

2.2) with 9 bits

$$2^9 = 512$$

$$512 - 400 = 112 \text{ more students}$$

128 64 32 16 8 4 2 1

5) 1) 01011010

$$2 + 8 + 16 + 64 = 90$$

$$\begin{array}{r} 11111111 \\ 2) 11111110 \\ + 00000010 \\ \hline 00000000 \end{array}$$

$$\begin{array}{r} 128 \ 64 \ 32 \ 16 \ 8 \ 4 \ 2 \ 1 \\ 000 \ 00 \ 0 \ 1 \ 0 \end{array} = 2 = -2$$

6.1) 102      128 64 32 16 8 4 2 1      64 + 32 + 4 + 2 = 102

$$\begin{array}{r} 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \end{array}$$

6.2) 64      128 64 32 16 8 4 2 1

$$\begin{array}{r} 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \end{array}$$

6.3 - 128      128 64 32 16 8 4 2 1

$$\begin{array}{r} 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \end{array}$$

starting with 1 so already negative.

7.1) 1011

$$\begin{array}{r} + 0001 \\ \hline 101100 \end{array}$$

7.2) 0000

$$\begin{array}{r} + 1010 \\ \hline 01010 \end{array}$$

7.3) 1100

$$\begin{array}{r} + 0011 \\ \hline 01111 \end{array}$$

7.4) 0101

$$\begin{array}{r} + 0110 \\ \hline 01011 \end{array}$$

7.5) 1111

$$\begin{array}{r} + 0001 \\ \hline 10000 \end{array}$$

$$\begin{array}{r}
 1 \quad 1 \ 1 \ 1 \ 1 \ 1 \ 1 \\
 8.1) \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \\
 + \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \\
 \hline
 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \ 0
 \end{array}$$

$$\begin{array}{r}
 1 \\
 8.2) \ 0 \ 1 \ 0 \ 1 \\
 + \ 1 \ 1 \ 0 \\
 \hline
 1 \ 0 \ 1 \ 1
 \end{array}$$

$$\begin{array}{r}
 10.1) \ 1 \ 0 \ 1 \\
 \text{and} \ 1 \ 1 \ 0 \\
 \hline
 1 \ 0 \ 0
 \end{array}$$

$$\begin{array}{r}
 10.2) \ ~~1 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0~~ \quad 1 \ 1 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \\
 \text{and} \ ~~1 \ 0 \ 1 \ 1~~ \quad \text{and} \ 1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0 \\
 \hline
 1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0
 \end{array}$$

$$\begin{array}{r}
 10.3) \ 0 \ 1 \ 1 \ 0 \quad 0 \ 0 \ 1 \ 1 \\
 \text{and} \ 1 \ 1 \ 0 \ 1 \quad \text{and} \ 0 \ 1 \ 0 \ 0 \\
 \hline
 0 \ 1 \ 0 \ 0 \quad 0 \ 0 \ 0 \ 0
 \end{array}$$

$$\begin{array}{r}
 10.4) \ 1 \ 0 \ 1 \\
 \text{or} \ 1 \ 1 \ 0 \\
 \hline
 1 \ 1 \ 1
 \end{array}$$

$$\begin{array}{r}
 10.5) \ 1 \ 1 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \\
 \text{or} \ 1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0 \\
 \hline
 1 \ 1 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0
 \end{array}$$

$$\begin{array}{r}
 10.6) \ 1 \ 1 \ 0 \ 0 \\
 \text{or} \ 1 \ 1 \ 0 \ 1 \\
 \hline
 1 \ 1 \ 0 \ 1
 \end{array}$$

$$\begin{array}{r}
 1 \ 1 \ 0 \ 1 \\
 \text{or} \ 0 \ 1 \ 0 \ 1 \\
 \hline
 1 \ 1 \ 0 \ 1
 \end{array}$$

$$\begin{array}{r}
 10.7) \sim 1 \ 0 \ 1 \ 1 \\
 \text{or} \sim 1 \ 1 \ 0 \ 0 \\
 \hline
 0 \ 0 \ 0 \ 0
 \end{array}$$

$$\begin{array}{r}
 10.8) \ 0 \ 1 \ 1 \ 0 \\
 \text{or} \ 0 \ 0 \ 0 \ 0 \\
 \hline
 0 \ 1 \ 1 \ 0
 \end{array}$$

$$\begin{array}{r}
 0 \ 1 \ 1 \ 0 \\
 \text{and} \ 1 \ 1 \ 1 \ 1 \\
 \hline
 \cancel{1 \ 1 \ 1 \ 1} \ 0 \ 1 \ 1 \ 0
 \end{array}$$