Lexical Elements

chapter 2

Comments

Arbitrary strings placed between the delimiters /* and */.

```
/*
 * A comment can be written in this fashion
 * to set it off from the surrounding code.
 */
```

The compiler changes each comment into a single blank character.

In this course we do not use the c++ style!!!

```
// This is a comment in c++
```

Keywords

Reserved words with strict meanings.

C does a lot with relatively few keywords.

Some implementations on some systems may have additional keywords.

`auto`	`do`	`goto`	`signed`	`unsigned`
`break`	`double`	`if`	`sizeof`	`void`
`case`	`else`	`int`	`static`	`volatile`
`char`	`enum`	`long`	`struct`	`while`
`const`	`extern`	`register`	`switch`	
`continue`	`float`	`return`	`typedef`	
`default`	`for`	`short`	`union`	

Identifiers

A token composed of a sequence of letters, digits and the special character _ (underscore)

```
tax = price * tax_rate
```

First character cannot be a digit!!

`5a_cse` is not legal

- Case sensitive: `CSE_5a` is different from `cse_5a`
- Some identifiers are already taken: keywords.
- Choose name that are meaningful (`cse_5a` is not a good example!!)
- In ANSI C the first 31 characters of an identifier are identified.

Constants

Examples for constant decimal integers

```
0
0123
```

But

```
123456789000 /*too large for the machine */
0123 /*an octal integer?*/
-49 /*constant expression*/
123.0 /* a floating constant*/
```

String Constants

A sequence of characters in double quotes marks.

String constants are treated as arrays of characters, so that `"a"` is different than `'a'`

```
"a string of text"
""    /* the null string */
"a = b + c"    /* nothing executed here */
"a string with double quotes \" within"
"a string backslash \\ is in this string"
```

Two string constants separated by white space are concatenated

`"abc" "def"` is equivalent to `"abcdef"`

Operators and Punctuators

In C many characters have particular meaning. For example

```
+     -     *     /     %
```

```
a+b    /* the expression a plus b */
a_b      /*a 3-character identifier*/
```

Some symbols have meanings that depend on context, for example

```
fprintf("%d",a);
```

versus

```
a = b % 7;
```

or

```
a+b        ++a        a+=b
```

Punctuations include parentheses, braces, commas, and semicolons

Precedence of Operators

Basically, mathematical expressions are evaluated as in mathematical convention.

`1 + 2 * 3` is equivalent to `1 + (2 * 3)`

```
1 + 2 - 3 + 4 -5  /* gives -1 */
```

Things may be a little tricky when dealing with mixture of postfix, prefix and unary operators for example

`- a * b - c` is equivalent to `((-a)* b) - c`

Increment & Decrement Operators

The increment ++ and decrement -- operators are unary. They can be used as prefix and postfix operators.

Both can be applied to variables but not to constants.

What is the difference between **`++i`** and **`i++`** **?**

```
int a = 0, b = 0, c = 0;
a = ++c;
b = c++;
printf( "%d %d %d\n", a, b, ++c );
```

What will be printed?

Assignment Operators

C treats **=** as a operator with precedence lower than all we have discussed.

```
b = 2;
c = 3;
a = b + c;
```

Is equivalent to

```
a = (b = 2) + (c = 3);
```

More useful statements

```
a = b = c = 0;
```

More assignment Operators

```
k = k + 2;
```

is equivalent to

```
k += 2;
```

A list of all assignment operators

```
=   +=  -=    *=   /=    %=    >>=   <<=
&=    ^=    |=
```

Operator Precedence and Associativity

Operator	Associativity
`()` `++` (*postfix*) `--` (*postfix*)	left to right
`+` (*unary*) `-` (*unary*) `++` (*prefix*) `--` (*prefix*)	right to left
`*` `/` `%`	left to right
`+` `-`	left to right
`=` `+=` `-=` `*=` `/=` etc.	right to left

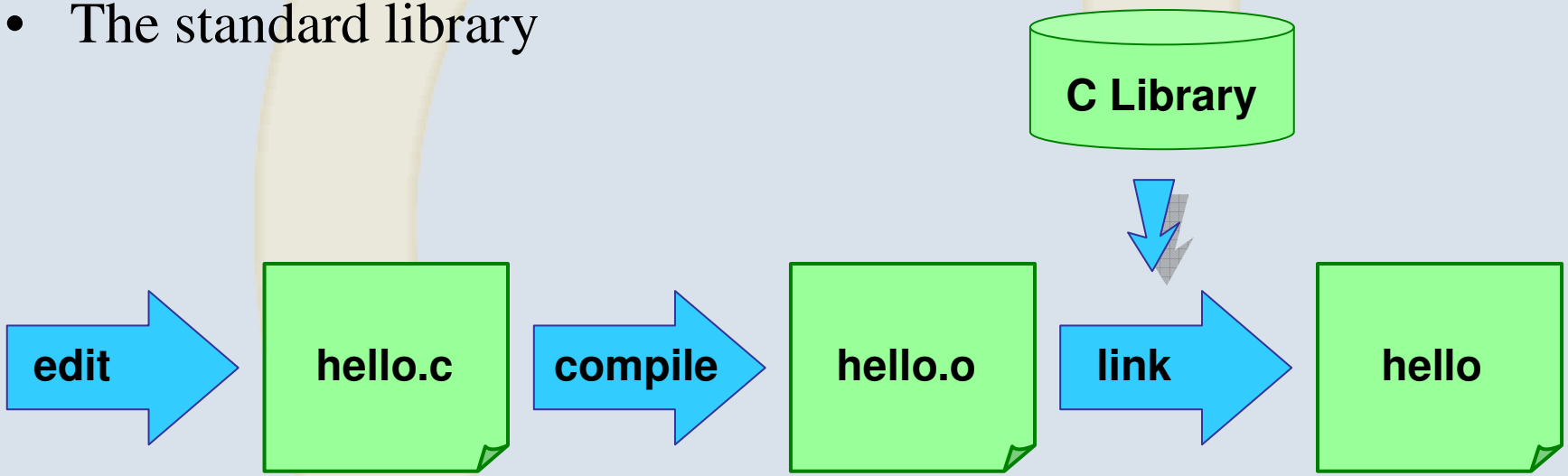
An example - powers of 2

```
/* Some powers of 2 are printed. */
#include <stdio.h>
int main(void)
{
   int   i = 0, power = 1;

   while (++i <= 10)
      printf("%6d", power *= 2);
   printf("\n");
   return 0;
}
```

The C System

- The preprocessor
- The standard library



Using a function from standard library

```
#include <stdio.h>
#include <stdlib.h>

int main(void)
{
   int   i, n;
   printf("\n%s",
      "How many random numbers do you want to see? ");
   scanf("%d", &n);
   for (i = 0; i < n; ++i) {
      if (i % 10 == 0)
         putchar('\n');
      printf("%7d", rand());
   }
   printf("\n\n");
   return 0;
}
```