(A) Lesson Context

BIG PICTURE of this UNIT:	• How can we visualize events and outcomes when considering compound events ? • How can we calculate probabilities when considering compound events ?		
CONTEXT of this LESSON:	Where we've been We've seen the difference between experimental and theoretical probability as the difference between calculating AND/OR probabilities and constructed tree diagrams	Where we are When dealing with compound events, how do we handle mutually exclusive & non-mutually exclusive events?	Where we are heading Can we predict how likely is an event to occur? How can we use that knowledge?

(B) Lesson Objectives:

a. be able to distinguish between compound events that are either mutually exclusive OR non-mutually exclusive events
b. perform probability calculations once having identified the events as mutually/non-mutually exclusive

(C) Key Terms for COMPOUND EVENTS

Mutually Exclusive – when two events _____ happen at the same time.
You will _____ have any outcomes in common.
So the probability of A OR B occurring is determined by ➔

Examples ➔

Mutually Inclusive – when one event can happen at the _____ time.
You will have outcomes in _____.

Examples ➔
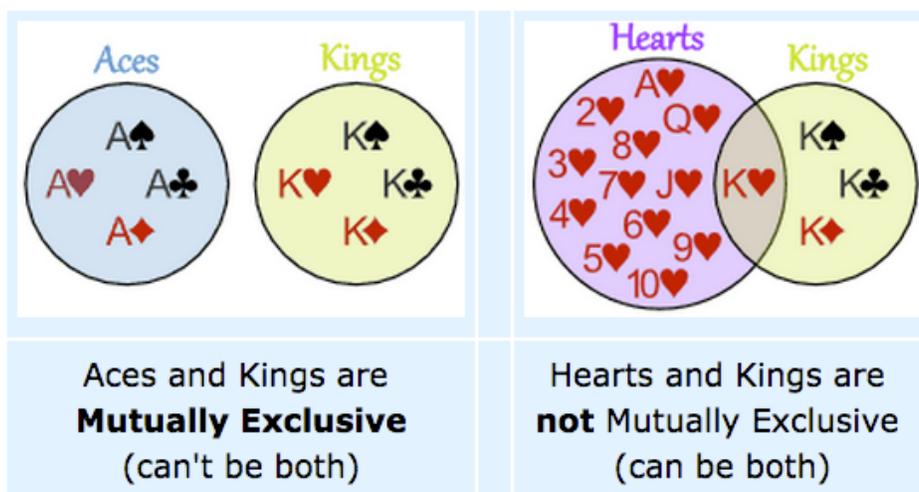So the probability of A OR B occurring is determined by ➔

Classify each pair of events 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	

(D) Simple Examples: Mutually Exclusive Events & Their Probabilities

In our examples now, we will simply consider the probability of event A **OR** event B occurring. So let our events be the selection of a card is drawn randomly from nine cards labeled 1 through 9. For each selection, we will consider TWO possible outcomes ➔ say we understand it as the OUTCOME of event A or the OUTCOME of event B)

What is the probability of picking a 5 or an even number. Mutually exclusive/inclusive? _____
 	
We have two possible outcomes.
    a. Getting a 5
    b. Getting an even number
	P(number less than 4 or a 2) = Mutually exclusive/inclusive? _____
	
	We have two possible outcomes.
	    a. Getting a number less than 4
	    b. Getting a 2

P(odd number or a number less than 3) = _____	P(1 or a number greater than or equal to 7) = _____
P(3 or a number greater than 9) = _____	P(2 or an even number) = _____

Aces and Kings are
Mutually Exclusive
(can't be both)

Hearts and Kings are
not Mutually Exclusive
(can be both)

(E) <u>Mutually Exclusive Events and Inclusive Events Worksheet</u>

1. 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?

2. 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'.

3. In a certain class, 5 of the 14 boys have brown hair, and 6 of the 12 girls have brown hair. What's the probability of selecting a girl or a person w/ brown hair?

4. Three coins are tossed. What is the probability of obtaining at least 2 tails?

5. A bag contains 7 red, 4 blue, and 8 black marbles. If 3 marbles are selected at random, what's the probability that all are red or all are black?

6. Two cards are drawn from a standard deck. What is the probability of…

    a) Both cards being aces or both being face cards?

    b) Both diamonds or both 7's?

    c) Both red or both clubs?

7. Slips of paper numbered 1 to 25 are in a box. A slip of paper is drawn at random. What is the probability that the number is…

    a) a multiple of 2 or 5   b) a multiple of 3 or odd   c) a multiple of 4 or is prime

8. A committee of 6 people is to be selected from a group of 7 men and 7 women. What is the probability that the committee will consist of…

    a) All men or all women   b) 4 men or 4 women   c) at least 5 women

9. 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.

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

11. The probabilities that John will receive an A, B, C, D, or E on a test is 0.13, 0.26, 0.45, 0.11 and 0.05 respectively. What is the probability that John will get the following result?

    a) An A or B   b) At least a D   c) Less than A

12. In a large sample of families in Canada, it was found that 80% of the husbands and 60% of the wives were employed outside the home. In 53% of the cases, both the husband and wife were employed outside the home. Assume that the sample is representative of the whole population of Canada. What is the probability that

    a) At least one spouse is employed outside the home   b) Neither spouse is employed outside the home

13. Environmentalists have accused a large company of dumping nuclear waste material in a local river. The probability that either the fish in the river or the animals that drink from the river will die is 11/21. The probability that only the fish will die is 1/3 and the probability that only the animals that drink from the river will die is 2/7. What is the probability that both the fish and the animals will die?

14. A student feels that the probability of passing her driver's test is 90%, the probability of selling her bicycle is 60% and the probability of passing the test and selling her bicycle is 55%. Find the probability that she will pass the test or sell her bicycle.

15. On a certain day, the probability of rain is 4/5, the probability of thunder is 3/5 and the probability of both is 2/5. What is the probability that it will rain or thunder?

16. As a promotion, a resort has a draw for free family day-passes. The resort considers July, August, March, and December to be "vacation months."

   a. If the free passes are randomly dated, what is the probability that a day-pass will be dated within

      i.   A vacation month?

      ii. June, July, or August?

   b. Draw a Venn diagram of the events in part a.

17. In an animal-behaviour study, hamsters were tested with a number of intelligence tests, as shown in the table below.

Number of Tests	Number of Hamsters
0	10
1	6
2	4
3	3
4 or more	5

If a hamster is randomly chosen from this study group, what is the likelihood that the hamster has participated in

   a. Exactly three tests?   b. Fewer than two tests?   c. Either one or two tests?

   d. No tests or more than three tests?

18. A grade 12 student is selected at random to sit on a university liaison committee. Of the 120 students enrolled in the grade 12 university-preparation mathematics courses,

> ➢ 53 are enrolled in data management
>
> ➢ 71 are enrolled in calculus
>
> ➢ 36 are enrolled in advanced functions
>
> ➢ 19 are enrolled in data management and calculus
>
> ➢ 15 are enrolled in calculus and advanced functions
>
> ➢ 9 are enrolled in advanced functions and data management
>
> ➢ 3 are enrolled in all three

   a. Draw a Venn diagram to illustrate this situation

   b. Determine the probability that the student selected will be enrolled in either data management or calculus

   c. Determine the probability that the student selected will be enrolled in only one of the three courses

Answers

9. 2/9   10. 2/3   11. a) 0.39   b) 0.95 c) 0.87   12. a) 0.87   b) 0.13

13. 2/21   14. 0.95   15. 3/5   16. a) (i) 124/365   (ii) 92/365

17. a) 3/28   b) 4/7   c) 5/14 d) 15/28   18. b) 7/8   c) 83/120