BINOMIAL RV HOMEWORK.

LeBron James, a famous basketball player, has 73.5% career free throw percentage. If a player like that attempts 3 free throws in a row, we can model the number of successful attempts by a random variable X with a binomial distribution:

$$X \sim \text{Binom}(n = 3, p = 0.735)$$

1. State the probability distribution of X. That is, find how likely is the player to have x successful free throw attempts out of 3:

x	$P(X = x)$
0	
1	
2	
3	

2. What are the chances that at least 1 free throw attempt is successful?

3. What is the expected number of successful free throws?

4. Find the standard deviation of X.

5. Find the probability of the event where the player either fails all three times or succeeds all three times.

6. How appropriate is a binomial model for this real-life situation? What could be a possible reason not to use it?

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7. Suppose that 361 cats are sampled completely randomly out of a population where 25% of cats are tabbies. Find the 95th percentile for the number of tabbies in that sample and describe what it means with a sentence.

It has been estimated that about 30% of California residents have adequate earthquake supplies. Suppose you randomly survey 12 California residents. We are interested in the number who have adequate earthquake supplies.

8. Describe the distribution of Y, a random variable equal to the number of people in the sample who have adequate earthquake supplies.

9. What is the probability that at least eight individuals have adequate earthquake supplies?

10. Find $P(Y < 3)$.

11. How many people would you expect to have adequate earthquake supplies?

12. Find the z-score of Y for the sample where no one has adequate earthquake supplies.

The four-leaf clover is a rare variation of the common three-leaf clover that has four leaflets instead of three. A 2017 survey of approximately 5.7 million clovers in six European countries found the frequency of 4-leaf clovers to be about 5000 to 1 (about one 4-leaf clover for every 5000 normal 3-leaf clovers).

13. Describe the distribution of C, a random variable equal to the number of four-leaf clovers in a simple random sample of 1,000 clovers.

14. Find the mean and the standard deviation of C.

15. What are the chances that at least one four-leaf clover will be found in a sample of size 1000?

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16. A medical researcher takes a simple random sample of 800 Californians out of a population where 55% of all respondents admit to consuming alcohol on a regular basis. Find the 12th percentile for the number of individuals in that sample who are regular consumers of alcohol.

ANSWERS.

1.

x	$P(X = x)$
0	0.01860963
1	0.15484613
2	0.42947887
3	0.39706537

2. 0.9813904

3. 2.205

4. 0.7644115

5. 0.7644115

7. 104, meaning that only 5% of all such samples of size 361 will have more than 104 tabbies.

8. $Y \sim \text{Binom}(n = 12, p = 0.3)$

9. 0.009489371

10. 0.2528153

11. 3.6

12. −2.267787