The probability of the empty set is always 0.
Know that \( P(S) = 1 \).
Know that \( S, \emptyset \) (even multiple copies of the empty set) are disjoint. I.e.,
\[
S \cup \emptyset \cup \emptyset \cup \emptyset \cup \emptyset \cup \cdots = S
\]
So we see that
\[
P(S \cup \emptyset \cup \emptyset \cup \emptyset \cup \emptyset \cup \cdots) = P(S) = 1
\]
Since the events are disjoint, we can sum the probability of the individual events to get the probability of the union of the events. I.e.,
\[
P(S) + P(\emptyset) + P(\emptyset) + P(\emptyset) + \cdots = 1
\]
but again \( P(S) = 1 \) so
\[
1 + P(\emptyset) + P(\emptyset) + P(\emptyset) + \cdots = 1
\]
So the only possibility is that
\[
P(\emptyset) = 0.
\]