

MATH 103/GRACEY  
DISCRETE PROBABILITY WORKSHEET

Kevin Durant is a rising star in the NBA. He plays for the Oklahoma City Thunder. Kevin's 3-point field goal percentage is 42.2%.

1. Let  $X$  denote the number of 3-point field goals that Kevin makes in four attempts. Find the probability that Kevin misses all four shots.

$$P(X=0) = {}_4C_0 \cdot (0.422)^0 \cdot (0.578)^4 \approx 0.112$$

$$4C_0 = \frac{4!}{(4-0)! \cdot 0!} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{4 \cdot 3 \cdot 2 \cdot 1} = 1$$

2. Represent the probability distribution in the table below. Let  $X$  denote the number of 3-point field goals that Kevin makes in four attempts.

$$P(X=1) = {}_4C_1 (0.422)^1 (0.578)^{4-1} \approx 0.326$$

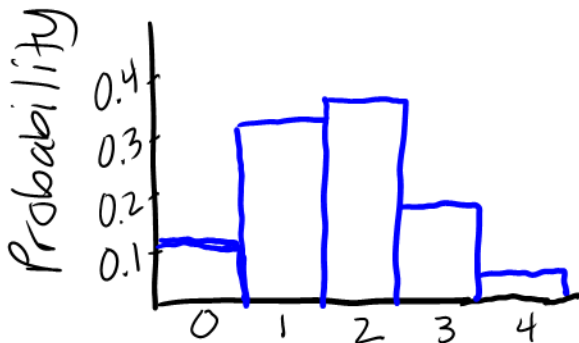
$$P(X=2) = {}_4C_2 (0.422)^2 (0.578)^{4-2} \approx 0.357$$

$$P(X=3) = {}_4C_3 (0.422)^3 (0.578)^{4-3} \approx 0.174$$

$$P(X=4) = {}_4C_4 (0.422)^4 (0.578)^{4-4} \approx 0.0317$$

X	P(X)
0	0.112
1	0.326
2	0.357
3	0.174
4	0.0317

3. Sketch the probability histogram which corresponds to the probability distribution from number 2.



4. What is the mean number of 3-point field goals that Kevin will make in four attempts?

$$\mu = \sum x \cdot P(x)$$

$$\mu = 0 \cdot 0.112 + 1 \cdot 0.326 + 2 \cdot 0.357 + 3 \cdot 0.174 + 4 \cdot 0.0317$$

$$\mu = 1.6888 \rightarrow \mu \approx 1.7 \text{ 3-point field goals}$$

5. What is the standard deviation of 3-point field goals that Kevin will make in four attempts?

$$\sigma^2 = \sum x^2 \cdot P(x) - \mu^2$$

$$\sigma^2 = 0^2 \cdot 0.112 + 1^2 \cdot 0.326 + 2^2 \cdot 0.357 + 3^2 \cdot 0.174 + 4^2 \cdot 0.0317 - 1.6888^2$$

$$\sigma^2 = 0.97515 \rightarrow \sigma \approx \sqrt{0.97515} \approx 1.0 \text{ 3-pt. field goals}$$

6. Multiply the number of trials and Kevin's 3-point field goal percentage (42.2%). What did you find out?

$4(0.422) \approx 1.7$  Cool! The mean of a random variable w/a binomial distribution is  $\mu = n \cdot p$

7. Now multiply the number of trials, Kevin's 3-point field goal percentage (42.2%), and the complement of Kevin's 3-point field goal percentage. Then evaluate the square root of your result. What did you find out?

$4(0.422)(0.578) = 0.976$   
 $\sqrt{0.976} \approx 1.0 \rightarrow$  Even better... the standard dev. of a random variable w/a binomial dist is  $\sigma = \sqrt{npq}$

8. Find the range of values for the usual number of 3-point field goals for Kevin when he attempts four 3-point field goals.

$$\mu - 2\sigma \leq \text{usual \# of 3-pt field goals out of 4 attempts} \leq \mu + 2\sigma$$

$$-0.3 \leq \text{usual \# of 3-pt field goals out of 4 attempts} \leq 3.7$$

9. Would it be considered unusual for Kevin to make four 3-point field goals out of four attempts? Explain.

yes as 4 lies outside of the usual # of 3-pt field goals out of 4 attempts.