

# The C Programming Language: Chapter 1

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Write an abstract

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## *Hello, world!*

Covers Exercises 1-1 and 1-2.

**1** `<hello.c 1>`≡  
`<Include the standard I/O functions. 5b>`

```
int main()
{
    printf("Hello, world!\n");
}
```

Uses `printf` **5b**.

Root chunk (not used in this document).

*Fahrenheit-Celsius table*

Covers Exercises 1-3, 1-4, and 1-5.

**2a** `<fahrcls.c 2a>≡`  
     *<Include the standard I/O functions. 5b>*  
     *<Include the standard string functions. 5c>*

This definition is continued in chunks **2** and **3**.

Root chunk (not used in this document).

Declare some useful constants.

**2b** `<fahrcls.c 2a>+≡`  
     `#define LOWER 0`  
     `#define UPPER 300`  
     `#define STEP 20`

Defines:

`LOWER`, used in chunk **2d**.

`STEP`, used in chunk **2d**.

`UPPER`, used in chunk **2d**.

*Exercise 1-3*

**2c** `<fahrcls.c 2a>+≡`  
     `void print_header(char lhs[], char rhs[])`  
     `{`  
         `printf("| %s | %s |\n", lhs, rhs);`  
         `putchar('|');`  
         `for (int i = -2; i < (int)strlen(lhs); ++i)`  
             `putchar('-');`  
         `putchar('+');`  
         `for (int i = -2; i < (int)strlen(rhs); ++i)`  
             `putchar('-');`  
         `puts("|");`  
     `}`

Defines:

`print_header`, used in chunks **2d** and **3a**.

Uses `printf` **5b**, `putchar` **5b**, `puts` **5b**, and `strlen` **5c**.

*Exercise 1-5*

**2d** `<fahrcls.c 2a>+≡`  
     `void fahrcls()`  
     `{`  
         `print_header("Fahrenheit", "Celsius");`  
         `for (int fahr = UPPER; fahr >= LOWER; fahr -= STEP)`  
             `printf("| %10d | %7.1f |\n", fahr, (5.0/9.0) * (fahr-32.0));`  
     `}`

Defines:

`fahrcls`, used in chunk **3b**.

Uses `LOWER` **2b**, `STEP` **2b**, `UPPER` **2b**, `printf` **5b**, and `print_header` **2c**.

*Exercise 1-4*

3a `<fahrrels.c 2a>+≡`

```
void celsfahr()
{
    print_header("Celsius", "Fahrenheit");
    for (int celsius = 0; celsius <= 300; celsius += 20)
        printf("| %7d | %10.0f |\n", celsius, 32.0 + (9.0/5.0) * celsius);
}
```

Defines:

`celsfahr`, used in chunk 3b.

Uses `printf` 5b and `print_header` 2c.

*The main function*

3b `<fahrrels.c 2a>+≡`

```
int main()
{
    fahrrels();
    puts("\n");
    celsfahr();

    return 0;
}
```

Uses `celsfahr` 3a, `fahrrels` 2d, and `puts` 5b.

*Copy*

Covers Exercises 1-6 and 1-7.

3c `<copy.c 3c>≡`  
*<Include the standard I/O functions. 5b>*

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

    return 0;
}
```

Uses `putchar` 5b.

Root chunk (not used in this document).

*Character Counting*

3d `<wc.c 3d>≡`  
*<Include the standard I/O functions. 5b>*

This definition is continued in chunks 4 and 5a.

Root chunk (not used in this document).

4a  $\langle wc.c\ 3d \rangle + \equiv$

```
double char_count()
{
    double nc;

    for (nc = 0; getchar() != EOF; ++nc)
        ;

    return nc;
}
```

Defines:  
char\_count, never used.

### *Line Counting*

4b  $\langle wc.c\ 3d \rangle + \equiv$

```
int line_count()
{
    int c, nl;

    nl = 0;
    while ((c = getchar()) != EOF)
        if (c == '\n')
            ++nl;

    return nl;
}
```

Defines:  
line\_count, never used.

### *Word Counting*

4c  $\langle wc.c\ 3d \rangle + \equiv$

```
#define IN 1
#define OUT 0
```

Defines:  
IN, used in chunk 5a.  
OUT, used in chunk 5a.

Exercise 1-8

Exercise 1-9

Exercise 1-10

5a *<wc.c 3d>+≡*

```

int main()
{
    int c, nl, nw, nc, state;

    state = OUT;
    nl = nw = nc = 0;
    while ((c = getchar()) != EOF) {
        ++nc;
        if (c == '\n')
            ++nl;
        if (c == ' ' || c == '\n' || c == '\t')
            state = OUT;
        else if (state == OUT) {
            state = IN;
            ++nw;
        }
    }

    printf("%d %d %d\n", nl, nw, nc);

    return 0;
}

```

Uses IN 4c, OUT 4c, and printf 5b.

Exercise 1-11

Exercise 1-12

### *Common Headers*

5b *<Include the standard I/O functions. 5b>≡*

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

Defines:

printf, used in chunks 1-3 and 5a.

putchar, used in chunks 2c and 3c.

puts, used in chunks 2c and 3b.

This code is used in chunks 1-3.

5c *<Include the standard string functions. 5c>≡*

```
#include <string.h>
```

Defines:

strlen, used in chunk 2c.

This code is used in chunk 2a.

*Chunks*

⟨Include the standard I/O functions. 5b⟩ 1, 2a, 3c, 3d, 5b

⟨Include the standard string functions. 5c⟩ 2a, 5c

⟨copy.c 3c⟩ 3c

⟨fahrrels.c 2a⟩ 2a, 2b, 2c, 2d, 3a, 3b

⟨hello.c 1⟩ 1

⟨wc.c 3d⟩ 3d, 4a, 4b, 4c, 5a

*Index*

IN: 4c, 5a

LOWER: 2b, 2d

OUT: 4c, 5a

STEP: 2b, 2d

UPPER: 2b, 2d

celsfahr: 3a, 3b

char\_count: 4a

fahrrels: 2d, 3b

line\_count: 4b

printf: 1, 2c, 2d, 3a, 5a, 5b

print\_header: 2c, 2d, 3a

putchar: 2c, 3c, 5b

puts: 2c, 3b, 5b

strlen: 2c, 5c