



PROGRAM DATA

Everything you always wanted to know about variables



DATA TYPES

Type	Size	Range	Comments
void	0	N/A	function return
bool	1	false / true	
char	1	-128 to 127, or 0 to 255	2-byte available
short	2	-32,768 to 32,767	short int
int	4 (typical)	-2,147,483,648 to 2,147,483,647	system dependent
long	4	-2,147,483,648 to 2,147,483,647	long int
float	4	$\pm 3.4028234 \times 10^{\pm 38}$	6 – 7 sig digs
double	8	$\pm 1.79769313486231570 \times 10^{\pm 308}$	~15 sig dig

CONSTANTS

Constant	Comments
10	Values without a decimal point are type int
10L	L makes it a long
10U	U makes it unsigned
10.0	Values with a decimal point are type double
10F or 10.0F	The F makes it a float
0xAB	Leading 0x or 0X indicates hexadecimal (unsigned int)
067	Leading 0 indicates octal (unsigned int)
'a'	Character constant
"hello"	String constant or string literal
1.23e20 or 1.23e-20	Scientific notation; 1.23×10^{20} and 1.23×10^{-20}

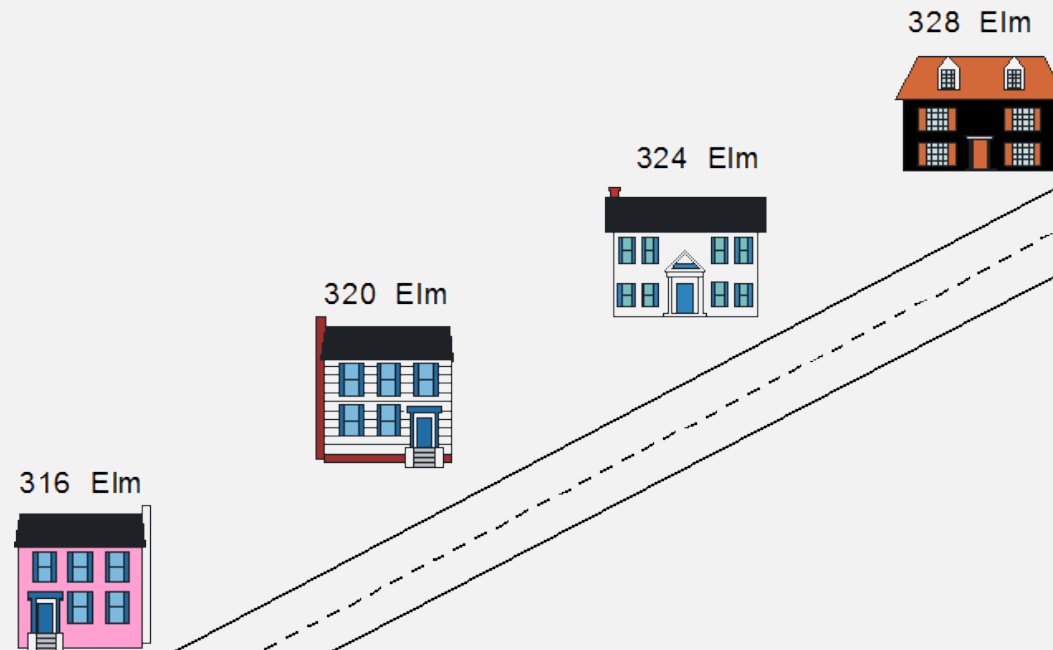


VARIABLES



- Variables are a named region of main memory. Variables have
 - A name
 - A value
 - An Address
- The compiler maps the name to the address

HOUSES AS A METAPHOR FOR VARIABLES





VARIABLE MODIFIERS

`auto`

- Default – keyword rarely used
- Memory is automatically allocated and deallocated as the variable comes into and goes out of scope
- Initialized each time memory is allocated
- `auto int maximum;`
- `auto int maximum = 100;`

`static`

- Memory is allocated once at load time
- Memory remains allocated until termination; value is not lost with scope change
- Initialized only once at load time
- `static int maximum;`
- `static int maximum = 100;`



SCOPE VS. MEMORY ALLOCATION

- Memory allocation
 - Programs have a store of unused or unassigned memory
 - Programs can allocate, assign, allot, or distribute that memory to hold variables
- Scope
 - Programmers can name programming elements like variables, functions, and classes
 - Scope is where the name is visible and the programming element is accessible



LEGAL IDENTIFIERS

- May be any length
- Are case sensitive (Counter is not the same as counter)
- Must begin with a letter or an underscore (_)
- Subsequent characters may be letters, digits, and underscores (but no other characters)
- Cannot be a keyword
- May only be defined once in a scope
- Should avoid library function names
- Must be declared before use
- Must be defined exactly once