CS 101: Computer Programming and Utilization

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(Abhiram Ranade's slides, borrowed and edited)
Lecture 3

This Lecture

- More about variables

- Assignment, arithmetic

Reserving memory for storing numbers

- Before you store numbers, you must explicitly reserve space for storing them.
  - “space” : region of memory
- This is done by a “variable definition” statement.
- variable
  - “Value of a variable”: value stored in the variable
- You must also state what kind of values will be stored in the variable: “data type” of the variable.

Variable creation/definition

Statement form

```
data-type-name variable-name;
```

- Example from chapter 1:

```
int nsides;
```

- `int` : data type name. Short for “integer”.
  - Reserve space for storing integer values, positive or negative, of a “standard” size.
  - Standard size = 32 bits on most computers.
- `nsides` : name given to reserved space, or the created variable.

Variable names: “Identifiers”

- Sequence of 1 or more letters, digits and the underscore “_” character
  - Should not begin with a digit
  - Some words such as `int` cannot be used as variable names. Reserved by C++ for its own use.
  - case matters. `ABC` and `abc` are distinct identifiers
  - Space not allowed inside variable name
- Examples: `nsides, telephone_number, x, x123, third_cousin`
- Non-examples: `#sides, 3rd_cousin, 3 rd cousin`
- Recommendation: use meaningful names, describing the purpose for which the variable will be used.

Some other C++ data types

- `unsigned int`
  - 1 word will be allocated.
  - Ordinary binary representation will be used.
- `char`
  - 1 byte will be allocated.
  - ASCII code of characters is stored.
- `float`
  - 1 word will be allocated.
  - IEEE FP representation, 8 bits exponent, 24 bits significand.
- `double`
  - 2 words will be allocated.
  - IEEE FP representation, 11 bits exponent, 53 bits significand.

Examples

```
unsigned int telephone_number;
float mass, acceleration;
```

- OK to define several variables in same statement.
- Keyword `long` : says, “I need to store bigger or more precise numbers, so give me more than usual space.”

```
long unsigned int cryptographic_password;
```

- Likely 64 bits will be allocated.

```
long double more_precise_acceleration;
```

- Likely 96 bits will be allocated

Variable initialization

- A value can be stored in a variable at the time of creation

```
int i=0, result;
float vx=1.0, vy=2.0e5, weight;
```

  - `i, vx,vy` given values as well as defined.
  - 2.0e5 is how you write $2.0*10^5$
  - Although the computer uses binary, you write in decimal.

```
char command = ‘f’;
```

  - ‘f’ is a “character constant”. It represents the ASCII value of the quoted character.

const

```
const double avogadro = 6.022e23;
```

- The keyword `const` : value assigned cannot be changed.

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