Name: ______________________________ Hour: _____ Date: ______

Lesson 6.3: Day 1: Is it smart to foul at the end of the game?

In the 2005 Conference USA basketball tournament, Memphis trailed Louisville by two points. At the buzzer, Memphis's Darius Washington attempted a 3-pointer; he missed but was fouled, and went to the line for three free throws. Each made free throw is worth 1 point. Was it smart to foul?

1. What are all the possible ways the shots could fall (e.g. make-miss-miss, etc.)?

① ✓✓✓ ③ ✓✗✓ ⑤ ✓✗✗ ⑦ ✗✗✓
② ✓✓✗ ④ ✗✓✓ ⑥ ✗✓✗ ⑧ ✗✗✗

2. Darius Washington was a 72% free-throw shooter. Find the probability that Memphis will win, lose or go to overtime. When you have found the probabilities put them in the table in #3.

Win	Lose	Overtime
3 makes (.72)(.72)(.72) =.373	0 makes and 3 misses (.28)(.28)(.28) = .022 1 make and 2 misses (.72)(.28)(.28) =.056 × 3 ways	2 makes and 1 miss (.72)(.72)(.28) =0.145 × 3 ways

$3 \times (\text{make})^2 (\text{miss})^1$

$_3C_2 \cdot .72^2 \cdot .28^1$

$_nC_k \, p^k (1-p)^{n-k}$

Total Shots, makes, %make, %miss

3. Prior to watching each shot, calculate the probability that Memphis wins the game in regulation, loses the game in regulation, or sends the game into overtime.

Louisville	Memphis	Shots Remain.	Probability Memphis Win	Probability Memphis Lose	Probability Overtime
75	73		=.373	.022+.169 =.191	=0.435
75	74		make make $(.72)^2 = .5184$	miss miss $(.28)^2 = .0789$	miss make or make miss (.28)(.72)×2 = .4032
75	74		0	.28	.72

4. Washington is a 40% 3-point shooter. Do you think Louisville was smart to foul? Why or why not?

maybe - chance of losing in regulation goes down but they might have to go to overtime and could lose there.

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Lesson 6.3 Day 1– Binomial Random Variables

Important ideas:	
LT #1 Binomial Setting B- Binary I- Independent N- Set Number of trials $n=$ S- same probability $p=$	LT #2 Binomial Prob. $P(X=k)$: must add to total $_nC_k\, p^k (1-p)^{n-k}$ must add to 1 total # #success Prob success Prob Failure

Check Your Understanding

1. For each of the following situations, determine whether or not the given random variable has a binomial distribution. Justify your answer.

a. Shuffle a deck of cards. Turn over the top card. Put the card back in the deck, and shuffle again. Repeat this process 10 times. Let X = the number of aces you observe.

Binary Success → Ace, Failure → Not Ace

I- Independent because of replacement

N: $n=10$

S: $p=4/52$

yes, binomial.

b. Choose 5 students at random from your class. Let Y = the number who are over 6 feet tall.

B- Success → over 6 ft. Failure → not over 6ft

I- Independent? No! No replacement.

Not binomial.

2. Pedro drives the same route to work on Monday through Friday. His route includes one traffic light. According to the local traffic department, there is a 55% chance that the light will be red on a randomly selected work day. Suppose we choose 10 of Pedro's work days at random and let Y = the number of times that the light is red.

a. Explain why Y is a binomial random variable.

B = Success → Red light, failure → Not red

I = Independent

N = $n=10$

S: $p=.55$

b. Find the probability that the light is red on exactly 7 days.

$P(Y=7) = {}_{10}C_7 \times .55^7 \times .45^3 = .166$