

Answer on Question #45518— Math — Statistics and Probability

A pair of dice is rolled 180 times. What is the probability that a total of six occurs a) At least 30 times b) between 33 and 42 times inclusive. Use Normal approximation to Binomial distribution.

Solution

To get six in a roll you have probability $((1,5)+(2,4)+(3,3)+(4,2)+(5,1))/(\text{total } 6^2 \text{ possibilities})$:

$$p = \frac{5}{36}$$

So, if X = number of times a total occurs out of $n=180$ rolls then $X \sim B(180, 5/36)$.

Now Let $Y \sim N(\mu, \sigma^2)$ be normal approximation of X

$$\mu = np = 180 \cdot \frac{5}{36} = 25, \quad \sigma^2 = np(1-p) = 180 \cdot \frac{5}{36} \cdot \frac{31}{36} \approx 21.5$$

So we have

$$X \sim N(25, 21.5)$$

Now, using tables, we can easily find: a. $X \geq 30$ which is the same $X \geq 29.5$ (continuity correction).

$$P(X \geq 29.5) \approx 0.417106$$

b. with continuity corrections: $32.5 \leq X \leq 42.5$:

$$P(32.5 \leq X \leq 42.5) \approx 0.363606$$