

Computer memory and dynamic allocation unit:

- ▶ Computer memory and pointers (spring-break eve and Monday)
- ▶ Dynamically allocated memory (Monday and Wednesday)
- ▶ Bit operations (**Today**)
- ▶ Back to ADTs: Stacks and Queues (next week Monday and Wednesday)

Today:

- ▶ Bit operations
- ▶ Uses of bit operations
- ▶ The current project

& bitwise and
| bitwise or
^ bitwise xor (exclusive or—true if exactly one operand is true)
~ bitwise negation
<< bitshift left
>> bitshift right

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

$$\begin{array}{r}
 \sim & 0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 \\
 \hline
 & 1 & 1 & 0 & 1 & 0 & 0 & 1 & 0
 \end{array}$$

$$\begin{array}{r} 45 \\ \& 100 \\ \hline 36 \end{array}$$

$$\begin{array}{r} 00101101 \\ \& 01100100 \\ \hline 00100100 \end{array}$$

$$\begin{array}{r} 45 \\ | 100 \\ \hline 109 \end{array}$$

$$\begin{array}{r} 00101101 \\ | 01100100 \\ \hline 01101101 \end{array}$$

$$\begin{array}{r} 45 \\ \sim 100 \\ \hline 73 \end{array}$$

$$\begin{array}{r} 00101101 \\ \sim 01100100 \\ \hline 01001001 \end{array}$$

$$\begin{array}{r} \sim 45 \\ \hline 210 \end{array}$$

$$\begin{array}{r} \sim 00101101 \\ \hline 11010010 \end{array}$$

Coming up:

- ▶ **Due Fri, Mar 27.** *Do Project 5, bit vector*