IS12 - Introduction to Programming
Lecture 14: Character Processing

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Outline

- Order of operations (review)
- Typecasting
- Characters and operations
- Input/output redirection
- Simple file processing
- Advanced file processing

Review: Order of Operators (so far)

1	( )	Left to right
2	- (negative sign) ++ --	Right to left
3	* / %	Left to right
4	+ -	Left to right
5	< <= > >=	Left to right
6	== !=	Left to right
9	?: (conditional)	Right to left
10	= += *= -= /= %=	Right to left

Review: Typecasting (so far)

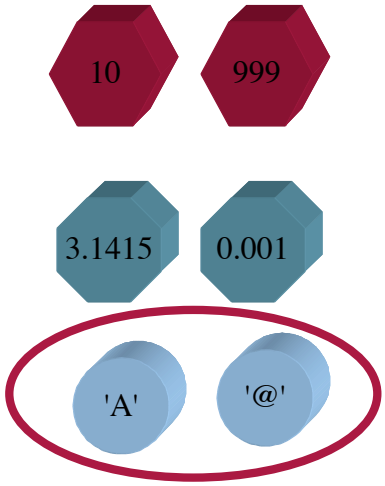
- 3 / 4 -> all integer, no typecasting, result is integer
- 3.0 / 4 -> float / integer -> float / float -> 3.0 / 4.0 -> result is float
- 3.0 / 4.0 -> all float, no typecasting, result is float
- Int intvar; float floatvar;
  intvar=3.1 -> typecasting, intvar has value 3
  floatvar=3 -> typecasting, floatvar has value 3.0
- When exactly typecasting occurs?

Typecasting - Explicit Conversion

- Types of data type conversion:
  - Implicit: arithmetic operations, assignment
  - Explicit: typecasting
- Typecasting operator:
  `(datatype) expression`
- Examples:
  `(float) 3 / 2 ⇨ 3.0 / 2 ⇨ 1.5`
  `(int) (10.0 / 3) ⇨ 3`
  `(int) 'a' ⇨ ???`

Primitive Data Types

- Integer data
  - 1, 10, 999, 1000
- Floating point data
  - 3.1415, 0.001, 2.0
- Characters
  - 'A', 'B', '_', '@'



Characters – Another Data Type

- Smallest storage space – one byte
- Stores code of one character (0-255)
  - printable characters as 'a' or '@' or ' '
  - non-printable characters '\0','\n '
- C programs can read characters

```
scanf("%c", &mychar);
```

or simpler:

```
mychar = getchar();
```

- C programs can print characters

```
printf("%c", mychar);
```

or simpler:

```
putchar(mychar);
```

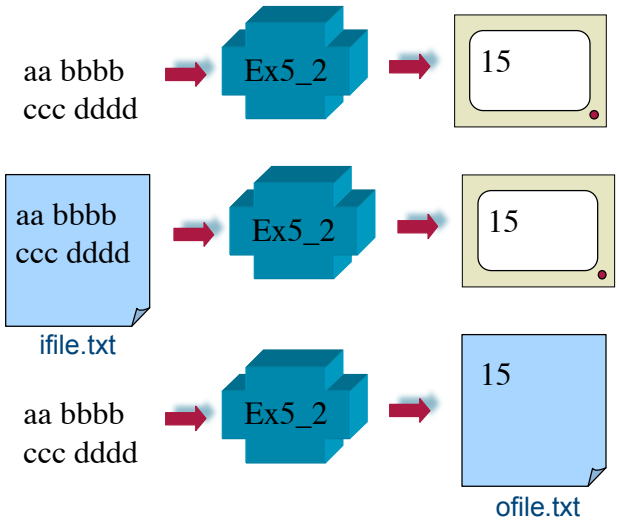
Example: Character Codes

```
/* Task: Print integer codes of characters from ‘ ’ to
   ‘z’ */

#define FIRSTCHAR ' '
#define LASTCHAR 'z'
#include <stdio.h>

main () {
   char c = FIRSTCHAR;
   while(c <= LASTCHAR) {
       printf("Code for %c is %d\n", c, (int) c);
       ++c;
   }
}
```

Standard Input and Output

- Each program has two streams - standard input and standard output
- By default input is connected to the keyboard and output to the screen
  `C:\> Ex5_3`
- But it could be redirected
  - Input from file: `C:\> Ex5_3 <ifile.txt`
  - Output to file: `C:\> Ex5_3 >ofile.txt`

Stream Redirection



Example: File Copying

```
#include <stdio.h>

void main () {
   int c;

   c = getchar();
   while(c != EOF) {
        putchar(c);
        c = getchar();
   }
}
```

- What is EOF?
- EOF is not a real symbol, it is not even char type, it is int (that's why int c;)
- getchar() is a request to the *operating system* for the next symbol
- if there are no more symbols, the operating system has to tell about it to the program - it returns this special value EOF

Example: Counting Characters

```
/* Task: How long (in characters) is an input
   file? */
#include <stdio.h>

main () {
   long nc;

   nc = 0;
   while(getchar() != EOF)
       ++nc;
   printf("%ld\n", nc);
}
```

Example: Line Counting

```
#include <stdio.h>

void main () {
   int c, nl;

   nl = 0;
   while((c = getchar()) != EOF)
       if(c == '\n')
              ++nl;
   printf("%d\n", nl);
}
```

Before next lecture:

- Do reading assignment
- Perry: Chapter 10: Typecasting; Chapter 18
- Use KnowledgeSea to find more readings
- Run Classroom Examples
  - This time it is VERY important