Chapter 2

which yields the solution \( u = 23 \), in agreement with the result of Example 2 of

\[
505.997 \approx 730 \log 2
\]

or taking logarithms of both sides we obtain

\[
2 \leq \left( \frac{730}{(1-u)u} \right)^{30}
\]

is equivalent to

\[
\left( \frac{0.730}{(1-u)u} \right)^{30} \leq 2
\]

To determine the smallest integer \( u \) for which this probability is less than \( \frac{1}{2} \) note that

\[
\left( \frac{0.730}{(1-u)u} \right)^{30} \leq \left( \frac{1}{2} \right)^{30} = \left( \frac{1}{2} \right)^{30} \frac{1}{2} = 365 \frac{1}{2}
\]

Therefore

\[
\left( 1 \right)^{30} \frac{1}{2} = 365 \frac{1}{2}
\]

The number of successes should approximately have a Poisson distribution with mean

Theoretical Exercise 21. As \( P \{ E \}_{i} = P \{ F \}_{i} = \frac{1}{2} \) the event \( E \) is thus uncorrelated to suppose that \( P \{ E \}_{i} \) and \( P \{ F \}_{j} \) are independent (see Theorem Exercise 21). Here we define the event \( E \) as for the case \( E \). Enneus \( E \) is a success then whereas the \( F \) is a failure. The number of successes is then equal to the number of \( E \) events. If \( i \neq j \), and say that to have a success in position \( i \) and have the same birthday. If

We approximate the above probability by using the Poisson approximation when \( n \) is a large value. A combinatorial argument was used to determine this probability and it was
determined that the probability that at least \( m \) people are in the same month. We consider the problem of selecting a random sample of 30 people from 365 people. The probability that at least 2 people have the same birthday is

\[
\exp \left( -\frac{365}{365} \right) = \exp \left( -\frac{365}{365} \right)
\]

On p. 164 of The Text. We have

\[
\exp \left( -\frac{365}{365} \right)
\]

The Poisson Approximation To get the same answer

The Birthday Problem, Exponential Approximation, and Poisson Approx

Let \( g \) denote the probability that in a group of \( m \) people no 2 people have a birthday on the same day. Then

\[
g = \frac{365}{365} \frac{364}{365} \frac{363}{365} \cdots \frac{365-m+1}{365} = \exp \left( -\frac{m}{365} \right)
\]

Two for \( m = 2 \) people compared to \( \frac{365}{365} \) we expect that

On p. 164 of The Text. We have

\[
\exp \left( -\frac{365}{365} \right)
\]

The Poisson Approximation To get the same answer