Section 2.2 Examples

$U = \{red, orange, yellow, green, blue, indigo, violet\}$
$A = \{red, orange, yellow\}$
$B = \{yellow, green, blue\}$

$A \cup B =$

$A \cap B =$

$A - B =$

$B - A =$

$\overline{A} =$

$U = \{red, orange, yellow, green, blue, indigo, violet\}$
$A = \{red, orange, yellow\}$
$B = \{yellow, green, blue\}$

$A \cup B = \{red, orange, yellow, green, blue\}$

$A \cap B =$

$A - B =$

$B - A =$

$\overline{A} =$

$U = \{red, orange, yellow, green, blue, indigo, violet\}$
$A = \{red, orange, yellow\}$
$B = \{yellow, green, blue\}$

$A \cup B = \{red, orange, yellow, green, blue\}$

$A \cap B = \{yellow\}$

$A - B =$

$B - A =$

$\overline{A} =$

$U = \{red, orange, yellow, green, blue, indigo, violet\}$
$A = \{red, orange, yellow\}$
$B = \{yellow, green, blue\}$

$A \cup B = \{red, orange, yellow, green, blue\}$

$A \cap B = \{yellow\}$

$A - B = \{red, orange\}$

$B - A =$

$\overline{A} =$

$U = \{red, orange, yellow, green, blue, indigo, violet\}$
$A = \{red, orange, yellow\}$
$B = \{yellow, green, blue\}$

$A \cup B = \{red, orange, yellow, green, blue\}$

$A \cap B = \{yellow\}$

$A - B = \{red, orange\}$

$B - A = \{green, blue\}$

$\overline{A} =$

$U = \{red, orange, yellow, green, blue, indigo, violet\}$
$A = \{red, orange, yellow\}$
$B = \{yellow, green, blue\}$

$$A \cup B = \{red, orange, yellow, green, blue\}$$

$$A \cap B = \{yellow\}$$

$$A - B = \{red, orange\}$$

$$B - A = \{green, blue\}$$

$$\overline{A} = \{green, blue, indigo, violet\}$$

Show that if A and B are sets with $A \subseteq B$, then $A \cup B = B$.

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Show that if A and B are sets with $A \subseteq B$, then $A \cup B = B$.

It is always the case that $B \subseteq A \cup B$, so it remains to show that $A \cup B \subseteq B$. But this is clear because if $x \in A \cup B$, then either $x \in A$, in which case $x \in B$ (because we are given $A \subseteq B$) or $x \in B$; in either case $x \in B$. **QED**.

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$	A ∩ (B ∪ C)
0	0	0	0	
0	0	1	1	
0	1	0	1	
0	1	1	1	
1	0	0	0	
1	0	1	1	
1	1	0	1	
1	1	1	1	

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$	A ∩ (B ∪ C)
0	0	0	0	
0	0	1	1	
0	1	0	1	
0	1	1	1	
1	0	0	0	
1	0	1	1	
1	1	0	1	
1	1	1	1	

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$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$	A ∩ (B ∪ C)
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$	$A \cap (B \cup C)$
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$	A ∩ (B ∪ C)	A ∩ B
0	0	0	0	0	
0	0	1	1	0	
0	1	0	1	0	
0	1	1	1	0	
1	0	0	0	0	
1	0	1	1	1	
1	1	0	1	1	
1	1	1	1	1	

Prove that

$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

by giving an element table proof.

A	B	C	$B \cup C$	A ∩ (B ∪ C)	A ∩ B
0	0	0	0	0	
0	0	1	1	0	
0	1	0	1	0	
0	1	1	1	0	
1	0	0	0	0	
1	0	1	1	1	
1	1	0	1	1	
1	1	1	1	1	

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$	$A \cap (B \cup C)$	$A \cap B$
0	0	0	0	0	0
0	0	1	1	0	0
0	1	0	1	0	0
0	1	1	1	0	0
1	0	0	0	0	0
1	0	1	1	1	0
1	1	0	1	1	1
1	1	1	1	1	1

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A	B	C	$B \cup C$	A ∩ (B ∪ C)	A ∩ B
0	0	0	0	0	0
0	0	1	1	0	0
0	1	0	1	0	0
0	1	1	1	0	0
1	0	0	0	0	0
1	0	1	1	1	0
1	1	0	1	1	1
1	1	1	1	1	1

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0	0	0	0	0	0	
0	0	1	1	0	0	
0	1	0	1	0	0	
0	1	1	1	0	0	
1	0	0	0	0	0	
1	0	1	1	1	0	
1	1	0	1	1	1	
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0	0	0	0	0	0	
0	0	1	1	0	0	
0	1	0	1	0	0	
0	1	1	1	0	0	
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1	1	0	1	1	1	
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0	0	0	0	0	0	0
0	0	1	1	0	0	0
0	1	0	1	0	0	0
0	1	1	1	0	0	0
1	0	0	0	0	0	0
1	0	1	1	1	0	1
1	1	0	1	1	1	0
1	1	1	1	1	1	1

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A	B	C	$B \cup C$	$A \cap (B \cup C)$	$A \cap B$	$A \cap C$
0	0	0	0	0	0	0
0	0	1	1	0	0	0
0	1	0	1	0	0	0
0	1	1	1	0	0	0
1	0	0	0	0	0	0
1	0	1	1	1	0	1
1	1	0	1	1	1	0
1	1	1	1	1	1	1

Prove that

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A	B	C	$B \cup C$	A ∩ (B ∪ C)	A ∩ B	A ∩ C	(A ∩ B) ∪ (A ∩ C)
0	0	0	0	0	0	0	
0	0	1	1	0	0	0	
0	1	0	1	0	0	0	
0	1	1	1	0	0	0	
1	0	0	0	0	0	0	
1	0	1	1	1	0	1	
1	1	0	1	1	1	0	
1	1	1	1	1	1	1	

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A	B	C	$B \cup C$	A ∩ (B ∪ C)	A ∩ B	A ∩ C	(A ∩ B) ∪ (A ∩ C)
0	0	0	0	0	0	0	
0	0	1	1	0	0	0	
0	1	0	1	0	0	0	
0	1	1	1	0	0	0	
1	0	0	0	0	0	0	
1	0	1	1	1	0	1	
1	1	0	1	1	1	0	
1	1	1	1	1	1	1	

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A	B	C	$B \cup C$	A ∩ (B ∪ C)	A ∩ B	A ∩ C	(A ∩ B) ∪ (A ∩ C)
0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	1	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	1	1	1	0	1
1	1	1	1	1	1	1	1

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0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	1	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	1	1	1	0	1
1	1	1	1	1	1	1	1

Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

by giving an element table proof.

A	B	C	$B \cup C$	$A \cap (B \cup C)$	$A \cap B$	$A \cap C$	$(A \cap B) \cup (A \cap C)$
0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	1	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	1	1	1	0	1
1	1	1	1	1	1	1	1

Prove the first identity law

$$A \cup \varnothing = A$$

using set-builder notation

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Prove the first identity law

$$A \cup \emptyset = A$$

using set-builder notation

$$A \cup \emptyset = \{x \mid x \in A \lor x \in \emptyset\}$$

Prove the first identity law $A \cup \emptyset = A$ using set-builder notation

$$A \cup \emptyset = \{x \mid x \in A \lor x \in \emptyset\}$$

$$= \{x \mid x \in A \lor F\}$$

Prove the first identity law $A \cup \varnothing = A$ using set-builder notation

$$A \cup \varnothing = \{x \mid x \in A \lor x \in \varnothing\}$$

$$= \{x \mid x \in A \lor F\}$$

$$= \{x \mid x \in A\}$$

Prove the first identity law $A \cup \emptyset = A$ using set-builder notation

$$A \cup \emptyset = \{x \mid x \in A \vee x \in \emptyset\}$$

$$= \{x \mid x \in A \vee F\}$$

$$= \{x \mid x \in A\}$$

$$= A$$