Problem Set 3.3 – Introduction to Probability Concepts | Unit 3 – Probability

BIG PICTURE of this UNIT:	• How can we visualize events and outcomes when considering probability events? • How can we count outcomes in probability events? • How can we calculate probabilities, given different types of events • Can we predict how likely it is that an event occurs? How can we use that knowledge?

This lesson will be based upon a STUDENT DIRECTED DISCUSSION model ….. in your groups, you should be having DISCUSSIONS about how to think and work through and then present the solutions to the following questions. The questions will involve basic ideas including (i) visualizing the outcomes of probability events/experiments, (ii) determining probabilities of single and compound probability events, (iii) counting outcomes, and (iv). EVERY PROBLEM SET will involve spiralling through these major concepts as you will be given the opportunity to deepen and extend your conceptual knowledge & skill set on these major themes as you see them multiple times in our lessons.

So, in your group, discuss & prepare solutions to the following questions. Record the key ideas of your discussions/solutions in your notebook. Then, once you have had your discussions, present your solutions on the board. Solutions do NOT necessarily NEED to be correct – they simply form the basis for DISCUSSIONS !!!! If your group has (i) multiple solutions that lead to the same answers OR (ii) same/different solutions that lead to different answers, present them ANYWAY!!

1. Construct a tree diagram to visualize and organize the possible outcomes of the following simple "probability experiment" – a multiple choice exam. So a HW Quiz contains questions with three possible answers of: yes, no, and not enough information provided. Draw a tree diagram that represents all the possible answers on a student's quiz that has only 3 questions.
    a. How many possible different "results" are there?
    b. If each answer was equally likely (i.e. you guessed for each answer), how probable is it that you will pass this HW quiz (get at least 2 correct, where YES is the correct answer to each question)

2. Ten slips of paper numbered from 1 to 10 are in a box. A slip of paper is drawn and a die is rolled. What is the probability of getting a 2 on only one of them?

3. A letter is picked at random from the alphabet. Find the probability that the letter picked is contained in the word 'flyers' or in the word 'eagles'.

4. If a die is thrown, what is the probability of obtaining an even number or a number greater than 4?

5. Go on line and find out what these two terms mean: (i) mutually exclusive events and (ii) mutually inclusive events (also known as non-mutually exclusive). Given your definitions, classify each pair of events (events A and B) as mutually exclusive or non-mutually exclusive.

	Event A	Event B
(a)	Randomly drawing a grey sock from a drawer	Randomly drawing a wool sock from a drawer
(b)	Randomly selecting a student with brown eyes	Randomly selecting a student on the honour roll
(c)	Having an even number of students in your class	Having an odd number of students in your class
(d)	Rolling a six with a die	Rolling a prime number with a die
(e)	Your birthday falling on a Saturday next year	Your birthday falling on a weekend next year
(f)	Getting an A on the next test	Passing the next test

6. We will now consider <u>the probability of event A OR event B occurring</u>. So our events will involve the selection of a card that is drawn randomly from nine cards labeled 1 through 9.

1. To determine the probability of picking a 5 or an even number.

(a) Are these events mutually exclusive or inclusive?
(b) How probable is it to get a 5?
(c) How probable is it to get an even number?
(d) So how probable is it to get a 5 or an even number?

2. To determine P(number less than 4 or a 2) =

(a) Are these events mutually exclusive or inclusive?
(b) How probable is it to get a number less than 4?
(c) How probable is it to get a 2?
(d) So determine P(number less than 4 or a 2)

3. P(odd number or a number less than 3) = ___

4. P(1 or a number greater than or equal to 7) = _____

5. P(3 or a number greater than 9) = ________

6. P(2 or an even number) = _________

7. In the game of craps, the thrower wins if on the first throw of a pair of dice, he throws a 7 or 11. Calculate the probability of winning on the first throw.

8. David and Omar empty a bag of 100 colored candies and count the number of each color, as shown in the following chart.

Number of Candies of Each Color

Color	Number
Orange	20
Red	10
Brown	30
Green	10
Yellow	15
Blue	15

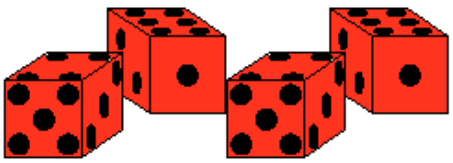
All the candies are put into the bag and then they shake the bag.

a. How likely is it that Omar will remove a blue candy?
b. How likely is it that David will remove two successive blue coloured candies?
c. Omar now takes 3 candies. How likely is it that Omar removes two blue candies?
d. How likely is it that David removes 5 candies, 2 of which are blue?

Higher Level Questions for More Complex Concepts in Probability. Determine the probability of the event described in each exercise. Unless stated otherwise, assume all items of chance (dice, coins, cards, spinners, etc.) are fair.

A Dicey Paradox

Stage: 3 ★★



Four fair dice are marked on their six faces, using the mathematical constants e, π and ϕ as follows:

A: 4 4 4 4 0 0
B: $\pi\pi\pi\pi\pi\pi$ where π is approximately 3.142
C: e e e e 7 7 where e is approximately 2.718
D: 5 5 5 $\phi\phi\phi$ where ϕ is approximately 1.618

The game is that we each have one die, we throw the dice once and the highest number wins. I invite you to choose first ANY one of the dice. Then I can always choose another one so that I will have a better chance of winning than you. You may think this is unfair and decide you want to play with the die I chose. In that case I can always chose another one so that I still have a better chance of winning than you. Investigate the probabilities and explain the choices I make in all possible cases.