Homework #1

Matthew Zender

Question 1

A

1. $10011011_2 =$ $2^7\ 2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0$ $= 1+2+8+16+128 = \underline{155}$
   $1\ 0\ 0\ 1\ 1\ 0\ 1\ 1$
2. $456_7 = 6\cdot7^0 + 5\cdot7^1 + 4\cdot7^2 = 6+35+196 = 237$
3. $38A_{16} = A\cdot16^0 + 8\cdot16^1 + 3\cdot16^2 = 10+128+768 = 906$
4. $2214_5 = 4\cdot5^0 + 1\cdot5^1 + 2\cdot5^2 + 2\cdot5^3 = 4+5+50+250 = 309$

B

1. $69_{10} = 64 + 4 + 1 = 1000101$
2. $485_{10} =$ 256 128 64 32 16 8 4 2 1 $= 111100101$
3. $601A_{16} =$ ~~$A\cdot16^0 + 1\cdot16^1 + 0\cdot16^2 + 6\cdot16^3 = 10+16+3328+24576$~~

   0110 1101 0001 1010

C

1. $1101011_2 = (611)_{16}$
2. $895_{10} =$

$$\frac{895}{16} = 55.9375 \xrightarrow{\times 16 = 15} \frac{55.9375}{16} = 3.49609375 \xrightarrow{\times 16 = 7} = 37F$$

$$\frac{895}{16}: \quad 55 \text{ r } 15$$
$$3 \text{ r } 7$$
$$0 \text{ r } 3$$

Question 2

1. 7566_8
   4515_8
   $+$ ~~14~~ $3095 = 14303$

2. 1011011_2
   $\times\ 1101_2$
   ~~1001001~~
   1101000

3. $\begin{array}{r} {}^{1}{}^{1}7A66_{16} \\ + \quad 45C5_{16} \\ \hline C02B \end{array}$

4. $\begin{array}{r} 2\cancel{B}022_{8} \\ - \quad 2433_{8} \\ \hline 0034 \end{array}$

Question 3

A.

1. $124_{10} =$ $\overset{1}{64}\ \overset{1}{32}\ \overset{1}{16}\ \overset{1}{8}\ \overset{1}{4}\ \overset{0}{2}\ \overset{0}{1} = 01111100$

2. $-124_{10} =$ $\begin{array}{r} 1111100 \\ + \quad 0000100 \\ \hline 10000000 \end{array} \rightarrow 10000100$

3. $109_{10} =$ $1\ 1\ 0\ 1\ 101 = 01101101$

4. $-79_{10} =$ First 79 $1\ 0\ 0\ 1\ 1\ 1\ 1 = 01001111$ $\begin{array}{r} 1001111 \\ + \quad 0110001 \\ \hline 10000000 \end{array}$

10110001

B.

1. $00011110 = 2+4+8+16 = 30$

2. $11100110 =$ $001\ 1\ 010 \rightarrow 2+8+16 = -26$

$\begin{array}{r} 1100110 \\ + \\ \hline 100000000 \end{array}$

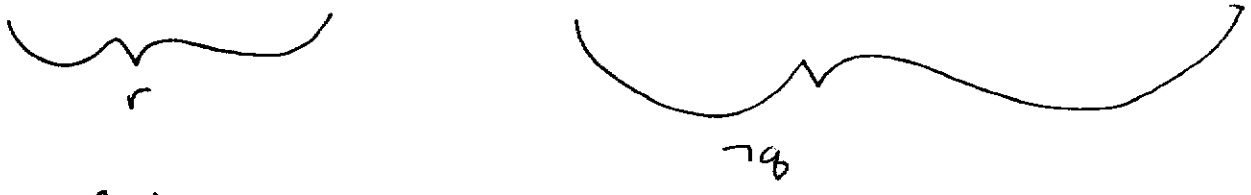
3. $00101101 = 1+4+8+32 = 45$

4. $10011110 =$ $1\ 1\ 00010 \rightarrow 1100010 \rightarrow 2+32+64 = -98$

$\begin{array}{r} 0011110 \\ + \\ \hline 10000000 \end{array}$

Question 4

1. you get an A in this class, but you do not do every homework assignment



$r \wedge \neg q$

2. you get an A on the final (p), you do every homework assignment (q), and you get an A in this class (r).

$p \wedge q \wedge r$

3. To get an A in this class (r), it is necessary for you to get an A on the final (p)

$p \rightarrow r$

4. you get an A on the final (p), but you don't do every ($\neg q$) homework assignment; nevertheless you get an A in the class (r)

$p \wedge \neg q \wedge r$

5. Getting an A on the final (p) and doing every homework (q) is sufficient for getting an A in this class (r)

$(p \wedge q) \rightarrow r$

6. You will get an A (r) in this class if and only if you either do every homework (q) or you get an A on the final (p)

$r \leftrightarrow (q \vee p)$

Question 5

$(p \to q) \wedge (p \to r) \equiv p \to (q \wedge r)$ AKA Distributivity law

p	q	r	$q \wedge r$	$p \to (q \wedge r)$	$(p \to q)$	$(p \to r)$	$(p \to q) \wedge (p \to r)$
T	T	T	T	T	T	T	T
T	F	T	F	F	F	T	F
F	T	T	T	T	T	T	T
F	F	T	F	T	T	T	T
T	T	F	F	F	T	F	F
T	F	F	F	F	F	F	F
F	T	F	F	T	T	T	T
F	F	F	T	T	T	T	T

Looking at this table we see that

$(p \to q) \wedge (p \to r)$ gets the same values as

$p \to (q \wedge r)$ for all assigned values of p, q, and r