

1 Lesson 5 Example 2

Complete the calculation for the Chevalier de Méré. Calculate the probability of getting at least one double-six in 24 rolls of two dice.

2 Answer

To solve the Chevalier de Méré's problem, we need to calculate the probability of getting at least one double-six in 24 rolls of two dice.

Complement Rule

Instead of calculating the probability of getting at least one double-six directly, it's easier to calculate the complement: the probability of not getting any double-sixes in 24 rolls. Then, we subtract this probability from 1 to find the desired probability.

Probability of Not Getting a Double-Six in One Roll

1. When rolling two dice, the probability of not getting a double-six is:

$$P(\text{not double-six in one roll}) = 1 - P(\text{double-six in one roll})$$

2. The probability of getting a double-six in one roll is:

$$P(\text{double-six in one roll}) = \frac{1}{36}$$

3. Thus, the probability of not getting a double-six in one roll is:

$$P(\text{not double-six in one roll}) = 1 - \frac{1}{36} = \frac{35}{36}$$

Probability of Not Getting a Double-Six in 24 Rolls

The rolls are independent, so the probability of not getting a double-six in 24 rolls is:

$$P(\text{not double-six in 24 rolls}) = \left(\frac{35}{36}\right)^{24}$$

Calculating the Complement Probability

We need the probability of getting at least one double-six in 24 rolls, which is the complement of not getting any double-sixes in 24 rolls:

$$P(\text{at least one double-six in 24 rolls}) = 1 - P(\text{not double-six in 24 rolls}) = 1 - \left(\frac{35}{36}\right)^{24}$$

Numerical Calculation

1. To find the numerical value of the above expression:

$$P(\text{not double-six in 24 rolls}) = \left(\frac{35}{36}\right)^{24} \approx 0.5086$$

2. Thus,

$$P(\text{at least one double-six in 24 rolls}) = 1 - 0.5086 = 0.4914$$

Conclusion

The probability of getting at least one double-six in 24 rolls of two dice is approximately 0.4914.