

$$\triangleright 36 + 78 = 114.$$

0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0

128 64 32 16 8 4 2 1
0 0 0 0 0 0 0 0

$$00100100 = 36$$

$$01001110 = 78$$

	128	64	32	16	8	4	2	1	
	0	0	1	0	0	1	0	0	(36)
+	0	1	0	0	1	1	1	0	(78)
	0	1	1	0	0	1	0		$\Rightarrow (114)$

$$2) 98 + 51 = 149$$

	128	64	32	16	8	4	2	1	
	0	0	0	0	0	0	0	0	
	0	1	1	0	0	0	1	0	(98)
+	0	0	1	1	0	0	1	1	(51)
	1	0	0	1	0	1	0	1	$\Rightarrow (149)$

$$3) 8 + 4 + 5 = 17.$$

	128	64	32	16	8	4	2	1	
	0	0	0	0	0	0	0	0	
	0	0	0	0	1	0	0	0	(8)
+	0	0	0	0	0	1	0	0	(4)
+	0	0	0	0	0	1	0	1	(5)
	0	0	0	0	0	0	0	1	$\Rightarrow (17)$

$$4) 13 + 18 + 25 = 56.$$

	128	64	32	16	8	4	2	1	
	0	0	0	0	0	0	0	0	
	0	0	0	0	1	1	0	1	(13)
	0	0	0	1	0	0	1	0	(18)
	0	0	0	1	1	0	0	1	(25)
	1	1	1	0	0	0	0		$\Rightarrow 56$

0
10

5) $15 + 24 + 62 = 101$

$$\begin{array}{r}
 \begin{array}{cccccccc}
 128 & 64 & 32 & 16 & 8 & 4 & 2 & 1 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
 \end{array} \\
 \hline
 \begin{array}{cccccccc}
 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\
 + & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\
 + & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 0
 \end{array} \quad \begin{array}{l} (15) \\ (24) \\ (62) \end{array} \\
 \hline
 \begin{array}{cccccccc}
 0 & 1 & 1 & 0 & 0 & 1 & 0 & 1
 \end{array} = (101)
 \end{array}$$

Handwritten practice lines for the letter 'i'. The letter is shown in its basic form on a set of three horizontal lines (top, middle, and bottom). The letter 'i' is formed by a vertical stroke and a dot above it. The practice lines are drawn on a piece of paper with a vertical margin line on the left.

2's complement.

A simple hand-drawn smiley face with two vertical lines for eyes and a curved line for a mouth.

128 64 32 16 8 4 2 1
 0 0 0 0 0 0 0 0
 0 0 0 0 1 1 0 0

231

0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	1 1 1 1 0 0 1 1

1 2 64 32 16 8 4 2 1
 ○○○○○○○○○
 ○○○○○○○○○

010 \leftarrow 1's

111 \leftarrow Binary ①

[illegible]

2) 45,

② 45, 128 64 32 16 8 4 2 1

○○○○	○○○○	○○○○	○○○○	○○○○○○○○	○○○○○○○○
○○○○	○○○○	○○○○	○○○○	○○○○○○○○	○○○○○○○○

128 64 32 16 8 4 2 1
 ○○○○○○○○○○○○○○○○○
 ○○○○○○○○○○○○○○○○○

1111 1111 1111 1111 11010010 = 1's

1 ∈ Binary one

[illegible]

3) - 27.

Handwritten notes showing two rows of numbers:

Row 1: 0000 0000 0000 0000 0000 0000

Row 2: 0000 0000 0000 0000 0000 0000

To the right of these rows, there are handwritten calculations:

128 64 32 16 8 4 2 1
0000 0000
000 | 101

128 64 32 16 8 4 2 1
 0 0 0 0 0 0 0 0
 0 0 0 1 1 0 1 1 ≤ 27 .

1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 1 0 0 ← 1's

1. A Binary
one

11111111 11111111 1111 1111 11100101 \Rightarrow 2's

(-27)

4) - 56.

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	0011 1000

1111 1111	1111 1111	1111 1111	1100 0111 ← 1's
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+

1111 1111	1111 1111	1111 1111	1100 1000 ← 2's
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Binary One

a) $35 + 1 = 36$ $\sim = -36$

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	0010 0100

1111 1111	1111 1111	1111 1111	1101 1011 ← 36
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Binary 0

1111 1111	1111 1111	1111 1111	1101 1100 ← -36 (2's)
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b) $\sim (-35) = 35 - 1 = 34$

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	0010 0010 ← 34

c) $\sim 20 = 20 + 1 = 21 = -21$

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	0001 0101 ← 21

1111 1111	1111 1111	1111 1111	1110 1010
-----------	-----------	-----------	-----------

+

1111 1111	1111 1111	1111 1111	1110 1011 ← -21
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d) $\sim (-20) = 20 - 1 = 19$

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	0001 0011

19

$$2) \sim(-49) = 49 - 1 = 48$$

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	0011 0000 ← 48

$$3) \sim(-62) = 62 - 1 = 61$$

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	0011 1101 ← 61

$$4) \sim(-157) = 157 - 1 = 156$$

0000 0000	0000 0000	0000 0000	256 128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	1001 1100 ← 156

$$5) \sim 157 = 0157 + \# = 158$$

$$\textcircled{2} \text{ 2's compl} = -158$$

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	1001 1110
1111 1111	1111 1111	1111 1111	0110 0001 ← 1's

1111 1111	1111 1111	1111 1111	0110 0010 ← 2's
			(-158)

$$6) \sim(-13) = 13 - 1 = 12$$

0000 0000	0000 0000	0000 0000	128 64 32 16 8 4 2 1 0000 0000
0000 0000	0000 0000	0000 0000	0000 1100 ← 12