(A) Lesson Objectives

1. Introduce the concept of compound events and independent events
2. Present algebraic and visual models for solving probabilities of compound, independent events

(B) Key Terms:

1. Compound Events:

2. Independent Events:

(C) Probabilities to be Calculated – AND/OR

1. We can determine p(A) AND p(B) ➔

2. We can determine p(A) OR p(B) ➔

(D) Models useful in calculating probabilities

1. **Algebraical Models** ➔ we can develop formulas to use in probability questions

2. **Visual Models** ➔ we can draw various representations that help us to see outcomes and sample spaces which include:
   i.
   ii.
   iii.
   iv.

(E) Exploration ➔ Working with Probability of Independent Events

1. Consider tossing a fair coin and then rolling a fair six-sided die.

(a) Why are these two events independent?

(b) Draw a tree diagram to represent all the possible outcomes from this experiment.

(c) What is the probability of getting a tails when tossing the coin?

(d) What is the probability of rolling a number less than three on the die?

(e) From your tree diagram, what is the probability that a tail was tossed **and** a number less than three was rolled?

(f) How could the probabilities in parts (c) and (d) be combined to obtain the probability found in part (e)?

(g) From your tree diagram, what is the probability that a tail was tossed **OR** a number less than three was rolled?

(h) How could the probabilities in parts (c) and (d) be combined to obtain the probability found in part (g)?

2. A fair six-sided die is rolled two times. What is the probability that it will land on a four each time?

(F) Examples of Working with Visualizations and Compound Probability Calculations

The key to many of these problems is to reword the problem so that the "AND" or the "OR" nature of the problem becomes apparent.

Ex 1. If two coins are tossed, what is the probability of getting exactly two heads?

Ex 2. How probable is it that a fair coin is tossed three times and in each case it came up heads?

Ex 3. If three coins are tossed, what is the probability of getting exactly two heads?

Ex 4. If three coins are tossed, what is the probability of getting at most two heads?

Ex 5. A coin is tossed 5 times and a tail is the outcome each time. What is the probability of getting a tail on the sixth throw?

Ex 6. Ava is taking a multiple choice quiz for which she has not studied. There are 5 questions on the quiz and each question has four possible choices. If Ava guesses on each of the questions, what is the probability that she will receive a perfect score?

Ex 7. Jacob consistently makes 80% of all of his free throws in basketball. If he is awarded 2 free throws, determine the following probabilities:

(i) He makes both free throws

(ii) He makes neither free throw

(iii) He makes the first but misses the second

(iv) He makes one of the two free throws

Ex 8. The weather forecast states that there is a 40% chance of rain on Saturday and a 70% chance of rain on Sunday

(a) What is the probability that it will rain on Saturday and Sunday?

(b) What is the probability that it will rain neither Saturday nor Sunday?

(c) Why don't the probabilities that you found in parts (a) and (b) add up to 1 (or 100%)?

(d) What is the probability that it will rain on the weekend?

Ex 9. A fair coin is tossed and a fair die is rolled. Calculate the following probabilities:

(a) a multiple of two will be rolled on the die **AND** a head will be tossed on the coin?

(b) a multiple of two will be rolled on the die **OR** a head will be tossed on the coin?

(c) a number greater than 4 and two consecutive heads on two consecutive tosses of the coin.

(d) a number greater than 4 and one heads on 2 consecutive tosses of the coin.

A box contains three green marbles (G), five blue marbles (B) and eight orange marbles (O). Use a tree diagram (or create lists) to help you visualize or analyze and then calculate the probabilities of the following events:

(a) that the first two picked will both be green if the first marble is ***replaced*** after its colour is noted.

(b) that the first two picked will both be green if the first marble is ***NOT replaced*** after its colour is noted.

(c) Should the answers for Q(a) and Q(b) be the same? Why or why not?

(d) Selecting a blue marble OR a green marble with your first pick.

(e) NOT selecting a blue marble with the first pick

(f) Selecting an orange OR green marble with the first pick

Now we will assume replacement and make 2 picks, so how probable is:

(g) Selecting a blue marble AND then a green marble.

(h) Selecting a green marble given that your first pick had been blue.

(i) Selecting at least one orange marble in your first two picks.

(j) NOT selecting an orange marble .

(k) Selecting an orange marble AND a blue marble.

(l) Selecting an orange marble OR a blue marble.

(m) Selecting a green marble given that your first marble was NOT blue.

(G) Examples of Working with Visualizations and Compound Probability Calculations

A shuffled deck of cards is placed face-down on the table. It contains 3 hearts (H), 4 diamonds (D), 5 clubs (C) and 2 spades (S). Use a tree diagram (or create lists) to help you visualize or analyze and then calculate the probabilities of the following events:

1. the top two cards are both spades.
2. The top 2 cards are EITHER hearts OR spades.
3. The top two cards are clubs AND diamonds.
4. The top two cards are NOT red.
5. The top two cards are NEITHER spades NOR hearts.