

Name: _____

Data Representation, Logic, Huffman Coding, Binary Numbers

DUE: Thursday March 16, 2017 @ beginning of class Please staple all sheets together BEFORE class.

Goal: The purpose of this assignment is to get a little practice with binary numbers, think about representing data digitally, and review basic logic as the foundation of how computers compute.

Exercises:

Binary Numbers

- 1 Convert 10 base 10 to base 2. _____
- 2 Convert 16 base 10 to base 2. _____
- 3 Convert 32 base 10 to base 2. _____
- 4 Convert 217 base 10 to base 2. _____
- 5 Convert RGB color (128, 0, 255) to base 2. (_____, _____, _____)
- 6 Add 1101011 base 2 to 1011100 base 2, SHOW YOUR WORK.
- 7 Add 1011 base 2 to 110 base 2. SHOW YOUR WORK.

1101011	1011
+1011100	+ 110

- 8 What letters does this binary (base 2) data correspond to assuming it is in ASCII?
01001010, 01100001, 11110111, 00110000 = _____, _____, _____, _____

ASCII	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
0000	N _U	S _H	S _X	E _X	E _T	E _O	A _K	B _L	B _S	H _T	L _F	Y _T	F _F	C _R	S _O	S _I
0001	P _L	P ₁	P ₂	P ₃	P ₄	N _K	S _V	E _Z	C _N	E _M	S _B	E _C	F _S	G _S	R _S	U _S
0010		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
0011	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
0100	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
0101	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
0110	~	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
0111	p	q	r	s	t	u	v	w	x	y	z	{		}	~	P _T
1000	°	° ₁	° ₂	° ₃	I _N	N _L	S _S	E _S	H _S	H _J	Y _S	P _D	P _V	R _I	S ₂	S ₃
1001	P _C	P ₁	P ₂	S _E	C _C	M _M	S _P	E _P	O _S	O _O	O _A	C _S	S _T	O _S	P _M	A _P
1010	°	ı	ç	£	♀	¥	ı	§	™	©	♂	«	¬	-	®	™
1011	°	±	²	³	´	µ	¶	·	,	ı	°	»	¼	½	¾	¿
1100	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
1101	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
1110	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
1111	ð	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

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Logic

9 Complete the following truth tables.

(a) NOT (p OR q)

p	q	p OR q	NOT (p OR q)
1	1		
1	0		
0	1		
0	0		

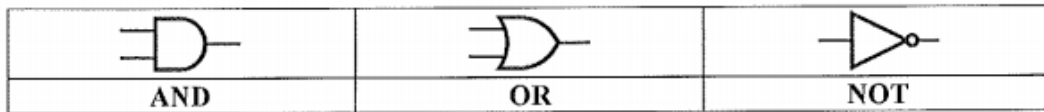
(b) p AND (NOT q)

p	q	NOT q	p AND (NOT q)
1	1		
1	0		
0	1		
0	0		

(c) p AND q AND r

p	q	r	p AND q	(p AND q) AND r
1	1	1		
1	0	1		
0	1	1		
0	0	1		
1	1	0		
1	0	0		
0	1	0		
0	0	0		

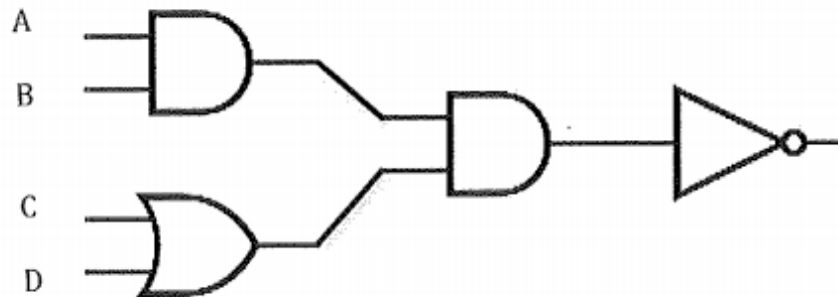
10 Using the 3 basic logic gates shown here, draw logic diagrams for the following logical statements.



a NOT (P OR Q)

b (A OR B) AND (NOT C)

11 Write the logical statement that corresponds to the following logic diagram.



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Huffman Coding (Please attach a separate sheet of paper for the Huffman trees.)

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- a Generate a binary Huffman tree from the following letter frequencies for the word *bananarama*.

letter	b	a	n	r	m
frequency	1	5	2	1	1

- b Using the binary Huffman tree you created for (a), give the binary Huffman encoding for the letter sequence *barn*. _____

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- a Generate a binary Huffman tree from the letter frequencies in the tongue twister: *She sells sea shells by the seashore*. Do not include the space character in your tree.

- b Using the binary Huffman tree you created for (a), give the binary Huffman encoding for the letter sequence *share*. _____

14 Create the Huffman tree that goes with the following frequency table.

letter	c	s	r	t	e
frequency	1	2	3	4	7