

Homework 3; Monday, March 2

NAME:

1) A box contains three balls—one red, one blue, and one yellow. Consider an experiment that consists of withdrawing a ball from the box, replacing it, and withdrawing a second ball.

- a. What is the sample space of this experiment?
- b. What is the event that the first ball drawn is yellow?
- c. What is the event that the same ball is drawn twice?

2) Repeat the previous problem but now consider that the second ball is drawn without replacement of the first ball.

- d. What is the sample space of this experiment?
- e. What is the event that the first ball drawn is yellow?
- f. What is the event that the same ball is drawn twice?

3) Audrey and her boyfriend Charles must choose which colleges they will attend in the coming fall. Audrey was accepted at UC Davis (UCD), UC San Diego (UCSD), UC Irvine (UCI), and San Francisco State University (SFSU). Charles was accepted at UCI and SFSU. Let the outcome of the experiment consist of the colleges that Audrey and Charles choose to attend.

- a. List all the outcomes in sample space S .
- b. List all the outcomes in the event that Audrey and Charles attend the same school.
- c. List all the outcomes in the event that Audrey and Charles attend different schools.
- d. List all the outcomes in the event that Audrey and Charles attend schools in the same state.

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4) A cafeteria offers a three-course meal. One chooses a main course, a starch, and a dessert. The possible choices are as follows:

Meal	Choices
Main course	Chicken or roast beef
Starch course	Pasta or rice or potatoes
Dessert	Ice cream or gelatin or apple pie

An individual is to choose one course from each category.

- a. List all the outcomes in the sample space.
- b. Let A be the event that ice cream is chosen. List all the outcomes in A.
- c. Let B be the event that chicken is chosen. List all the outcomes in B.
- d. List all the outcomes in the event $A \cap B$.
- e. Let C be the event that rice is chosen. List all the outcomes in C.
- f. List all the outcomes in the event $A \cap B \cap C$.

5) The following pairs of events E and F relate to the same experiment. Tell in each case whether E and F are disjoint (i.e. mutually exclusive) events.

- a. A die is rolled. Event E is that it lands on an even number, and F is the event that it lands on an odd number.
- b. A die is rolled. Event E is that it lands on 3, and F is the event that it lands on an even number.

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- c. A person is chosen. Event E is that this person was born in the United States, and F is the event that this person is a U.S. citizen.
- d. A man is chosen. Event E is that he is over 30 years of age, and F is the event that he has been married for over 30 years.
- e. A woman waiting in line to register her car at the department of motor vehicles is chosen. Event E is that the car is made in the United States, and F is the event that it is made in a foreign country.

6) A bowl contains 12 poker chips—3 red, 4 white, and 5 blue. If one of these poker chips is selected at random from the bowl, what is the probability that its color is

- a. red?
- b. red or white?
- c. not white?

7) A student council is made up of four women and six men. One of the women is president of the council. A member of the council is selected at random to report to the dean.

- a. What is the probability that a woman is selected?
- b. What is the probability that a man is selected?
- c. What is the probability that the president of the student council is selected?

8) The following frequency distribution reports the highest education level achieved by *Standard and Poor's* top 500 CEOs.

Level	Frequency
No college	14
B.S. / B.A.	164
M.B.A.	191
Doctorate	50

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Find the probability that a randomly selected CEO from Standard and Poor's top 500 achieved the educational level of:

- a. B.S. / B.A.
- b. either M.B.A. or Doctorate
- c. at least some college

9) The following data comes from a Center for Health Statistics. The table shows the number of female hospitalizations for cardiovascular disease, by age group, during one year in Florida.

<i>Age group (yr)</i>	<i>Number</i>
0–19	810
20–39	5,029
40–49	10,977
50–59	20,983
60–69	36,884
70–79	65,017
80 and over	69,167

One of these case records is selected at random. Find the probability that the woman was:

- a. in her 50s.
- b. less than 50 years old.
- c. between 40 and 69 years old, inclusive.
- d. 70 years old or older.

10) An ordinary deck of playing cards has 52 cards. There are four suits—spades, hearts, diamonds, and clubs—with 13 cards in each suit. Spades and clubs are black; hearts and diamonds are red. If one of these cards is selected at random, what is the probability that it is:

- a. spade?
- b. not a club?
- c. red?
- d. a face card (jack, queen, or king)?

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11) Consider the following values: 64% of the students at a college are women; 12% of the female students are majoring in computer science. If a student chosen at random is a woman, what is the probability that she will be majoring in computer science?

12) A hospital administration did a survey of patients regarding satisfaction with care and type of surgery. The results follow:

	Heart	Hip	Knee	Total
Not satisfied	7	12	2	21
Neutral	15	38	10	63
Satisfied	32	16	25	73
Very satisfied	4	22	23	49
Total	58	88	60	206

a) Find the probability that a patient is satisfied:

- i) $\frac{32}{206}$ ii) 73 iii) $\frac{122}{206}$ iv) 122 v) $\frac{73}{206}$ _____

b) Find the probability that a patient is very satisfied and had knee surgery:

- i) $\frac{109}{206}$ ii) $\frac{11}{206}$ iii) $\frac{23}{206}$ iv) $\frac{23}{60}$ v) $\frac{23}{60} + \frac{23}{49}$ _____

c) Find the probability that a patient is neutral and had hip surgery:

- i) $\frac{38}{88}$ ii) $\frac{88}{206}$ iii) $\frac{38}{206}$ iv) $\frac{38}{63}$ v) $\frac{63}{88}$ _____

d) Find the probability that a patient had knee surgery:

- i) 60 ii) 206 iii) $\frac{146}{206}$ iv) $\frac{60}{206}$ v) $\frac{2}{206}$ _____

e) Find the probability that a patient is satisfied and had heart surgery:

- i) $\frac{73}{206}$ ii) $\frac{58}{73}$ iii) $\frac{32}{58}$ iv) $\frac{32}{206}$ v) $\frac{32}{73}$ _____

f) Find the probability that a patient is not satisfied and had heart surgery:

- i) $\frac{7}{58}$ ii) $\frac{7}{206}$ iii) $\frac{7}{21}$ iv) $\frac{21}{206}$ v) $\frac{58}{206}$ _____

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13) Explain what is wrong with the following argument: “When two balanced dice are rolled, the sum of the dice can be 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12, giving 11 possibilities. Therefore the probability is $1/11$ that the sum is 12.”

14) What is wrong with the following argument? “If two coins are tossed, then there are 3 possible outcomes: (1) 2 heads, (2) 1 head and 1 tail, (3) 2 tails. Hence the probability of two heads is $1/3$ ”

15) Use the following data to compute the following 14 probabilities (listed below the table)

	Democrat	Republican	Independent	<i>Total</i>
females	250	300	50	<i>600</i>
males	250	100	50	<i>400</i>
<i>Total</i>	<i>500</i>	<i>400</i>	<i>100</i>	<i>1000</i>

- | | |
|---------------------------------------|--|
| 1. $P(\text{Democrat})$ | 8. $P(\text{Republican} \mid \text{male})$ |
| 2. $P(\text{Republican})$ | 9. $P(\text{Republican} \mid \text{female})$ |
| 3. $P(\text{Independent})$ | 10. $P(\text{male} \mid \text{Democrat})$ |
| 4. $P(\text{Republican and male})$ | 11. $P(\text{female} \mid \text{Democrat})$ |
| 5. $P(\text{Independent and male})$ | 12. $P(\text{female} \mid \text{Republican})$ |
| 6. $P(\text{Independent and female})$ | 13. $P(\text{Democrat} \mid \text{not Independent})$ |
| 7. $P(\text{female and Republican})$ | 14. $P(\text{Republican} \mid \text{not Independent})$ |

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16) Two fair dice are tossed:

- a. What is the probability of a sum of six?
- b. What is the probability of a sum of five?
- c. What is the probability of doubles (e.g. 1-1, 2-2, 3-3, etc)?
- d. What is the probability of a sum of six or doubles?
- e. What is the probability of a sum of six and doubles?
- f. What is the probability of a sum of five or doubles?
- g. What is the probability of a sum of five and doubles?

17) At a certain university in the United States, 62% of the students are at least bilingual—speaking English and at least one other language. Of these students, 80% speak Spanish and, of the 80% who speak Spanish, 10% also speak French.

Determine the probability that a randomly selected student at this university:

- a. does not speak Spanish.
- b. speaks Spanish and French.