2.4. (a) $S = \{(H,H), (H,T), (T,H), (T,T)\}$.

(b) $\{(T,T)\}$.

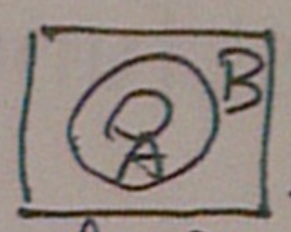
(c) Two tosses of a coin are both heads.

2.12 To prove $A=B$, we can prove $A \subset B$ and $B \subset A$.

① $A \subset B$.

Since we know an element ω in A is also in $A \cap B$.

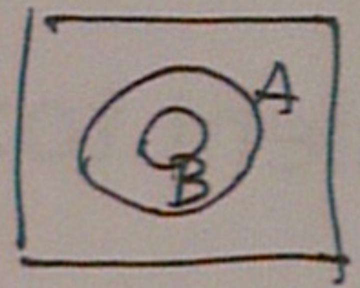
i.e. if $x \in A$, then $x \in A \cap B$ (Given)



$\therefore$ $A \subset B$. (An element of A is also an element of B).

② If $x \in A \cup B$, then $x \in A$ (Given)

This can only be true if $B \subset A$.



Two sets are equal iff they have the same elements.

By ①, ②, we can derive $A \subset B$ and $B \subset A$, so $A=B$. ∎

2.22 (a) An elementary event is the event contains only single outcomes.

If the dice is fair, and two tosses are independent.

Then all the outcomes are equally likely to occur. $\Rightarrow \frac{1}{36}$.

(b) $P(A) = \frac{1+2+3+4+5+6}{36} = \frac{7}{12}$.

$P(B) = \frac{6}{36} = \frac{1}{6}$.

$P(C) = \frac{8}{36} = \frac{2}{9}$.

$P(A \cap B^c) = \frac{1+2+3+4+5}{36} = \frac{5}{12}$.

$P(A \cap C) = \frac{4}{36} = \frac{1}{9}$.