GER1000 2018 Sem 2
Quiz 8 and solutions

1. Refer to the new drug test in unit 4 (slides 9-12).
   Suppose six patients took the new drugs and one of them dies of the disease, which of the following is/are true?
   (I) The null hypothesis says that the chance of survival is 5/6.
   (II) The p value is more than 0.10.

   A) (I) only
   B) (II) only
   C) Both (I) and (II)
   D) None of the above

   Explanation: The null hypothesis says that the chance of survival is 0.6 (Chapter 6 unit 4 Slide 11), so (I) is false. The p-value is 6 x 0.4 x 0.6 x 0.6 x 0.6 x 0.6 x 0.6 + 0.6 x 0.6 x 0.6 x 0.6 x 0.6 x 0.6 = 0.2333 (Chapter 6 Unit 4 Slide 4). Since 0.2333>0.10, option (II) is true.

2. In a population of 1000, 750 people test positive and 250 people test negative for a specific disease. If a randomly chosen person has a negative test result, the probability that he or she actually has the disease is 72%. The specificity of the test is 70%. The probability of a randomly chosen person having a positive test result given that he or she does not have the disease is closest to _____.
   A) 0%
   B) 10%
   C) 20%
   D) 30%
   E) 40%

Explanation: Using the given data, we can obtain the following table. P(Positive|No Disease)=30/100=30%. (Chapter 6 Unit 6 Slide 7)

	Positive	Negative	sum
Disease	720	180	900
No disease	30	70	100
sum	750	250	1000

3. In a population of 1000, 750 people test positive and 250 people test negative for a specific disease. If a randomly chosen person has a negative test result, the probability that he or she actually has the disease is 72%. The specificity of the test is 70%. The sensitivity of the test is closest to_____.
   A) 50%
   B) 60%
   C) 70%
   D) 80%
   E) 90%

Explanation: Using the given data, we can obtain the following table. Sensitivity = P(Positive|Disease)=720/900=80%. (Chapter 6 Unit 6 Slide 5)

	Positive	Negative	sum
Disease	720	180	900
No disease	30	70	100
sum	750	250	1000

4. Refer to the following table adapted from *Yearbook of Statistics Singapore, 2017*. What is the probability that a randomly selected person is male and between 0-4 years old, given that the person is Chinese?

Number

Ethnic Group / Sex	Total	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39
Total	3,933,559	187,160	201,509	207,495	239,771	260,854	279,988	285,544	301,998
Males	1,929,526	95,678	102,426	105,589	122,911	132,046	137,243	135,596	143,553
Females	2,004,033	91,482	99,083	101,906	116,860	128,808	142,745	149,948	158,445
Chinese	2,923,172	130,177	135,257	137,225	165,774	184,609	204,843	208,889	220,701
Males	1,425,244	66,943	69,259	70,290	85,383	93,681	100,380	99,734	104,108
Females	1,497,928	63,234	65,998	66,935	80,391	90,928	104,463	109,155	116,593
Malays	525,888	33,088	31,706	35,267	42,750	47,798	46,239	38,943	30,939
Males	261,564	16,992	16,267	18,121	22,160	24,538	23,559	19,575	14,936
Females	264,324	16,096	15,439	17,146	20,590	23,260	22,680	19,368	16,003
Indians	356,876	17,312	25,415	25,676	22,939	22,438	22,787	27,781	35,342
Males	182,935	8,635	12,637	12,722	11,463	11,125	11,136	12,869	18,172
Females	173,941	8,677	12,778	12,954	11,476	11,313	11,651	14,912	17,170
Others	127,623	6,583	9,131	9,327	8,308	6,009	6,119	9,931	15,016
Males	59,783	3,108	4,263	4,456	3,905	2,702	2,168	3,418	6,337
Females	67,840	3,475	4,868	4,871	4,403	3,307	3,951	6,513	8,679

A) 0.023
B) 0.047
C) 0.045
D) 0.091

Explanation: Using the given data, we obtain P(person is male and between 0-4 years old |Chinese) = 66943/2923172 = 0.023. (Chapter 6 Unit 5 Slide 7)

5. Suppose A and B are two dependent events. Let P(A) denote the probability that A occurs, P(A and B) the probability that both A and B occur, and P(A|B) the conditional probability that A occurs given B has occurred. Which of the following is/are true?
   (I) P(A and B) is always less than or equal to P(A).
   (II) P(A | B) is always less than or equal to P(A).

A) (I) only
B) (II) only

C) Both (I) and (II)
D) None of the above

Explanation: Since the event “A and B” requires event “A” to also occur, P(A and B) is always less than or equal to P(A). For (II) let us consider A as the event of drawing a black card in a typical deck of 52 playing cards and B as the event of drawing a Spade. $P(A|B) = 1$, since Spade is a black card. $P(A) = 26/52 = ½$.