Question **1**

Not yet answered

Marked out of 1.00

We are given that

$$P(A) = 0.3, P(B) = 0.7$$

and

$$P(A \cap B) = 0.1.$$

Thus

Select one:

- a. A and B are Independent
- b. $$P(A \mid B) = P(A)$$
- c. A and B are mutually exclusive
- d. $$P(A \mid B) = 0.1428571$$

Question **2**

Not yet answered

Marked out of 1.00

This problem is from Johnson (2000)

There are three suppliers of loblolly pine seedlings. All three obtain their seed from areas in which longleaf pine is present, and, consequently, some cross-fertilization occurs forming Sonderegger pines. Let B1 represent the first supplier, B2 the second, and B3 the third. B1 supplies 20% of the needed seedlings, of which 1% are Sonderegger pines. B2 supplies 30% of which 2% is Sonderegger pines, and B3 supplies 50% of which 3% is Sonderegger pines. In this situation, what is the probability that a blindly chosen seedling will be Sonderegger pine?

Select one:

- a. 0.3
- b. 0.03
- c. 0.091
- d. 0.023

Question **3**

Not yet answered

Marked out of 1.00

Horgan's article on reliability is required reading this week to see how the rules of probability learned are used in reliability. Refer to that article, posted in module 2, independence lecture section, to do this exercise.

A rocket has a built-in redundant (parallel) system. In this system if component A fails, it is bypassed, and component B is used. If component B fails, it is bypassed, and component C is used. The probability of failure of any of those components is 0.15. Assume that the failures of these components are mutually independent events. Let A, B and C denote the events that components A, B and C fail, respectively. What is the probability that the system does not fail.

Select one:

- a. 0.4319
- b. 0.9966
- c. 0.614125
- d. 0.003375

Question **4**

Not yet answered

Marked out of 1.00

Horgan's article on reliability is required reading this week to see how the rules of probability learned are used in reliability. Refer to that article, posted in module 2, independence lecture section, to do this exercise.

A paraller system works if at least one of the components in the system works. With a parallel system, as the number of components increases, the reliability of the system

Select one:

- a. increases at decreasing rate
- b. does not change
- c. decreases
- d. increases at increasing rate

Question 5

Not yet answered

Marked out of 1.00

The product rule studied in lecture 5 was the general product rule. This is the rule you must apply to calculate a joint probability when there is no independence. The exercise given below is a good exercise to practice that rule for three events. Use this notation:

Let A denote the event "People live in urban area" , U the event "upper middle class"; M the event "middle class" ; E the event "purchased electronics."

The product rule for the three events in this problem, A, U, E would be

$$P(A \cap U \cap E) = P(A)P(U|A)P(E|A \cup U)$$

Exercise

About 52% of the population of China lived in urban areas in 2012. In 2012, the upper-middle class accounted for just 14% of urban households, while the middle-middle class accounted for almost 50%. About 56% of the urban upper-middle class bought electronics and household appliances, as compared to 36% of the middle-middle class. If this continued like this in the near future, what would be the probability that a randomly chosen household in China is an upper-middle class urban person that purchases appliances and electronics? This information was obtained from https://www.mckinsey.com/industries/retail/our-insights/mapping-chinas-middle-class.

Select one:

- a. 0.0407
- b. 0.07
- c. 0.67
- d. 0.13

Question 6

Not yet answered

Marked out of 1.00

When looking at the Census information posted under Lecture 5, we notice that there is a percentage reported, 22.0% for language spoken at home. That 22% does not appear on the right hand side, which gives types of language. For example, for Spanish, it gives 13.5%. Which of the following is true for the United States?

- a. Both 22% and 13.5% are total probabilities
- b. The 22% is a total or marginal probability and the 13.5% is a conditional probability.
- c. The 22% is a conditional probability and the 13.5% is a total probability.
- d. The 22% is a joint probability.

Question **7**

Not yet answered

Marked out of 7.00

A quiz has four questions of multiple-choice type. There are three possible answers for each question, but only one answer is right. Assuming a student guesses at random for the answer to the each question and that the student's successive guesses are independent, what is the probability that the student gets more right than wrong answers? Show work to answer this question.

Complete work means:

(a) You set a sample space for the problem and list all the outcomes in the sample space. USe the following notation. If a question is answered correctly, you denote it by 1 (the number one), if not, make it 0. We used that notation in week 1, when we talked about the sample space and events.

(b) Calculate the probability of each outcome in the sample space, justifying why you calculate it this way.

(c) Define the event in the sample space that will satisfy the condition for which you need to calculate the probability, call that event A and list all its outcomes.

(d) Use axioms or rules of probability and tell us which to calculate the probability of that event.

NOTE (in addition to specific ones above given for that question):

- Questions where you must show work must
- indicate your labeling of events
- Say what you are calculated and write it with the notation we use in class (if conditional, write as conditional, etc)
- Show all steps of intermediate work.
- Provide final answer
- If a question has part (a) (b), the answers must be labeled that way as well.
- If attachments are not allowed you must type your answer in the space provided. We will not read attachments or links to external web sites or places. f you can not upload a file is because attachments are not allowed.

Question 8

Not yet answered

Marked out of 4.00

Kell's Public Station marketing campaign is targetting students in a dorm.

It is known that in a random week day, 2/3 of the students in the dorm watch CNN, 1/2 watch BBC and 1/3 watch both CNN and BBC.

Let A denote the event "the student watches CNN" and

B denotes the event "the student watches BBC"

Match the following sets with their probabilities.

$A \cap B^c$	Choose...
$$(A^c \cap B^c) \cup (A^c \cap B)	Choose...
$(A^c \cap B) \cup (A \cap B^c)$	Choose...
$A^c \cap B$	Choose...

Question 9

Not yet answered

Marked out of 4.00

In 2002, a group of medical researchers reported that on average, 30 out of every 10,000 people have colorectal cancer. Of these 30 people with colorectal cancer, 18 will have a positive hemoccult test. Of the remaining 9970 people without colorectal cancer, 400 will have a positive test.

According to the discussion on tests and properties of tests after lecture 5, how would you match the following?

NPV	Choose...
Sensitivity of the hemoccult test	Choose...
Specificity of the hemoccult test	Choose...
PPV	Choose...

Question **10**

Not yet answered

Marked out of 3.00

In lecture 4, the taxicab problem was again revisited at the very beginning of the lecture. It was first posed in the "What is Probability for" in the Getting Ready module. The topic of that problem concerns concepts that we have seen in Chapter 3.

In this exercise, now, match the following, using the information given in Lecture 4.

The probability that the witness identifies the cab as blue	Choose...
Probability that the cab is green and the witness identified the cab as blue	Choose...
Probability that the cab is actually blue and is identified as blue by the witness	Choose...
Probability that the cab having been identified as blue by the witness is actually a green cab	Choose...

Question **11**

Not yet answered

Marked out of 1.00

We draw a card at random from a well shuffled deck of cards like those shown in the lectures this week. Consider the event A that the card is an "ace" and the event B that the card is "diamonds." Which of the following is true?

- a. A and B are independent
- b. A and B are not independent
- c. $$P(A \cap B) = 1/52$$
- d. $$P(A)P(B) = 1/52$$

Question **12**

Not yet answered

Marked out of 1.00

Consider two nonempty and non-mutually exclusive events A, B in the sample space. The union of these two events is not equal to S.

We are given

$$P(A \cap B^c) + P(A \cap B) + P(B \cap A^c)$$

This is equal to which of the following? (Choose all that applies)

- [ ] a. $$P(A \cap B^c) + P(B)$$
- [ ] b. $$P(A) - 2P(A \cap B) + P(B) + P(A \cap B)$$
- [ ] c. $$P(A \cap B^c) + P(B)$$
- [ ] d. $$P(A \cup B)$$

Question **13**

Not yet answered

Marked out of 1.00

Consider two nonempty events included in the sample space. The union of these two events is not the whole sample space.

In proving that $$P(A \cap B^c) = P(A) - P(AB)

which of the following we did not use ?

- [ ] a. Axiom 3 for mutually exclusive events
- [ ] b. the concept of partition of a set
- [ ] c. the product rule for independent events

Question **14**

Not yet answered

Marked out of 1.00

Bayesville is a town with 2000 people. In this town, 1% of the population has a disease called conditionatis. Jimmy tests positive for the disease and consults with the Doctor. The doctor tells Jimmy that the test for conditionatis is 95% accurate so that Jimmy has 95% chance of having the disease. The doctor puts Jimmy under radiotherapy for the next three months.

Which of the following is true?

- [ ] a. The doctor suffers a disease themselves: The disease called "prosecutor fallacy."
- [ ] b. Jimmy's chance of having conditionatis is 1% only, not 95%.
- [ ] c. Jimmy only has 16% chance of having conditionatis, not 95%
- [ ] d. The chance that a randomly chosen person in this town has conditionatis and tests positive is 0.0095. That is Jimmy's chance of having the disease.

Question **15**

Not yet answered

Marked out of 1.00

Three components are connected to form a system as shown in the figure http://www.stat.ucla.edu/~jsanchez/stat100plots/carlton-devore1-5.pdf. Because the components in the 2-3 subsystem are connected in parallel, that subsystem will function if at least one of the two individual components functions. For the entire system to function, component 1 must function and so must the 2-3 subsystem.

The experiment consists of determining the condition of each component in order to determine the condition of the system.
What outcomes are contained in the event C that the system functions?

For notation, s represents a functioning component, and f represents a nonfunctioning component.

Select one:

- a. C={sss, ssf, sfs, fss}
- b. C={sss,ssf, sfs}
- c. C={sss, sfs}
- d. C={sss, sfs, ssf, sff, fff}
- e. C={sss, ssf, sfs, sff, fss, fsf, ffs, fff}

Question **16**

Not yet answered

Marked out of 1.00

Bayes theorem is sometimes used in classification of items where a system has already learned the probabilities.

Suppose there are two classes, $y=1$ and $y=2$ into which we can classify w, a new value of the item.
By Bayes theorem, we can write

$$P(y=1 \mid w) = \frac{P(y=1 \cap w)}{P(w)} = \frac{P(y=1)P(w \mid y=1)}{P(w)}$$

$$P(y=2 \mid w) = \frac{P(y=2 \cap w)}{P(w)} = \frac{P(y=2)P(w \mid y=2)}{P(w)}$$

Dividing,

$$\frac{P(y=1 \mid w)}{P(y=2 \mid w)} = \frac{P(y=1)P(w \mid y=1)}{P(y=2)P(w \mid y=2)}$$

Our decision is to classify a new example into class 1 if

$$\frac{P(y=1 \mid w)}{P(y=2 \mid w)} > 1$$

or equivalently if

$$\frac{P(y=1)P(w \mid y=1)}{P(y=2)P(w \mid y=2)} > 1$$

which means that w goes into class 1 if

$$P(y=1)P(w \mid y=1) > P(y=2)P(w \mid y=2)$$

and

w goes into class 2 if

$$P(y=1)P(w \mid y=1) < P(y=2)P(w \mid y=2).$$

When

$$P(y=1)P(w \mid y=1) = P(y=2)P(w \mid y=2),$$

the result is inconclusive.

The conditional probabilities of

$$P(w \mid y=1)$$

and

$$p(w \mid y=2)$$

are assumed to be already learned as are the prior probabilities $P(y=1)$ and $P(y=2)$. If these can be accurately estimated, the classifications will have a high probability of being correct.
For example, an e-mail spam filter has learned from past e-mails what proportion are spam (y=1) and which are not (y=2). It has also been tracking what proportion of those spam e-mails contain the sentence ``click here`` (event w), thus knows $p(w \mid y=1)$. Similarly, it has been tracking what percentage of e-mails that are not spam contain the same sentence, thus knows

$$p(w \mid y=2)$$

. In fact, many commercial spam filters are based on this basic training based on past e-mails and Bayes theorem.

With that information, answer the following question:

Suppose the prior probabilities of being in either of the two classes are $P(y=1)= 0.4$, and $P(y=2)= 0.6$. Also the conditional probabilities for the new example w are

$$P(w \mid y = 1) = 0.5$$

and

$$P(w \mid y = 2) = 0.3$$

. Into what class should you classify the new example? Show the work.

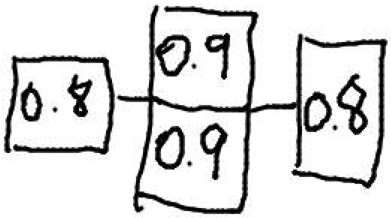
Select one:

- a. class 1
- b. both class and two
- c. it is inconclusive
- d. class 2

Question **17**

Not yet answered

Marked out of 1.00



What is the reliability of the system in the picture? Assume all components are independent.

Select one:

- a. 0.6336
- b. 0.1216
- c. 0.0396
- d. 0.90

Question **18**

Not yet answered

Marked out of 1.00

The prosecutor's fallacy is P(A|B)=P(B|A). Under what conditions would that equality be true?

Make sure to show detailed work. When a question has space to answer, you need to provide:

NOTE:

- Questions where you must show work must
- indicate your labeling of events
- Say what you are calculated and write it with the notation we use in class (if conditional, write as conditional, etc)
- Show all steps of intermediate work.
- Provide final answer
- If a question has part (a) (b), the answers must be labeled that way as well.
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Question **19**

Not yet answered

Marked out of 1.00

An incoming lot of cell phones is to be inspected for defects by an engineer in a cell phone manufacturing plant. Suppose that, in a tray containing twenty cell phones, four are defective (D) and sixteen are working properly (W) so that the P(W)=16/20 and P(D)=4/20. Two cell phones are to be selected with replacement. After listing the sample space, find the probabilities of the following events:

(a) neither is defective;

(b) at least one of the two are defective.

NOTE:

- Questions where you must show work must
- indicate your labeling of events
- Say what you are calculated and write it with the notation we use in class (if conditional, write as conditional, etc)
- Show all steps of intermediate work.
- Provide final answer
- If a question has part (a) (b), the answers must be labeled that way as well.
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Question 20

Not yet answered

Marked out of 1.00

This week, we have a video of a guest speaker, Maureen Grey. She talks about the representativeness heuristic. (Psychologist term)

The video Virtual intuition, also in our course web site, mentions also something related to representativeness heuristic. (medical terms)

We also have an article on the prosecutor's fallacy somehow related to that as well. (political terms)

Which of the following statements best characterizes the common message in all those sources in such different contexts?

Think of two events considered in each source to see the similarities.

Let's say we call those events A and B (although they represent different things in each context.

- a. P(A | B) should not be interpreted as P(B| A). They are too very different things.
- b. the common thread of these three scenarios is the addition or union rule.
- c. If there is a very small fraction of a population with a condition A, it is less likely that a person from that population has the condition after observing event B
- d. The prior probabilities P(A) and P(B) must be taken into account before making any judgment about P(A|B)