Practice Test 1

Probability

Last Name	First Name	Date

This assignment is closed books. One 2-sided US Letter sheet of notes is OK.

All your scratch work will be collected with the test and discarded.

All electronic devices besides approved calculators and computers running approved software are prohibited.

Avoid rounding during computation as much as possible. Final answers should be rounded to no fewer than 4 significant digits.

1 (4 points). Compute the values of the following expressions, given that
$c = 0.787, \quad d = 0.3124, \quad \beta = 0.001, \quad y = 509.36, \quad z = 144.28$

(a) $\dfrac{17d}{c} + \dfrac{y}{z} =$

(b) $\dfrac{2c - 3d}{\sqrt{\beta y}} =$

(c) $c\beta(y - z)^2$

(d) $\sqrt{\dfrac{d}{c^2} + \dfrac{c^3}{d - 100\beta}}$

2 (3 points). Circle those and only those numbers that represent probabilities.

$\dfrac{9}{19}$ $\quad -0.001$ $\quad \dfrac{19}{20}$ $\quad \dfrac{17}{16}$ $\quad 0.009$ $\quad -0.5$ $\quad 1.5$ $\quad 1.0$

3 (6 points). Suppose that A and B are events with:

- $P(A) = 0.15$
- $P(A \cap B) = 0.03$
- $P(A|B) = 0.12$

(a) Show that $P(B) = 0.25$

(b) Assuming that $P(B) = 0.25$, find $P(A \cup B)$

(c) Find $P(B|A)$

(d) Are events A and B independent? Explain. **Yes / No**

(e) Are events A and B mutually exclusive? **Yes / No**

4 (12 points)**.** A coffee shop collects the following sample of drink orders over one month. The experiment is to choose one of these orders at random.

	Cafè Latte	Cafè Mocha	Black Tea	Herbal Tea	Total
Hot	12	8	4	6	
Iced	5	5	2	3	
Total					

(a) What are the chances that the drink is iced?

(b) What are the chances that the drink is **not** a Mocha?

(c) How likely is the drink to be either a Latte or a herbal tea?

(d) What is the probability of selecting hot tea of any kind?

(e) Are the events "Iced" and "Black Tea" mutually exclusive? **Yes / No**

(f) Are the events "Iced" and "Black Tea" independent? Show work. **Yes / No**

5 (10 points)**.** A video game marketing company conducts a study where they ask to identify one's favorite genre, and esimate the number of hours played per week. The experiment is to choose one of the surveyed individuals at random.

Hours played	Roleplaying	Sports	Adventure	Total
$0-4$	12	6	5	
$4-8$	5	8	3	
$8-12$	7	0	4	
Total				

(a) What is the probability of someone playing less than 4 hours per week, given that they prefer Roleplaying?

(b) What are the chances of someone favoring Adventures, given that they play more than 4 hours per week?

(c) How likely is the individual to play less than 8 hours per week, given that they prefer Sports games?

(d) Are the events "$8-12$" and "Sports" mutually exclusive? **Yes / No**

(e) Are the events "$8-12$" and "Sports" independent? Show work. **Yes / No**

6 (12 points)**.** Suppose that a sample of vehicles yields the following contingency table. The experiment is to choose one of these vehicles at random.

	Red	White	Black	Total
Coupe	4	34	12	
Sedan	2	5	3	
SUV	10	0	10	
Total				

(a) Find P(the vehicle is white or a sedan)

(b) Find P(the vehicle is white and an SUV)

(c) Find P(the vehicle is neither black nor an SUV)

(d) Find the probability that a vehicle is an SUV, given it is black

Let N be the event **the vehicle is white and an SUV**,
and let B be the event **the vehicle is black**

(e) Are the events N and B mutually exclusive? **Yes / No**

(f) Are the events N and B independent? Explain. **Yes / No**

7 (4 points)**.** Compute the values of the following expressions:

(a) $\dfrac{30!}{28!}$ (b) ${}_9C_7$

8 (6 points)**.** An experiment consists in choosing a random day of the week (Mon, Tue, Wed, Thu, Fri, Sat, or Sun) and a random time of day (morning, afternoon, or evening), so that every choice is equally likely.

(a) Contruct the sample space for this experiment. What is the size of this sample space?

(b) Find the probability that the chosen time is during a weekend (Saturday or Sunday) and not in the evening.

(c) Find the probability that the chosen time is either on Monday, or in the morning.

9 (2 points)**.** A pizza place makes their pizza either New York or Chicago style, and offers a choice of 3 cheeses and 10 toppings. How many different pizzas can be made, if every pizza has to be either New York or Chicago style, and has to be covered with one type of cheese and two different toppings?

10 (2 points)**.** Eliane wants to enroll into 2 STEM classes and 2 Humanities classes during her first semester at the University. How many different schedules are there if Eliane has 4 STEM classes and 5 Humanities classes to choose from?

11 (2 points)**.** Barbara is taking a test with 10 questions, where she is supposed to answer any 7 questions of her choice in any order. How many different ways are there to pick 7 questions to answer?

12 (2 points)**.** Acme Co is interviewing 19 candidates in order to fill 3 positions. 9 of the candidates are local residents and the other 10 are from a different state. If all outcomes are equally likely, what is the probability that all 3 new hires are locals?

13 (2 points)**.** June has 4 math books and 5 cooking books, and she wants to put them on a shelf in a visually appealing manner, so that all the math books go first, and all the cooking books go after. How many ways are there to order the books on a shelf?

14 (2 points)**.** While playing Yahtzee, Fiona tosses five six-sided dice. What are the chances that she gets a Yahtzee (all 5 dice showing the same number) on the first try?

15 (2 points)**.** A box of chocolate candy has 12 dark chocolate pieces, 6 milk chocolate pieces, and 6 mint-flavored pieces of candy. Ivan grabs 4 pieces without looking, so that all selections are equally likely. What is the probability that he ends up with 2 dark chocolate and 2 mint-flavored candies?

16 (10 points)**.** An experiment consists of choosing two distinct random cards out of a standard 52-card deck, in such a way that all possible outcomes are equally likely.

(a) Find the size of the sample space.

(b) Find the probability that *both cards are hearts*.

(c) Find the probability that *neither card is an Ace*.

(d) Find the probability that *both cards are hearts* **and** *neither card is an Ace*.

(e) Find the probability that *both cards are hearts*, **given that** *neither card is an Ace*.

(f) Are events *both cards are hearts* and *neither card is an Ace* independent?

(g) Are events *both cards are hearts* and *neither card is an Ace* mutually exclusive?

17 (4 points)**.** Now suppose we choose **three** distinct random cards out of a standard 52-card deck, in such a way that all possible outcomes are equally likely.

(a) Find the probability that all three cards are Hearts.

(b) Find the probability that all three cards are different suits.