Data representation

College of Saint Benedict & Saint John's University

decimal refresher

58036

decimal refresher

5		8		0		3		6
50000	+	8000	+	0	+	30	+	6

decimal refresher

5		8		0		3		6
50000	+	8000	+	0	+	30	+	6
5×10000	+	8×1000	+	0×100	+	3×10	+	6×1

decimal refresher

5		8		0		3		6
50000	+	8000	+	0	+	30	+	6
5×10000	+	8×1000	+	0×100	+	3×10	+	6×1
5×10^4	+	8×10^3	+	0×10^2	+	3×10^1	+	6×10^0

binary refresher

10110

binary refresher

1	0	1	1	0
1×2^4 +	0×2^3 +	1×2^2 +	1×2^1 +	0×2^0

binary refresher

1		0		1		1		0
1×2^4	$+$	0×2^3	$+$	1×2^2	$+$	1×2^1	$+$	0×2^0
1×16	$+$	0×8	$+$	1×4	$+$	1×2	$+$	0×1

binary refresher

1		0		1		1		0
1×2^4	$+$	0×2^3	$+$	1×2^2	$+$	1×2^1	$+$	0×2^0
1×16	$+$	0×8	$+$	1×4	$+$	1×2	$+$	0×1
16	$+$	0	$+$	4	$+$	2	$+$	0

unsigned addition

$$0 \quad + \quad 0 \quad = \quad 0$$

$$0 \quad + \quad 1 \quad = \quad 1$$

$$1 \quad + \quad 0 \quad = \quad 1$$

$$1 \quad + \quad 1 \quad = \quad 10$$

$$0 \quad 0 \qquad 0 \quad 1 \quad 0 \quad 1 \quad = 5$$

$$\text{ADD} \quad 0 \quad 0 \qquad 0 \quad 1 \quad 0 \quad 1 \quad = 5$$

unsigned addition

$$0 + 0 = 0$$

$$0 + 1 = 1$$

$$1 + 0 = 1$$

$$1 + 1 = 10$$

	0	0		0	1	0	1	= 5
ADD	0	0		0	1	0	1	= 5
C = 0	0	0		1	0	1	0	= 10

signed addition

$$0 \quad 0 \quad \quad 0 \quad 1 \quad 0 \quad 1 \quad = +5$$

$$\text{ADD} \quad 1 \quad 0 \quad \quad 0 \quad 1 \quad 0 \quad 1 \quad = -5$$

signed addition

	0	0	0	1	0	1	$= +5$
ADD	1	0	0	1	0	1	$= -5$
$C = 0$	1	0	1	0	1	0	$= -10$

one's complement

NOT	0	0		0	1	0	1

one's complement

NOT	0	0		0	1	0	1
	1	1		1	0	1	0

one's complement

NOT	0	0		0	1	0	1
	1	1		1	0	1	0

	0	0		0	1	0	1
ADD	1	1		1	0	1	0

one's complement

NOT	0	0		0	1	0	1
	1	1		1	0	1	0

		0	0		0	1	0	1
ADD		1	1		1	0	1	0
C = 0		1	1		1	1	1	1

one's complement

	NOT	0	0		0	1	0	1
		1	1		1	0	1	0

		0	0		0	1	0	1
	ADD	1	1		1	0	1	0
	$C = 0$	1	1		1	1	1	1
	ADD	0	0		0	0	0	1

one's complement

	NOT	0	0	0	1	0	1
		1	1	1	0	1	0

		0	0	0	1	0	1
	ADD	1	1	1	0	1	0
$C = 0$		1	1	1	1	1	1
	ADD	0	0	0	0	0	1
$C = 1$		0	0	0	0	0	0