ProbabilityExerciseSetOne is due on Friday, September 13, 2019 at 11:59pm.

The number of attempts available for each question is noted beside the question. If you are having trouble figuring out your error, you should consult the textbook, or ask a fellow student, one of the TA's or your professor for help.
There are also other resources at your disposal, such as the Mathematics Continuous Tutorials. Don't spend a lot of time guessing – it's not very efficient or effective.

Make sure to give lots of significant digits for (floating point) numerical answers. For most problems when entering numerical answers, you can if you wish enter elementary expressions such as $2 \wedge 3$ instead of 8, $\sin(3 * \text{pi}/2)$instead of -1, $e \wedge (\ln(2))$ instead of 2, $(2+\tan(3)) * (4-\sin(5)) \wedge 6-7/8$ instead of 27620.3413, etc.

---

1. (1 point) Recent crime statistics collected over the past year reveal the following figures: 80% of all people arrested were male, 12% of all people arrested were under the age of 18; 6% of all people arrested were female and under the age of 18.

Let M repesent the event that the person arrested is male, and $U18$ represent the event that the person arrested is under the age of 18.

Part (a) Complete the table below. Use two decimals in each of your answers.

	M	M^c	Row Probabilities
$U18$	_____	_____	_____
$U18^c$	_____	_____	_____
Column Probabilities	_____	_____	_____

Part (b) A person who was arrested in the past year is randomly chosen. What is the probability that this person is male or under the age of 18? Enter your answer to two decimals. _____

Part (c)

Find the probability that the person chosen in (b) is neither male nor under the age of 18. Use two decimals in your answer.

_____

Part (d)

What is the probability of all people arrested in the past year are male and at least 18 years of age? Enter your answer as a decimal to two places. _____

Part (e) Are the events M and $U18$ mutually exclusive events? Select the most appropriate reason below.

- A. M and $U18$ are mutually exclusive events, because $P(M \cup UH) = 0$.
- B. M and $U18$ are mutually exclusive events, because $P(M \cap UH) = P(M)P(U18)$.
- C. M and $U18$ are not mutually exclusive events, because $P(M \cap UH) \neq 0$.
- D. M and $U18$ are mutually exclusive events, because $P(M \cap UH) = 0$.
- E. M and $U18$ are not mutually exclusive events, because $P(M \cap UH) \neq P(M)P(U18)$.

Answer(s) submitted:

- 0.06
- 0.06
- 0.12
- 0.74
- 0.14
- 0.88
- 0.80
- 0.20
- 1
- 0.86
- 0.14
- 0.74
- C

(correct)

---

2. (1 point) Two fair die are tossed, and the uppermost face of each die is observed. The following events are defined from this random experiment:

A represent the event the uppermost faces sum to five

B represent the event that the product of the uppermost faces is four. For example, die1*die2 = 4

C represent the event that the absolute difference between the uppermost faces is 1. For example, $|die1 - die2| = 1$

Part (a) Find the probability that the uppermost faces do not sum to five. _____ (Use four decimals in your answer)

Part (b) Find $P(A \cup C)$ _____ (Use four decimals)

Part (c) What is the probability that the uppermost faces do not sum to five or are not a product of 4? _____ (use four decimals)

Part (d) Find $P(A \cap (B \cup C))$ _____ (use four decimals)

Part (e) Are the events a sum of 5 and a product of 4 mutually exclusive events? Select the most appropriate reason below.

- A. A sum of 5 and a product of 4 are mutually exclusive events because they are not independent events.

- B. A sum of 5 and a product of 4 are not mutually exclusive events because $P(A \cap B) \neq 0$.
- C. A sum of 5 and a product of 4 are not mutually exclusive events because $P(A \cap B) \neq P(A)P(B)$.
- D. A sum of 5 and a product of 4 are not mutually exclusive events because $P(A \cap B) = P(A)P(B)$.
- E. A sum of 5 and a product of 4 are mutually exclusive events because $P(A \cap B) = 0$.

Answer(s) submitted:

- 0.8889
- 0.3333
- 0.9444
- 0.1111
- B

(correct)

---

3. (1 point) A triangular die is a four-sided die, each side possessing either a number 1, 2, 3, or 4. Two such die are tossed simultaneously and the bottom faces - the face that each die lands on - is observed. Consider the following events:

A the bottom-most faces sum to six

B each bottom-most face shows an even number

C both bottom-most faces show the same number, referred to as *doubles*

Part (a) What is the probability that the bottom-most faces do not sum to six? _____ (Use four decimals in your answer)

Part (b) Compute $P(A \cup B)$ _____ (Use four decimals)
Part (c) Compute $P(A^C \cap C^c)$ _____ (use four decimals)
Part (d) Compute $P(A \cap B \cap C)$ _____ (use four decimals)

Part (e) Are the events A and C mutually exclusive events? Select the most appropriate reason below.

- A. A and C are not mutually exclusive events because $P(A \cap C) \neq 0$.
- B. A and C are not mutually exclusive events because $P(A \cap C) \neq P(A)P(C)$.
- C. A and C are mutually exclusive events because they are not independent events.
- D. A and C are not mutually exclusive events because $P(A \cap C) = P(A)P(C)$.
- E. A and C are mutually exclusive events because $P(A \cap C) = 0$.

Answer(s) submitted:

- 0.8125
- 0.3125
- 0.6250
- 0
- A

(correct)

---

4. (1 point) The Canadian Tobacco Monitoring Survey is a national survey administered by Statistics Canada to study smoking trends of Canadians aged 15 or older. The most recent survey found that 21% of Canadians aged 15 years or older smoke on a daily basis. In addition, 23% of men are smokers, and 19% of women are smokers.

The most recent census shows that men make up 50% of the Canadian population, with women making up the remainder.

You randomly pick a Canadian that is 15 years old or older. Compute the probability this person

Part (a) is male and a smoker. _____ (Use four decimals in your answer)

Part (b) is a women and not a smoker. _____ (Use four decimals)
Part (c) What percentage of smokers are male? _____%(enter your percentage to two decimals)
Part (d) What percentage of smokers are women? %_____% (enter your percentage to two decimals)

Answer(s) submitted:

- 0.1150
- 0.4050
- 54.76
- 45.24

(correct)

---

5. (1 point) Three people get into an elevator on the main floor of a building that has 9 floors (this building has 8 floors above the ground-level). Assuming that each of the three people will get off the elevator on one of floors 2 through 9, and each does so randomly.

Part (a) What is the probability that the three people get off on the 4th floor? _____ (use four decimals)
Part (b) What is the probability that the three people get off on the same floor? _____ (use four decimals)
Part (c) What is that at least two of the three people get off on the same floor? _____ (use four decimals)
Part (d) What is the probability that exactly two of the three people get off on the same floor? _____ (use four decimals)

Answer(s) submitted:

- 0.0020
- 0.0156
- 0.3438
- 0.3281

(correct)

6. (1 point) A pool of potential jurors consists of 17 men and 15 women. 12 jurors are to be chosen at random from the pool of 32.

What is the probability that this jury is made up

Part (a) 3 men? _____ (use four decimals)

Part (b) half of the jury are men and half are women? _____ (use four decimals)

Part (c) at least two women are amongst the 12 jurors? _____ (use four decimals)

Part (d) The jury has been selected and there are 9 men on the jury. Assuming the jury was chosen randomly, what is the chance of this occurring?

$P(9-men) =$_____ (use four decimals)

Part (e) Consider the jury selection that occurred in part (d) and the probability this happening. Would this particular jury cause you to question the randomness of the jury selection? That is, can the 9 men on the jury lead you to be suspicious about the randomness of the jury selection?

- A. No, because the chance of 9 men being chosen on the jury is likely if the jury selection were random.
- B. Yes, because the chance of 9 men being chosen on the jury is likely if the jury selection were random.
- C. Yes, because the chance of 9 men being chosen on the jury is not likely if the jury selection were random.
- D. No, because the chance of 9 men being chosen on the jury is not likely if the jury selection were random.

Answer(s) submitted:

- 0.0151
- 0.2743
- 0.9992
- 0.0490
- C

(correct)

7. (1 point) Suppose I give you a list of 20 problems to study, from which I will randomly pick 10 questions for an exam.

For whatever reason, you prepare for this exam by completing and understanding how to solve 12 questions of the 20, so there are 8 questions you do not know how to solve.

Part (a) Compute the probability that you completely solve 8 of the 10 questions appearing on the midterm exam. _____ (use four decimals)

Part (b) To pass the midterm, you must correctly solve at least half of the 10 questions. Compute the probability that you will pass the exam. _____ (use four decimals)

Answer(s) submitted:

- 0.0750
- 0.9151

(correct)

8. (1 point) The game of Yahtzee consists of tossing five fair die simultaneously and observing the top side of each die.

Compute the probability of observing

Part (a) at least two die show the same number? _____ (use four decimals)

Part (b) a one, two, three, four, and five in any order.

_____ (use four decimals)

Part (c) observing a straight. (A straight consists of five numbers in sequence. For example, (1,2,3,4,5) is a straight.)

_____ (use four decimals)

Part (d) Compute the probability that all die show the same number.

$P(all\ die\ are\ the\ same) =$_____ (use four decimals)

Part (e) You are to find the probability of the five die showing two distinct pairs. Select the probability expression that would correctly compute this probability.

- A. $\frac{\binom{6}{1}\binom{5}{1}\binom{4}{1}\binom{5}{2}\binom{3}{2}}{\binom{6}{5}}$
- B. $\frac{\binom{6}{2}\binom{4}{1}\binom{5}{2}\binom{3}{2}}{\binom{6}{5}}$
- C. $\frac{\binom{6}{1}\binom{5}{1}\binom{4}{1}\binom{5}{2}\binom{3}{2}}{6^5}$
- D. $\frac{\binom{6}{3}}{6^5}$
- E. $\frac{\binom{6}{2}\binom{4}{1}\binom{5}{2}\binom{3}{2}}{6^5}$

Answer(s) submitted:

- 0.9074
- 0.0154
- 0.0309
- 0.0008
- E

(correct)