

ESc 101: FUNDAMENTALS OF COMPUTING

Lecture 8

Jan 18, 2010

COMPUTING FACTORIAL

```
main()
{
    int n; /* number whose factorial is to be computed */
    int factorial; /* stores n! */

    printf("Enter a number: ");
    scanf("%d", &n); /* Read the number n */

    /* Calculate n! */
    for (factorial = 1; n > 0; n = n - 1)
        factorial = factorial * n;

    printf("%d", n);
    printf("! = ");
    printf("%d\n", factorial);
}
```

OVERFLOWING VALUES

- Since `int` type can store numbers up to $2^{31} - 1$ only, the value of the factorial is wrongly calculated for $n > 12$.
- This is rather limiting, and we need to find a way to get around this.
- We will develop C programs to implement arithmetic with large numbers soon.

BACK TO MACHINE LANGUAGE CODE PROGRAM

```
main()
{
    int i;
    int instruction; /* stores a symbol */

    instruction = (int) getchar(); /* read first symbol */

    /* Run through all the symbols of the input */
    for (; instruction != EOF; ) {
```

BACK TO MACHINE LANGUAGE CODE PROGRAM

```
/* For a symbol, output its binary sequence */
for (i = 0; i < 8; i++) {

    if (instruction < 128) /* the msb is 0 */
        printf("0");
    else { /* the msb is 1 */
        printf("1");
        instruction = instruction - 128; /* make msb 0 */
    }
    /* make 2nd msb the new msb */
    instruction = instruction * 2;
}
printf("\n");
/* read next symbol */
instruction = (int) getchar();
}
}
```

ARITHMETIC EXPRESSIONS

Uses the following operations: +, -, *, /, %, ++, --

The precedence is ensured by (and).

ARITHMETIC EXPRESSIONS

Examples:

- $n + m * 5 / (a + b) \% 44$
- $(n + (m * 5) / (a + b)) \% 44$