It’s To Be Expected

Its_To_Be_Expected.tns

Name ________________________

Class ________________________

Creating a Tree Diagram

Read the problem on page 1.2.

1. List the sample space for the three shots.

2. What is the probability that **Aisha** will make her shot? Will miss her shot?

3. What is the probability that **Bria** will make her shot? Will miss her shot?

4. What is the probability that **Carmen** will make her shot? Will miss her shot?

One way to organize the results of the scenario is to create a tree diagram where each set of branches represent one girl’s shot. On page 1.3, change the labels to the appropriate probabilities. (A = Aisha, B = Bria, C = Carmen, 1 = made, 2 = miss.)

Since the events of each girl making her shot are independent, the **multiplication rule** for probability can be used. Use the tree diagram to help calculate the eight probabilities.

5. What is the probability that none of the girls make their shots?

6. What is the probability that one girl makes her shot? (*Hint:* Which of the eight probabilities must be added together to find the answer?)

7. What is the probability that two girls make their shots?

8. What is the probability that all the girls make their shots?

Introducing Expected Value

Read the problem on page 1.7. Then on page 1.8, enter the probabilities from pages 1.5 and 1.6. Enter the payoff in Column C and then calculate **probabilities·payoff** in Column D.

9. Find the expected value of the winnings.

Extension – Putting it All Together

In a lottery, players may pick six numbers from two separate pools of numbers — five different numbers from 1 to 56 and one number from 1 to 46. You win the jackpot by matching all six winning numbers in a drawing.

MATCH		MATCH	PRIZE	CHANCES
5	+	1	Jackpot	1 in 175,711,536
5	+	0	$250,000	1 in 3,904,701
4	+	1	$10,000	1 in 689,065
4	+	0	$150	1 in 15,313
3	+	1	$150	1 in 13,781
3	+	0	$7	1 in 306
2	+	1	$10	1 in 844
1	+	1	$3	1 in 141
0	+	1	$2	1 in 75
Overall chances of winning a prize:				1 in 40

1. Verify the chances to win the jackpot from your knowledge of counting principles.
2. Calculate the expected value for the lottery assuming the jackpot is $42 million.
3. Tickets cost $1.00 per play. How much does the lottery make/lose for each ticket sold?
4. What would the expected value need to be for the lottery to break even?
5. What would the jackpot need to be for the lottery to break even?