

Answer on Question #23926 – Math – Statistics and Probability

Question

If 16 dates are named at random, what is the probability that 3 of them will be Sundays?

Solution

The problem is not well posed, because we are not informed about the set of days: month, year or decade, from which we take days. Suppose we take 16 days from a month that consists of 31 days including 4 Sundays. There are $\binom{31}{16}$ ways to select 16 days and we must choose 3 Sundays out of 4 and $16-3=13$ days from the rest $31-4=27$ days, which are not Sundays.

Thus, by the classical definition of probability, the probability that 3 of them will be Sundays equals

$$\begin{aligned} \frac{\binom{4}{3} \cdot \binom{27}{13}}{\binom{31}{16}} &= \frac{\frac{4!}{3!(4-3)!} \cdot \frac{27!}{13!(27-13)!}}{\frac{31!}{16!(31-16)!}} = \frac{\frac{4!}{3! \cdot 1!} \cdot \frac{27!}{13! \cdot 14!}}{\frac{31!}{16! \cdot 15!}} = \frac{4!}{3! \cdot 1!} \cdot \frac{27!}{31!} \cdot \frac{16! \cdot 15!}{13! \cdot 14!} = \\ &= \frac{4 \cdot 3! \cdot 27! \cdot 16 \cdot 15 \cdot 14 \cdot 13! \cdot 15 \cdot 14!}{3! \cdot 1! \cdot 31 \cdot 30 \cdot 29 \cdot 28 \cdot 27! \cdot 13! \cdot 14!} = \frac{4 \cdot 16 \cdot 15 \cdot 14 \cdot 15}{31 \cdot 30 \cdot 29 \cdot 28} = \\ &= \frac{201600}{755160} = \frac{20160}{75516} = \frac{10080}{37758} = 0.26696. \end{aligned}$$

Answer: 0.26696.