

Quiz 1 Solution

40 minutes

1. (5) Convert the decimal number 113 to binary. Show your work.

$113/2 = 56$	$r = 1$	1	
$56/2 = 28$	$r = 0$	01	
$28/2 = 14$	$r = 0$	001	
$14/2 = 7$	$r = 0$	0001	
$7/2 = 3$	$r = 1$	10001	
$3/2 = 1$	$r = 1$	110001	
$1/2 = 0$	$r = 1$	1110001	ANSWER

2. (10) a) Add the two pairs of binary numbers and show the results in binary. (Be sure to show the carry as you add.)

$$\begin{array}{r}
 0111 \\
 00101 \\
 \hline
 10111 \\
 11100
 \end{array}$$

- b) Show both operands and the result of the addition in decimal if the numbers are

i) unsigned
 $5 + 23 = 28$

ii) signed (two's complement)
 $5 + (-9) = -4$

3. (10) Each of the following 8-bit numbers was found in a computer. Show the decimal equivalent (if it exists) if each is

	00010110	11001010
a) unsigned binary	22	202
b) signed binary	+22	-54
c) BCD (8421 code)	16	not a number

4. Complete the truth table for a system with 4 inputs, a, b, c, and d and one output, f. The first three inputs (a, b, c) represent a binary number, n, in the range 0 to 7; however, the input 0 never occurs. The last input (d) specifies which of two computations is made.

d = 0: f is 1 iff n is a multiple of 3

d = 1: f is 1 iff n is a multiple of 2

a	b	c	d	f
0	0	0	0	X
0	0	0	1	X
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

5. (15) Reduce the expression below (using the algebraic properties) to a sum of products expression with 2 terms and 3 literals. Show each step.

$$x' y' z' + x' y' z + x' y z' + x' y z + x y z'$$

$$= x' y' (z' + z) + x' y (z' + z) + x y z'$$

$$= x' y' + x' y + x y z'$$

$$= x' (y' + y) + x y z'$$

$$= x' + x y z'$$

$$= x' + y z'$$