

NAME: _____

1. Convert the following decimal numbers into 8-bit binary numbers in two's-complement notation.

-21, 32, 126, -17, 48

2. Convert the following 8-bit binary numbers, which are in two's complement form, into decimal.

10111010, 11100111, 01001010, 00010001, 00101100

3. Convert the following numbers from hexadecimal into binary. These are unsigned numbers of arbitrary size.

A14, C0, D2E, FB349, 5678

4. Give truth tables for the following logical expressions. Make sure I can find your answer without any confusion.

p	q	r	$(p \rightarrow r) \wedge (q \rightarrow r)$	$r \wedge (\sim p \vee q)$	$p \leftrightarrow (q \wedge \sim r)$
T	T	T			
T	T	F			
T	F	T			
T	F	F			
F	T	T			
F	T	F			
F	F	T			
F	F	F			

5. Which of the following are propositions? Write Yes or No in the blank provided.

- a. _____ One is bigger than two.
- b. _____ Your clothes will never be cleaner than with jiffy wash!
- c. _____ Help!
- d. _____ I'm being chased by a big black monster!
- e. _____ I want that dog is home.
- f. _____ Is two bigger than four?
- g. _____ If I were a rich man, I'd buy a new horse.
- h. _____ Stand up for your country!
- i. _____ I saw the moon turn blood red.
- j. _____ Everybody likes to sing.

6. Prove the following.

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

7. Let $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 3, 5, 7, 9\}$, $B = \{0, 2, 4, 6, 8\}$, $C = \{1, 4, 7\}$, $D = \{0, 4, 6, 8, 9\}$. List the contents of the following sets. Use $\emptyset$ for the empty set.

a. $A \cup C$

b. $A \cap B$

c. $B \cap D$

d. $A - C$

e. D'

8. Which of the following statements are true?

- _____ a. If $2=3$ then $7=97$.
- _____ b. If $2<3$ then $100>10$
- _____ c. If $30>3$ then George Washington was the first president.
- _____ d. If “shoe” is a color then “red” is a flavor.
- _____ e. If $6+7=13$ then $6-7=12$.

9. Given the base set $S=\{0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15\}$ which of the following relations, R , are reflexive, transitive, symmetric or anti-symmetric? Mark an X in the appropriate box if the given relation has the property.

- a. $(x,y) \in R$ if and only if $x-y$ is a multiple of 3. (Note that 0, and -3 are multiples of 3.)
- b. $(x,y) \in R$ if and only if the binary representation of y has more 1's than the binary representation of x .
- c. $\{(1,1),(2,2),(3,3),(1,2),(2,1),(1,3),(3,1),(2,3),(3,2)\}$
- d. $(x,y) \in R$ if and only if $(x < 7 \wedge y < 7)$, or $x \geq 7 \wedge y \geq 7$.
- e. $\{(1,2),(2,3),(1,3),(4,5),(5,4),(5,5),(4,4)\}$

Relation	Reflexive	Symmetric	Transitive	Antisymmetric
a				
b				
c				
d				
e				

10. Is the following inference correct or incorrect? Prove your result.

$$p \rightarrow q$$

$$q \rightarrow p$$

$$\underline{\sim p}$$

$$\sim q$$