

Worksheet 1

CS 2210 Discrete Structures

(Due 1/29 9pm)

* Teams of 3-4 students (must work in group).

** This page is double sided. Make sure to do both sides. **You must show your work.**

*** Write your answer in the allocated space. Scan and submit as one pdf on gradescope.

Name 1: Ernesto Lopez Name 2: Cobin Bliss

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Question 1: Proposition: "Today is Spring only if the flowers bloom."

Put in "If..., then..." form:

If today is spring, then the flowers bloom

Converse:

If the flowers bloom, then today is spring

Inverse:

If today is not spring, then the flowers do not bloom

Contrapositive:

If the flowers do not bloom, then today is not spring

Question 2: Decide if True or False.

If $4 \cdot 5 = 25$, then today is Monday. T

If $1+1=2$, the trees can walk. F

$2+1=5$ if and only if dogs can read. T

Question 3: For $((\neg p \vee \neg r) \vee (\neg q \wedge r)) \wedge q$ build truth table to evaluate expression.

p	q	r	$\neg p$	$\neg q$	$\neg r$	$(\neg p \vee \neg r)$	$(\neg q \wedge r)$	$(1) \vee (2)$	$((1) \vee (2)) \wedge q$
T	T	T	F	F	F	F	F	F	F
T	T	F	F	F	T	T	F	T	T
T	F	T	F	T	F	F	T	T	F
T	F	F	F	T	T	T	F	T	F
F	T	T	T	F	F	T	F	T	T
F	T	F	T	F	T	T	F	T	T
F	F	T	T	T	F	T	T	T	F
F	F	F	T	T	T	T	F	T	F

Question 4: Perform bitwise operations $(10101011 \wedge 10101001) \vee 10011101$.

$$\begin{array}{r}
 10101011 \\
 10101001 \\
 \hline
 10101001
 \end{array}
 \text{ AND }
 \begin{array}{r}
 10101001 \\
 10011101 \\
 \hline
 10111101
 \end{array}
 \text{ OR }$$

Question 5: Game of Knights, Knaves and Spies: Knights always tell truth. Knaves always lie, Spy can lie or tell truth. There are three people (Alex, Brook and Cody), one of whom is a knight, one a knave, and one a spy. Alex says: "Cody is a knave." Brook says: "Alex is a knight." Cody says: "I am the spy." Decide who is the knight, who the knave, and who the spy? To receive full credit, you should provide a table with all possible assignments and a detailed explanation for each assignment on how it can or can't work.

A: C is knave

B: A is knight

C: C is spy

A	B	C	
T	T	T	① F because Cody can't be 2 things at once
T	T	F	Possible ✓
T	F	T	① F because Cody can't be 2 things at once
T	F	F	③ Alex can't be knight if B is false
F	T	T	③
F	T	F	③ Alex can't be knight and lie
F	F	T	if Cody is spy, either A or B is lying
F	F	F	② F because a knight can't lie

Conclusion

Alex is knight

Brook is spy

Cody is knave