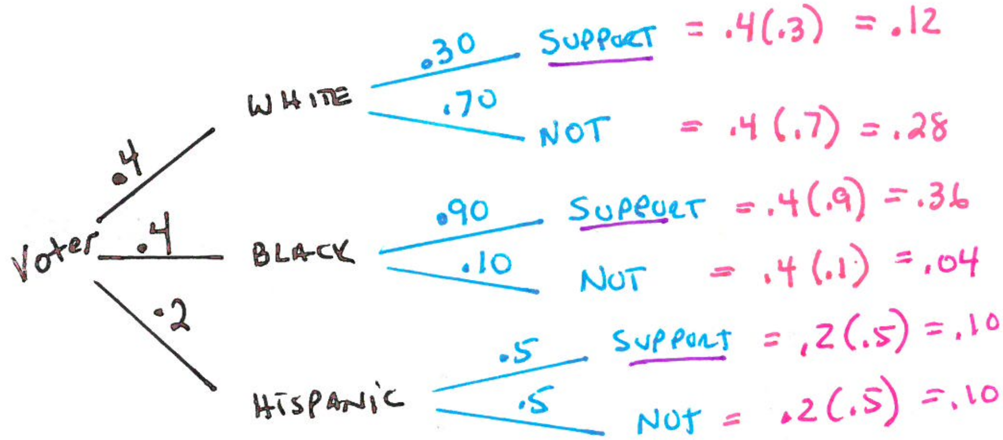
Since the 2 probabilities are NOT EQUAL B + M are NOT INDEPENDENT. 10

4) Urban voters

The voters in a large city are 40% white, 40% black, and 20% Hispanic.

A mayoral candidate anticipates attracting 30% of the white vote, 90% of the black vote, and 50% of the Hispanic vote.

a) Draw a tree diagram to represent this situation. 10



b) What percent of the overall vote does the candidate expect to get? 10

$P(\text{Support}) = .12 + .36 .10 = .58$

The mayor should expect to get about 58%

c) If the candidate's predictions come true, what percent of her votes come from black voters? (Write this as a conditional probability and use the definition of conditional probability.) 10

$P(\text{BLACK} \mid \text{Support}) = \frac{.36}{.58} = .621$

5) **Universal blood donors** People with type O-negative blood are universal donors. That is, any patient can receive a transfusion of O-negative blood. Only 8% of the American population have O-negative blood. If 10 people appear at random to give blood, what is the probability that at least 1 of them is a universal donor? ~~Follow the four-step process~~.

10

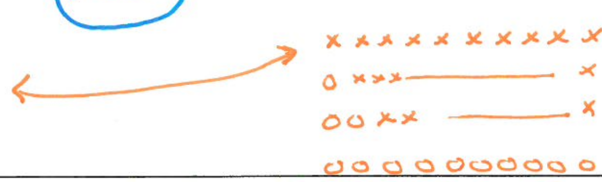
P(AT LEAST 1 OUT OF 10 women IS Oneg)

1 − P(NONE HAVE O neg)

$1 - (.92)^{10} = .566$

.4343

P(NOT Oneg) = 1 − .08 = .92



5.3 QUICK QUIZ	BONUS:	Name: 2 pts each

Testing the test Are false positives too common in some medical tests? Researchers conducted an experiment involving 250 patients with a medical condition and 750 other patients who did not have the medical condition. The medical technicians who were reading the test results were unaware that they were subjects in an experiment.

Technicians correctly identified 240 of the 250 patients with the condition. They also identified 50 of the healthy patients as having the condition

TIP: Create a Venn diagram, table, or tree diagram:

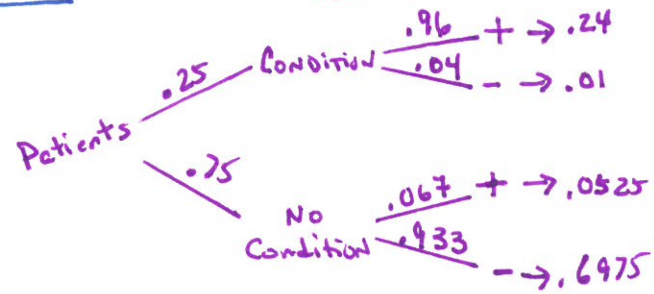
TEST RESULT

DISEASE	+	−	
No	(FALSE +) 50	700	750
Yes	240	(FALSE −) 10	250
	290	710	1,000

Table EASIER W/COUNTS

$P(+|D) = \frac{240}{250} = .96$

$P(+|NO) = \frac{50}{750} = .0667$



(a) What were the false positive rates for the test?

$P(\text{FALSE POSITIVE}) = \frac{50}{750} = .0667$

$P(+ \text{ GIVEN NO DISEASE})$

Around 7% of people with No condition Tested positive for the condition.

(b) What were the false negative rates for the test?

$P(\text{FALSE NEGATIVE}) = \frac{10}{250} = .04$

$P(- \text{ GIVEN DISEASE})$

Around 4% of the with the condition Tested negative for the condition.

(c) Given that a patient got a positive test result, what is the probability that the patient actually had the medical condition?

$P(\text{DISEASE} \mid +\text{TEST}) = \frac{240}{290} = .8276$

$= \frac{P(\text{DISEASE and } +\text{TEST})}{P(+\text{ TEST})}$

OR

$P(\ ) = \frac{.24}{.24 + .0525} = .8205$

Given a patient got a positive test result, there is about an 83% chance they had the disease