Probability

x is in $A \cap B \leftrightarrow x$ is in A **and** x is in B
x is in $A \cup B \leftrightarrow x$ is in A **or** x is in B

Probability of an intersection
$P(T_1 \cap S_1 0) = \frac{n(T_1 \cap S_1 0)}{n(SS)} = \frac{0}{36} = 0$ since the intersection is the empty set

Probability of a union
$P(T_1 \cup S_1 0) = \frac{n(T_1 \cup S_1 0)}{n(SS)} = \frac{19}{35}$
or
$P(T_1) \cup P(S_1 0) = \frac{19}{35}$

If $A_1, A_2, \ldots, A_n$ are disjoint (mutually exclusive – i.e. there is no overlap amongst any of the sets):
$P(A_1 \cup A_2 \cup \ldots \cup A_n) = P(A_1) + P(A_2) + \ldots + P(A_n)$

In all cases $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

What is the probability that the sum is nine?
$P(S_9) = \frac{n(S_9)}{N(SS)} = \frac{4}{36} = \frac{1}{9} \approx .111$
Probability that the sum is **not** nine?
$P(S_9^{'}) = \frac{n(S_9^{'})}{n(SS)} = \frac{32}{36} = \frac{8}{9} \approx .8889$
In all cases:
$P(A^{'}) = 1 - P(A)$

Flipping a coin four times