Exam 3 , Chapter 3 preview

CS 210 Fall 2017

Chapter 3.1: Set definitions and operations

Question 1
Using these sets:

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ $A = \{5, 6, 9\}$ $B = \{3, 4, 9, 10\}$
$C = \{5, 6\}$ $D = \{2, 6, 8\}$

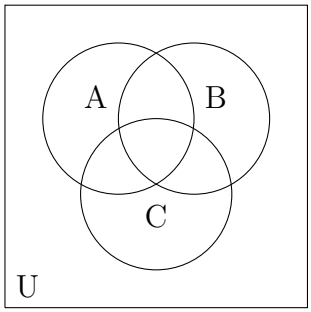
Find the results of the following set operations:

a. $A - C$ b. $C - A$ c. $A \cap C$
d. $A \cup D$ e. A' f. $C \cup B$

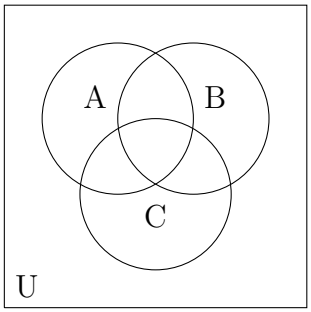
Question 2

Fill in the Venn diagrams for each of the following statements. Remember to include the Universe.

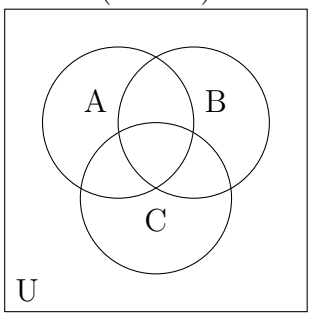
a. $U - A$



b. $B' - A$



c. $A \cup (B - C)$



Question 3

Write the following in set-builder notation with the form description:

a. The set of odd integers.

b. The set of natural numbers that are even.

Chapter 3.2: More operations on sets

Question 4

Using these sets:

$$A = \{fast, slow\} \qquad B = \{bike, car\}$$

Find the result of the following:

a. $A \times B =$

b. $\wp(B) =$

c. List out all 2 partitions of A.

Question 5

Using these sets:

$$A = \{1, 2\} \qquad B = \{a, b\}$$

Find the result of the following:

a. $A \times B =$

b. $\wp(A \times B) =$

c. $\wp(A) =$

d. $\wp(B) =$

e. Fill out the table for $\wp(A) \times \wp(B)$:

	$\emptyset$	$\{1\}$	$\{2\}$	$\{1, 2\}$
$\emptyset$				
$\{a)$				
(b)				
(a, b)				

Write out the set $\wp(A) \times \wp(B) =$

Chapter 3.4: Boolean algebra

Question 6

Rewrite each of the following with the equivalent Boolean Algebra version. Convert upper-case Set names to lower-case variables ($A \to a$) but keep the same letters for propositional variables ($p \to p$).

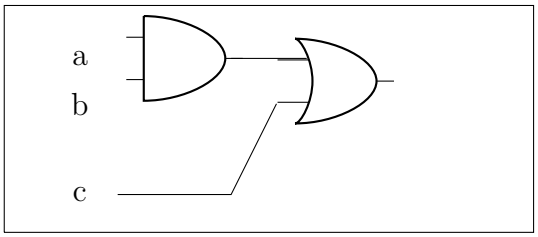
a. $(A \cup B)$ b. $C - D$ c. $p \wedge q$
d. $\neg q$ e. $(A \cap B)'$ f. $\neg(p)$

Chapter 3.5: Logic circuits

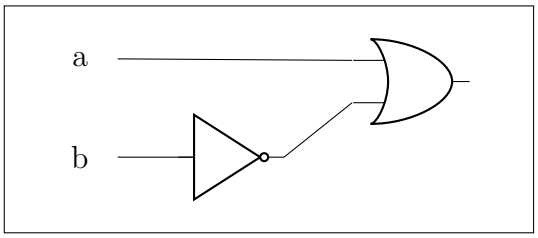
Question 7

Identify the Boolean Expression for the following diagrams. You do not need to simplify it.

a.



b.



Question 8

Draw a circuit diagram for the following Boolean Expression:

$$a'b + b'c$$

Question 9

For the following Karnaugh map:

	y	y'
x		✓
x'	✓	✓

Identify the following:

a. All 3 terms:

b. Simplified equation:

Question 10

Simplify the following Boolean Expression. Mark the terms in the Karnaugh map, then build out rectangles to come up with a simplified expression.

$$xyz' + xy'z' + x'yz + x'yz' + x'y'z' + x'y'z$$

	yz	yz'	$y'z'$	$y'z$
x				
x'				

Exam 3 , Chapter 3 preview answer key

Chapter 3.1: Set definitions and operations

Question 1

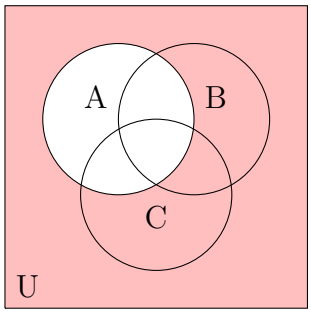
1. $A - C =$ $\{9\}$ 2. $C - A =$ $\emptyset$ 3. $A \cap C =$ $\{5, 6\}$

4. $A \cup D =$ $\{2, 5, 6, 8, 9\}$ 5. $A' =$ $\{1, 2, 3, 4, 7, 8, 10\}$

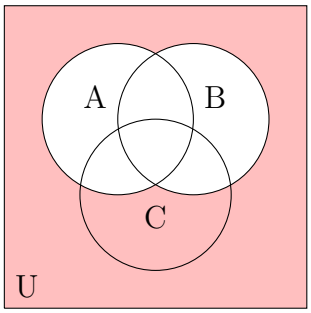
6. $C \cup B =$ $\{3, 4, 5, 6, 9, 10\}$

Question 2

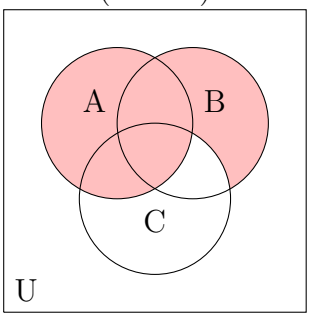
a. $U - A$



b. $B' - A$



c. $A \cup (B - C)$



Question 3

a. The set of odd integers. $\{2k + 1 : k \in \mathbb{Z}\}$

b. The set of natural numbers that are even. $\{2k : k \in \mathbb{N}\}$

Question 4

a. $A \times B =$ $\{(fast, bike), (fast, car), (slow, bike), (slow, car)\}$

b. $\wp(B) =$ $\{\emptyset, \{bike\}, \{car\}, \{bike, car\}\}$

c. List out all 2 partitions of A.

(a) $\{\{fast\}, \{slow\}\}$
(b) $\{\{fast, slow\}\}$

Question 5

a. $A \times B =$ $\{(1, a), (1, b), (2, a), (2, b)\}$

b. $\wp(A \times B) =$ $\{\emptyset,$
$\{(1, a)\}, \{(1, b)\}, \{(2, a)\}, \{(2, b)\},$
$\{(1, a), (1, b)\}, \{(1, a), (2, a)\}, \{(1, a), (2, b)\},$
$\{(1, b), (2, a)\}, \{(1, b), (2, b)\}, \{(2, a), (2, b)\},$
$\{(1, a), (1, b), (2, a)\}, \{(1, a), (1, b), (2, b)\},$
$\{(1, a), (2, a), (2, b)\}, \{(1, b), (2, a), (2, b)\},$
$\{(1, a), (1, b), (2, a), (2, b)\}\}$

c. $\wp(A) =$ $\{\emptyset, \{1\}, \{2\}, \{1,2\}\}$

d. $\wp(B) =$ $\{\emptyset, \{a\}, \{b\}, \{a,b\}\}$

e. Fill out the table for $\wp(A) \times \wp(B)$:

	$\emptyset$	$\{1\}$	$\{2\}$	$\{1,2\}$
$\emptyset$	$(\emptyset, \emptyset)$	$(\emptyset, \{1\})$	$(\emptyset, \{2\})$	$(\emptyset, \{1,2\})$
$\{a)$	$(\{a\}, \emptyset)$	$(\{a\}, \{1\})$	$(\{a\}, \{2\})$	$(\{a\}, \{1,2\})$
(b)	$(\{b\}, \emptyset)$	$(\{b\}, \{1\})$	$(\{b\}, \{2\})$	$(\{b\}, \{1,2\})$
(a,b)	$(\{a,b\}, \emptyset)$	$(\{a,b\}, \{1\})$	$(\{a,b\}, \{2\})$	$(\{a,b\}, \{1,2\})$

Write out the set $\wp(A) \times \wp(B) =$ $\{(\emptyset, \emptyset), (\emptyset, \{1\}), (\emptyset, \{2\}), (\emptyset, \{1,2\}),$
$(\{a\}, \emptyset), (\{a\}, \{1\}), (\{a\}, \{2\}), (\{a\}, \{1,2\})$
$(\{b\}, \emptyset), (\{b\}, \{1\}), (\{b\}, \{2\}), (\{b\}, \{1,2\})$
$(\{a,b\}, \emptyset), (\{a,b\}, \{1\}), (\{a,b\}, \{2\}), (\{a,b\}, \{1,2\})\}$

Question 6

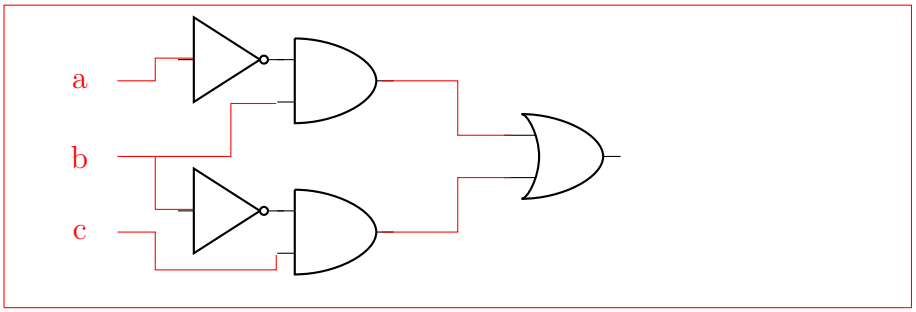
$(A \cup B)$ $(a+b)$	$C - D$ $c \cdot d'$
$p \wedge q$ $p \cdot q$	$\neg q$ q'
$(A \cap B)'$ $(a \cdot b)'$	$\neg(p)$ $(p)'$

Question 7

a. $(a \cdot b) + c$

b. $(a + b')$

Question 8



Question 9

a. All 3 terms: $x'y$, $x'y'$, xy'

b. Simplified equation: $x' + y'$

Question 10

	yz	yz'	$y'z'$	$y'z$
x		✓	✓	
x'	✓	✓	✓	✓

Can simplify to...

$$x' + xz'$$