Variable Declarations
Variables

- input values
- output values
- store values
- modify values
C++ Variable Syntax

- declare variables before you use them
- variable names must contain only alpha-numeric characters and the underscore
- variable names must not begin with a numeric character
Example Names

- Legal
  - x, y, xyz_Hello, bob, joe12

- Illegal
  - 12joe, hi-there, go!
Good Practices

- Declare variables at the inside top of the main function
- Give the variables meaningful names
  - Good: age, tirePressure, and lateral_distortion
  - Not so good: x
- Use comments to add further meaning
  - int age; // how long the tire has been installed on the car
Integer Types: short

- example declaration:
  - short shoeSize;
  - short shoeSize = 5;
- memory allocation:
  - 2 bytes
- range of values
  - $-2^{15}$ to $+2^{15}$ or $\sim-32k$ to $\sim32k$
Integer Types: integer

- example declaration:
  - int numCarsOnHwy;
  - int numBoatsOnLake = 5001;

- memory allocation:
  - 2 or 4 bytes depending on the system
  - Missouri S&T’s systems use 4 bytes

- range of values:
  - $-2^{31}$ to $+2^{31}$ or $\sim-2\text{billion}$ to $\sim2\text{billion}$
Integer Types: long

- example declaration:
  - long desk_length = 123;
  - long numKeys;

- memory allocation:
  - 4 bytes

- range of values:
  - \(-2^{31}\) to \(+2^{31}\) or \(-2\text{billion}\) to \(+2\text{billion}\)
Floating Point Types: float

- example declaration:
  - float bodyTemp = 98.6;
  - float shoeSize;

- memory allocation:
  - 4 bytes

- precision:
  - 6 significant figures (decimal)
Floating Point Types: double

- example declaration:
  - double weight_of_mountain = 746538433.55; // tons

- memory allocation:
  - 8 bytes

- precision:
  - 15 significant figures (decimal)
Floating Point Types: long double

- example declaration:
  - long double feather_wt = 0.0000000000000032; // lbs

- memory allocation:
  - Not standardized

- precision:
  - Very!
Non-Numeric Types: character

- example declaration:
  - char continueResponse = 'y';

- memory allocation:
  - 1 byte

- range of values:
  - a char type can take on the 256 possible values of the ASCII character set
<table>
<thead>
<tr>
<th>Dec</th>
<th>Hex</th>
<th>Char</th>
<th>Dec</th>
<th>Hex</th>
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</tbody>
</table>

http://cs.mst.edu
Non-Numeric Types: string

- example declaration:
  - string firstName = “Clayton”;

- memory allocation:
  - varies on string size

- note:
  - you must use the double quotes for string variable initializations and the single quotes (or ticks) for characters
Non-Numeric Types: boolean

- example declaration:
  - bool quit = false;
  - bool passed = true;

- memory allocation:
  - 1 byte

- note:
  - The words true and false are reserved in C++.
Constants

- Used when a variables value should never be altered
- Examples
  - const float PI = 3.14159;
  - const double DISTORTION_COEFFICIENT = 5.662398;
  - const float TAX_RATE = 0.023;
  - PI = 4; // NO, will not compile
const Examples

const short TWO = 2; // bad
float val1, val2, average;
average = (val1 + val2) / TWO;

const short TWO = 3; // even worse
float val1, val2, val3, average;
average = (val1 + val2 + val3) / TWO;

const short DIVISOR = 2; // better
End of Session