Chapter 5 AP Statistics Practice Test

Section I: Multiple Choice *Select the best answer for each question.*

T5.1. Dr. Stats plans to toss a fair coin 10,000 times in the hope that it will lead him to a deeper understanding of the laws of probability. Which of the following statements is true?

(a) It is unlikely that Dr. Stats will get more than 5000 heads.
(b) Whenever Dr. Stats gets a string of 15 tails in a row, it becomes more likely that the next toss will be a head.
(c) The fraction of tosses resulting in heads should be close to 1/2.
(d) The chance that the 100th toss will be a head depends somewhat on the results of the first 99 tosses.
(e) All of the above statements are true.

PROBABILITY ONLY TELLS US WHAT HAPPENS APPROXIMATELY IN THE LONG RUN, NOT WHAT WILL HAPPEN IN THE SHORT RUN.

T5.2. China has 1.2 billion people. Marketers want to know which international brands they have heard of. A large study showed that 62% of all Chinese adults have heard of Coca-Cola. You want to simulate choosing a Chinese at random and asking if he or she has heard of Coca-Cola. One correct way to assign random digits to simulate the answer is:

YOU NEED EXACTLY 62 OF THE 100 2-DIGIT NUMBERS TO REPRESENT THE EVENT "HAVING HEARD OF COKE"

(a) One digit simulates one person's answer; odd means "Yes" and even means "No."
(b) One digit simulates one person's answer; 0 to 6 mean "Yes" and 7 to 9 mean "No."
(c) One digit simulates the result; 0 to 9 tells how many in the sample said "Yes."
(d) Two digits simulate one person's answer; 00 to 61 mean "Yes" and 62 to 99 mean "No." 62%
(e) Two digits simulate one person's answer; 00 to 62 mean "Yes" and 63 to 99 mean "No." 63%

T5.3. Choose an American household at random and record the number of vehicles they own. Here is the probability model if we ignore the few households that own more than 5 cars:

Number of cars:	0	1	2	3	4	5
Probability:	0.09	0.36	0.35	0.13	0.05	0.02

P(MORE THAN 2) = .13 + .05 + .02 = .20
20%

A housing company builds houses with two-car garages. What percent of households have more cars than the garage can hold?

(a) 7% (b) 13% (c) 20% (d) 45% (e) 55%

T5.4. Computer voice recognition software is getting better. Some companies claim that their software correctly recognizes 98% of all words spoken by a trained user. To simulate recognizing a single word when the probability of being correct is 0.98, let two digits simulate one word; 00 to 97 mean "correct." The program recognizes words (or not) independently. To simulate the program's performance on 10 words, use these random digits: 9 out of 10 Correct

60970 70024 17868 29843 61790 90656 87964 18883

The number of words recognized correctly out of the 10 is

(a) 10 (b) 9 (c) 8 (d) 7 (e) 6

Questions T5.5 to T5.7 refer to the following setting. One thousand students at a city high school were classified according to both GPA and whether or not they consistently skipped classes. The two-way table below summarizes the data.

	GPA			
Skipped Classes	**<2.0**	**2.0–3.0**	**>3.0**	
Many	80	25	5	= 110
Few	175	450	265	
	255			1000

T5.5. What is the probability that a student has a GPA under 2.0?

(a) 0.227 (b) 0.255 (c) 0.450 (d) 0.475 (e) 0.506

$P(<2.0) = \frac{255}{1000} = .255$

T5.6. What is the probability that a student has a GPA under 2.0 or has skipped many classes?

(a) 0.080 (b) 0.281 (c) 0.285 (d) 0.365 (e) 0.727

$P(<2.0 \text{ or Skipped Many Classes}) = \frac{80+25+5+175}{1000} = \frac{285}{1000} = .285$

T5.7. What is the probability that a student has a GPA under 2.0 given that he or she has skipped many classes?

(a) 0.080 (b) 0.281 (c) 0.285 (d) 0.314 (e) 0.727

$P(GPA < 2.0 \mid \text{SKIPPED MANY Classes}) = 80/110 = .7272$

T5.8. For events A and B related to the same chance process, which of the following statements is true?

(a) If A and B are mutually exclusive, then they must be independent.

(b) If A and B are independent, then they must be mutually exclusive.

(c) If A and B are not mutually exclusive, then they must be independent.

(d) If A and B are not independent, then they must be mutually exclusive.

(e) If A and B are independent, then they cannot be mutually exclusive.

IF A and B are independent, then we don't know whether B has occured if A occured. But if A and B are mutually exclusive, then if B has occured then we know that A couldn't have occurred.

T5.9. Choose an American adult at random. The probability that you choose a woman is 0.52. The probability that the person you choose has never married is 0.25. The probability that you choose a woman who has never married is 0.11. The probability that the person you choose is either a woman or has never been married (or both) is therefore about

(a) 0.77. (b) 0.66. (c) 0.44. (d) 0.38. (e) 0.13.

$P(\text{women}) = .52$

$P(\text{Never married}) = .25$

$P(\text{women and never married}) = .11$

$P(\text{women or never married}) = .52 + .25 - .11 = .66$

T5.10. A deck of playing cards has 52 cards, of which 12 are face cards. If you shuffle the deck well and turn over the top 3 cards, one after the other, what's the probability that all 3 are face cards?

(a) 0.001 (b) 0.005 (c) 0.010 (d) 0.012 (e) 0.02

$P(1^{st}\text{ FACE and } 2^{ND}\text{ FACE and } 3^{rd}\text{ face}) =$

$\frac{12}{52} \cdot \frac{11}{51} \cdot \frac{10}{50} \approx \frac{1320}{132600} = .00995$

HW **Chapter 5 AP TEST**

II SECTION 2: FREE RESPONSE

Notice from this picture, you can find the conditional probabilities
$P(B|A)=5/27$
$P(A|B)=5/8$

T5.11 (A) 48 Possible Outcomes

A = TEACHER WINS (27 times)

T = TIE

$P(\text{TEACHER WINS}) = P(A) = \frac{27}{48} = \boxed{\frac{9}{16} \text{ or } .5625}$

YOU \ TEACHER	1	2	3	4	5	6	7	8
1	T	A	A	A	A	A	A	A
2		T	A	A	A	A	A	A
3	B	B	B T	B A	B A	B A	B A	B A
4				T	A	A	A	A
5					T	A	A	A
6						T	A	A

(B) B = YOU GET A 3 ON YOUR FIRST ROLL

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= 27/48 + 8/48 - 5/48 = \frac{30}{48} = \boxed{5/8 \text{ OR } .625}$

(C) ARE EVENTS A and B INDEPENDENT?

TO VERIFY CHECK $P(A|B) = P(A)$ and $P(B|A) = P(B)$

These are the formulas and prob. from above parts

$P(A) = 27/48$

$P(B) = 8/48$

$P(A \cap B) = \frac{5}{48}$

$\boxed{P(B|A) = \frac{P(A \cap B)}{P(A)}}$

both correct

$* \quad P(A) = P(A|B)$

$27/48 = \frac{P(A \cap B)}{P(A)} = \boxed{\frac{5/48}{27/48}} = \boxed{\frac{5}{27}}$

$\frac{5}{\cancel{48}} \cdot \frac{\cancel{48}}{27}$

$27/48 \neq 5/27$

SINCE THESE ARE NOT EQUAL, THE EVENTS ARE NOT INDEPENDENT

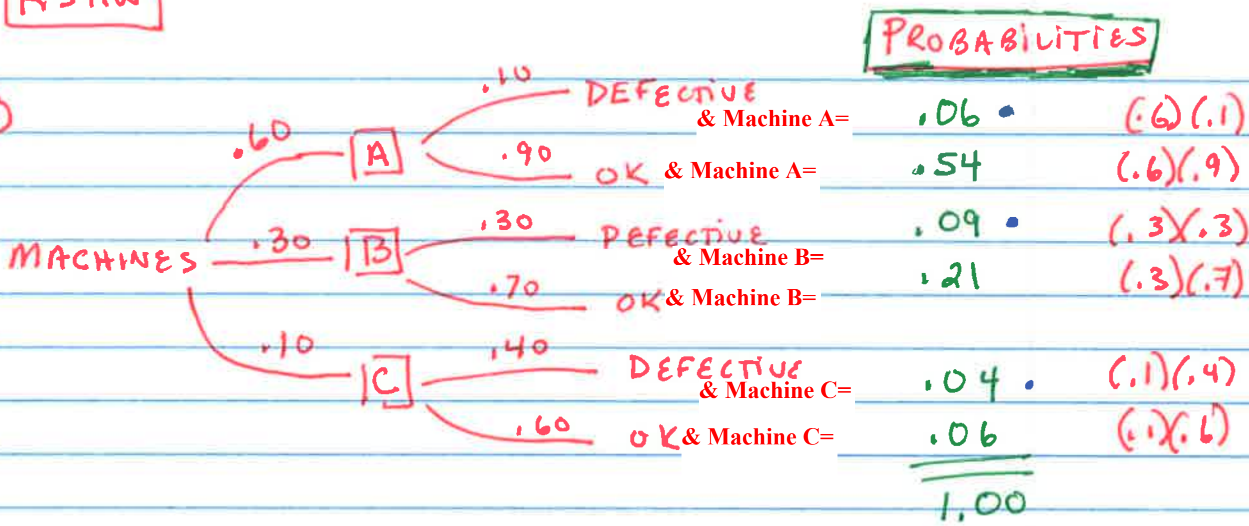
Or you could find P(B)= P(B|A): P(B) = 8/48=.167 $\neq$ P(B|A)=5/27=.185

Since they are not equal the events are NOT INDEPENDENT

R5HW

T 5.12

(A)



(B) $P(\text{DEFECTIVE}) = .06 + .09 + .04 = \boxed{.19}$

(C) FIND THE CONDITIONAL PROBABILITIES THAT THE PART WAS PRODUCED ON A PARTICULAR MACHINE GIVEN THAT IT IS DEFECTIVE

$$P(A \mid \text{DEFECTIVE}) = \frac{P(A \cap \text{DEFECTIVE})}{P(\text{DEFECTIVE})} = \frac{.06}{.19} = \boxed{.3158}$$

$$P(B \mid \text{DEFECTIVE}) = \frac{P(B \cap \text{DEFECTIVE})}{P(\text{DEFECTIVE})} = \frac{.09}{.19} = \boxed{.4737} \; **$$

$$P(C \mid \text{DEFECTIVE}) = \frac{P(C \cap \text{DEFECTIVE})}{P(\text{DEFECTIVE})} = \frac{.04}{.19} = \boxed{.2105}$$

CONCLUSION: SINCE THE LARGEST OF THESE 3 CONDITIONAL PROBABILITIES is for MACHINE B, GIVEN THAT A PART IS DEFECTIVE, IT IS MOST LIKELY TO HAVE COME FROM MACHINE B.

5R HW

T5.13

P(SMOKES) = .25
P(SMOKES and CANCER) = .08 ($\cap$)
P(NOT SMOKE AND NOT CANCER) = .71

Given from the table

TIP: Create a table using %'s

	Smoke	NOT	
Cancer	(.08) 8	4	12
NOT	17	(.71) 71	88
	(.25) 25	75	100

A P(CANCER | SMOKER) =

$$\frac{P(\text{Cancer and Smoke})}{P(\text{Smoke})} = \frac{.08}{.25} = .32$$

B P(smoke or Cancer) = See table for work

P(smoke) + P(Cancer) − P(Smoke and Cancer)

$25/100 + 12/100 - 8/100 = .29$

OR WE Can use the complement rule. IF we know P(not smoke and NOT Cancer), the remaining part is 1 − P(not smoke and NOT Cancer).

Therefore: P(Smoke or Cancer) = 1 − P(not smoke and not Cancer)

$1 - .71 = .29$

C P(at least one of two get cancer) =

1 − (neither gets cancer) =

$1 - (.88)^2 = .2256$

p(cancer) = 12%

TIP: when you see "AT LEAST," think!!! 1-P(neither or none)

R5HW

T5.14 P(OUT OF STATE) = .17

ⓐ Simulation Design

① assign the numbers 01-17 to represent out of state cars
② In state cars assigned 00, 18-99
③ Start reading 2-digit numbers from a random table until you get 2 numbers between 01 and 17; and ignore repeats.
④ Repeat many times for simulation

NOTE: SINCE USING %'s Repeats are acceptable

ⓑ 3 Repetitions (NOTE - DO NOT CHANGE LINES FOR EACH SIMULATION)

#1: 41, 05, 09 - 3 Cars to get 2 out of state

#2: 20, 31, 06, 44, 90, 50, 59, 59, 88, 43, 18, 80, 53, 11 - 12 cars out of 14

#3: 58, 44, 69, 94, 86, 85, 79, 67, 05, 81, 18, 45, 14

2 OUT OF STATE CARS OUT OF 13