AP Statistics
More Chapter 5 Test Review

Name Key
Date ____ Hour ____

Use the following table for questions 1 - 3

The following table compares the hand dominance of 200 Canadian high-school students and what methods they prefer using to communicate with their friends. Suppose one student is chosen randomly from this group of 200.

	Cell phone/Text	In person	Online	Total
Left-handed	12	13	9	**34**
Right-handed	43	72	51	**166**
Total	**55**	**85**	**60**	**200**

1) What is the probability that the student chosen prefers to communicate with friends in person?

$P(\text{In Person}) = \frac{85}{200} = \frac{17}{40} = .425$

2) If you know the person that has been randomly selected is left-handed, what is the probability that they prefer to communicate with friends in person?

given

$P(\text{In Person} \mid \text{Left Handed}) = \frac{13}{34} \approx .382$

3) You select a student from the group at random. Which of the following statements is true about the events "Left-Handed" and "Prefers to communicate with friends in person"?

(a) ~~The events are mutually exclusive and independent.~~

(b) ~~The events are not mutually exclusive but they are independent.~~

(c) ~~The events are mutually exclusive, but they are not~~ independent.

(d) The events are not mutually exclusive, nor are they independent.

(e) ~~The events are independent, but we do not have enough information to determine if they are mutually exclusive.~~

Not ME, now ✓ for Independence

① $P(\text{Left H} \mid \text{In Person}) = P(\text{Left H})$

$\frac{13}{85} \neq \frac{34}{200}$ no $\neq$

so not Independent

Another way to see if independent

Does $P(\text{Left}) \cdot P(\text{In Person}) = P(L \cap I.P)$

$\frac{34}{200} \cdot \frac{85}{200} = 13/200$

$\frac{289}{20} \neq \frac{13}{200}$

so not independent

4) Event A has probability 0.4. Event B has probability 0.5. If A and B are independent, then the probability that both events occur is .2 ?

$P(A) = 0.4$

$P(B) = 0.5$

Since A and B are independent → $P(A \cap B)$

$P(A) \cdot P(B) = P(A \cap B)$

$0.4 \cdot 0.5 = .2$

5) Event A has probability 0.4. Event B has probability 0.5. If A and B are independent, then the probability that either events occur is 0.7 ?

$P(A \text{ or } B)$

$P(A) = 0.4$

$P(B) = 0.5$

$P(A \cap B) = (0.4)(0.5) = .2$

$P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)$

$= 0.4 + 0.5 - .2 = 0.7$

Use the following situation for questions 6 and 7.

Ignoring twins and other multiple births, assume that babies born at a hospital are independent random events with the probability that a baby is a boy and the probability that a baby is a girl both equal to 0.5.

$P(\text{boy}) = .5$ (1 time) $\quad P(\text{Girl}) = .5$ (1 time)

6) What is the probability that the next five babies are girls?

$P(\text{next 5 babies girls}) = (.5)^5 = .03125$

7) What is the probability that at least one of the next three babies is a boy?

$P(\text{at least 1 baby of next 3 a boy}) =$ ③ $1 - .125 = .875$

① $P(\text{at least 1 boy}) = 1 - P(\text{no boys})$

② $P(\text{no boys}) = .5$ (1 time) $\quad \text{Prob}(\text{no boys 3 times}) = .5^3 = .125$

8) In a cookie jar, there are 12 chocolate chip cookies, 5 oatmeal raison cookies, and 7 macadamia nut cookies. What is the probability that if two cookies were chosen (without replacement), that both cookies were the same type of cookie?

$P(\text{2 cookies same type}) = P(\text{2 C.C}) + P(\text{2 O.R}) + P(\text{2 MN})$

$= \frac{12}{24} \cdot \frac{11}{23} + \frac{5}{24} \cdot \frac{4}{23} + \frac{7}{24} \cdot \frac{6}{23}$

$\frac{132}{552} + \frac{20}{552} + \frac{42}{552} = \frac{194}{552} \approx .3514$

Use the following for questions 9 and 10.
An event A will occur with probability 0.5. An event B will occur with probability 0.4. The probability that both A and B will occur is 0.2.

$P(A) = 0.5$
$P(B) = 0.4$
$P(A \cap B) = 0.2$

9) What is the conditional probability of A, given B?

$P(A|B) = \frac{.2}{.4} = .5$

10) We may conclude that
(a) events A and B are independent.
~~(b)~~ events A and B are mutually exclusive. no $P(A \cap B) \neq 0$
~~(c)~~ either A or B always occurs. no $P(A) + P(B) = 1$
~~(d)~~ events A and B are complementary. no $P(A) + P(B) \neq 1$
~~(e)~~ none of the above is correct.

✓ by $P(A) \cdot P(B) = P(A \cap B)$

$(.5)(.4) = 0.2$ ✓

Independent

or ✓ by $P(A|B) = P(A)$

$P(A|B) = .5$

$P(A) = .5$ ✓

Independent

or ✓ by $P(B|A) = P(B)$

$P(B|A) = \frac{.2}{.5} = .4$

$P(B) = 0.4$ ✓

Independent

11) Three machines – A, B, and C – are used to produce a large quantity of identical parts at a factory. Machine A produces 60% of the parts, while Machines B and C produce 30% and 10% of the parts respectively. Historical records indicate that 10% of the parts produced by Machine A are defective, compared with 30% for Machine B and 40% for Machine C. What is the probability that a randomly chosen part is defective?

Prob

Parts
- .60 Machine A — .10 — Defective – .06
- .30 Machine B — .30 — Defective – .09
- .10 Machine C — .40 — Defective – .04

P(Def) = P(Def from A) + P(Def from B) + P(Def from C) = .06 + .09 + .04 = .19

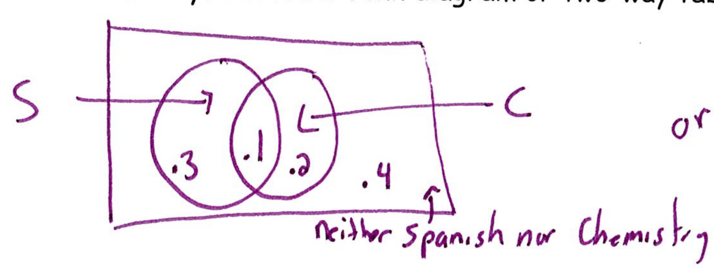
12). A company has developed a drug test to detect steroid use by athletes. The test is accurate 95% of the time when an athlete has taken steroids. It is 97% accurate when an athlete hasn't taken steroids. Suppose the drug test will be used in a population of athletes in which 10% have actually taken steroids. Suppose we know Given that the test was accurate, what is the probability that they didn't take steroids?

Athletes
- .10 Steroids
  - .95 accurate — .095
  - .05 not accurate — .005
- .90 Steroids'
  - accurate — .873
  - not accurate .027

P(Steroids' | accurate) = $\frac{.873}{(.095 + .873)}$ = .873/.968 = .902

13) A counselor analyzes student's course selection and calculates the following: The probability that a randomly-chosen student is taking Spanish is 0.4, that the student is taking Chemistry is 0.3, and that the student is taking BOTH Chemistry and Spanish is 0.1.

(a) Let S = Randomly-chosen student is taking Spanish, and C = Randomly-chosen student is taking Chemistry. Sketch a Venn diagram or two-way table that summarizes the probabilities above.



or

or

	Spanish	Spanish'	Total
Chemistry	.1	.2	.3
Chemistry'	.3	.4	.7
Total	.4	.6	1

(b) Find the probability that a randomly-selected student is taking Spanish OR Chemistry.

$P(S \cup C) = P(S) + P(C) - P(S \cap C)$ or $P(S \cup C) = .3 + .1 + .2 = .6$

$= .4 + .3 - .1 = .6$

(c) Find the probability that a randomly-selected student is taking Spanish or isn't taking Chemistry

$P(S \cup C') = P(S) + P(C') - P(S \cap C')$

$= .4 + .7 - .3 = .8$