

Answer on Question #83912 – Math – Statistics and Probability

Let probability of getting an even number in one throw = p

Then probability of getting an odd number in one throw = $1 - p$

Let the random variable X = the number of even numbers in 5 throws, i.e. in 5 trials;

$n=5$, the probability of success = p , $X \sim B(n, p)$, i.e. $X \sim B(5, p)$.

$$P [X = r] = \binom{5}{r} p^r (1-p)^{5-r}$$

$$r = 0, 1, 2, 3, 4, 5$$

$$\text{Given } P [X = 3] = 2 P [X = 2]$$

$$\Rightarrow \binom{5}{3} p^3 (1-p)^2 = 2 \binom{5}{2} p^2 (1-p)^3$$

$$\Rightarrow 10 p^3 (1-p)^2 = 2 \times 10 p^2 (1-p)^3$$

$$\Rightarrow p = 2(1-p)$$

$$\Rightarrow p = 2/3$$

$$\text{Probability of no even number in one set of 5 trials} = P[X = 0] = \binom{5}{0} (1-p)^5 = \left(1 - \frac{2}{3}\right)^5 = \frac{1}{243}$$

$$\text{Hence expected number of sets out of 2500 sets showing no even number} = 2500 \times \frac{1}{243}$$

$$= 10.29$$

$$\approx 10 \text{ sets.}$$

Answer: about 10 sets.