A.3 Tautologies and Contradictions

1 ~~#~~ Def: A tautology is a compound statement whose truth value is ALWAYS true; regardless of the truth value of its variables.

Ex: p: "My hair is blue" $\sim p$: "My hair is not blue"

$p \vee (\sim p)$: "Either my hair is blue or my hair is not blue"

p	$\sim p$	$p \vee (\sim p)$
T	F	T
F	T	T

Def: A contradiction is a compound statement whose truth value is always false; regardless of the truth value of its variables.

p	$\sim p$	$p \wedge (\sim p)$
T	F	F
F	T	F

Ch. 6 Sets and Counting

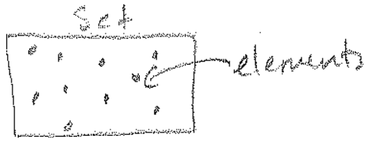
Each cube has two faces colored red, two white, two blue, and there will be exactly two cubes with each possible configuration of colors

If you want to include every possible configuration of colors, how many cubes will the kit contain?

72 Mike 32 Tyler 64 Jordan
45 Luke 36 Andrew
84 Branden 58 Jackson

6.1 Sets and Set Operations

<u>Def</u>: A <u>set</u> is a collection of items, the items are called the <u>elements</u> of the set.



Car brands, $C = \{$Ford, Honda, Chevy, Nissan, BMW, GMC, Buick, Audi, Infiniti, Saab, Mercury, VW, Mercedes, Jeep, Porsche, Cadillac, Smart, Jaguar, Landrover, Mini, Acura, Aston Martin, Lamb, Suburu, Italian, Fiat, Tesla$\}$

Ford $\in C$ "Ford is an element of the set C"

Rolls Royce $\notin C$ "~~E~~ Rolls Royce is not an element of the set C"

$C = X$ The two sets are equal, contain the same elements

$B = \{$Ford, Nissan, BMW$\}$

$B \subseteq C$ "B is a subset of the set C"

$C \subseteq C$

$B \subset C$ "B is a proper subset of C"

$\emptyset$ is the <u>empty set</u> - the set containing no elements, the empty set is a subset of every set.

$A = \{\emptyset\}$ A is the set containing the empty set, non-empty.

A <u>finite</u> set has a finite number of elements.
An <u>infinite</u> set does not have finitely many elements.

$\mathbb{N} = \{0, 1, 2, 3, 4, \ldots\}$ the natural (counting) numbers are an infinite set

Set of outcomes

Flip a coin : $S = \{H, T\}$

Roll a die, faces numbered 1 through 6

$S = \{1, 2, 3, 4, 5, 6\}$

S = { ⚀, ⚁, ⚂, ⚃, ..., ⚅ }