1) (3 points each) Find the sample space associated with the following experiments:

a) Flip a coin 2 times:

{HH, HT, TH, TT}

b) Flip a coin 3 times:

{HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}

see here!

2) (3 points each) After flipping a coin 3 times, find the probability of…

a) Getting exactly 1 head:

$\frac{3}{8}$

b) Getting at least 2 heads:

$\frac{4}{8} = \frac{1}{2}$

3) (3 points each) Consider a standard deck of cards.

a) How many Face Cards are there?

12

b) What is the probability of picking a Face Card?

$\frac{12}{52} = \frac{3}{13}$

c) How many Clubs are there?

13

d) What is the probability of picking a Club?

$\frac{13}{52} = \frac{1}{4}$

e) How many cards are Club Face Cards?

3

f) What is the probability of picking a face card **or** a Heart?

$\frac{12+13-3}{52} = \frac{22}{52} = \frac{11}{26}$

4) (4 points each) Dario has 12 markers in his bag, 4 of which are not working. Picking 3 markers at random, what is/are…

a) The probability they all work:

$\frac{C(8,3)}{C(12,3)} = \frac{56}{220} = \frac{14}{55}$

$\frac{8}{12} \cdot \frac{7}{11} \cdot \frac{6}{10}$

b) The odds they all work:

14 to 41

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5) (3 points each) Consider the chart below:

Age:	20 - 24	25 - 29	30 - 34	Total
Female	12	13	7	32
Male	18	9	12	39
Total	30	22	19	71

Picking one person at random, what is the probability that they are…

a) Female: $\frac{32}{71}$

b) Female and between 25 – 29: $\frac{13}{71}$

c) Female given they are between 25 – 29: $\frac{13}{22}$

6) (4 points each) In a room of 30 people, 17 saw the movie *Up*, 14 people saw the movie *Finding Nemo* (*FN*), and 6 people saw both. Picking a person at random, what is the probability that they:

a) Saw *Up* and *FN*? $\frac{6}{30} = \frac{1}{5}$

b) Saw *Up* given they saw *FN*? $\frac{6}{14} = \frac{3}{7}$

c) Saw *FN* given they didn't see *Up*? $\frac{14-6}{30-17} = \frac{8}{13}$

7) (3 points each) Three cards are picked, one at a time, from a standard deck of cards. Find the probability that you pick a Heart first, a Diamond second, and another Heart third if…

a) The cards are not replaced: $\frac{13}{52} \cdot \frac{13}{51} \cdot \frac{12}{50} = \frac{13}{850}$

b) The cards are replaced: $\left(\frac{13}{52}\right)^3 = \frac{1}{64}$

8) (4 points) A multiple-choice test has 6 questions with 4 possible answers each. How many ways can you answer the questions? Assume all questions will be answered.

oops $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 4^6 = 4096$

9) (4 points) How many distinct permutations can be formed using all of the letters in the word SUBBOOKKEEPER?

$$\frac{13!}{1!\,1!\,2!\,2!\,2!\,3!\,1!\,1!} = 129{,}729{,}600$$

S U B O K E P R

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10) (4 points) A room is full of 12 artists, 7 financial advisors, 8 highly trained dolphins, and 4 less scary clowns. A committee is to be formed that contains 12 people to rid the world of the Monday blues. What is the probability that exactly 3 people from each group? Assume dolphins are people.

$$\frac{C(12,3)\,C(7,3)\,C(8,3)\,C(4,3)}{C(31,12)} = \frac{1,724,800}{141,120,525}$$

11) (3 points) Finn and Jake are having a party where they invited 3 women and 3 men. Assuming everyone arrives at a different time, what is the probability that the women are the first three guests and the men are the last three guests?

$$\frac{P(3,3)\,P(3,3)}{P(6,6)} = \frac{3\cdot2\cdot1\cdot3\cdot2\cdot1}{6\cdot5\cdot4\cdot3\cdot2\cdot1} = \frac{1}{20}$$

12) (3 points each) Short answer. When writing the answer to a question that give the following directions, how can you write your answer?

a) "What is the probability that..." easily

b) "What are the odds that..." neatly

13) (3 points each) It was found this week that 37.93% of computers use an Android OS. Picking 5 computer users, found the probability, written as a percent rounded to four decimal places, that...

a) They all have the Android OS:

$(.3793)^5 = 0.7851\%$

b) Exactly 3 have the Android OS:

$C(5,3)(.3793)^3(1-.3793)^2 = 21.0238\%$

14) A raffle is being held where 1,000 tickets were sold for \$15 each. One first place ticket brings in a prize of \$500. Two second place prizes are for \$200 each. Five third place prizes are for \$100 each. Rounding answers (in dollars) to two decimal places...

a) (6 points) What is the expected net value of the game?

1st 2nd 3rd Lose

$$\frac{1}{1000}\cdot485 + \frac{2}{1000}\cdot185 + \frac{5}{1000}\cdot85 + \frac{992}{1000}(-15) = -13.60$$

b) (2 points) Is the game fair to play? Why or why not?

No, expected to lose since the value is negative.

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