

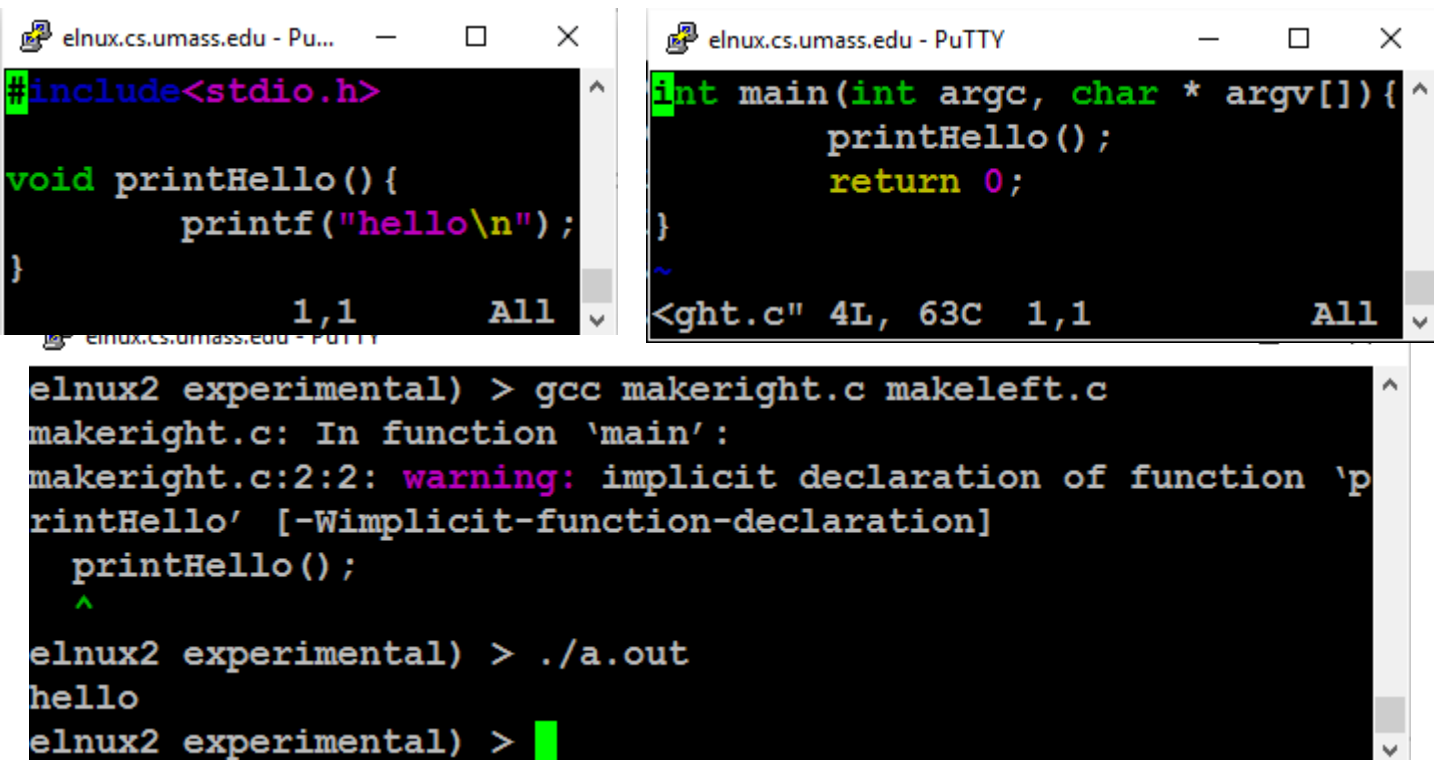
A photograph of a campus scene. In the foreground, there are several tulips in shades of red and yellow. Behind them is a paved area, possibly a walkway or road. In the background, there are green lawns, trees with sparse leaves, and a white building. The right side of the image is overlaid with a dark red semi-transparent rectangle containing text.

CS197C

Intro to C

Nicolas Scarri - *October 17, 2016*

Multiple files



```
elinux.cs.umass.edu - Pu...  -  □  ×  
#include<stdio.h>  
void printHello(){  
    printf("hello\n");  
}  
1,1 All
```

```
elinux.cs.umass.edu - PuTTY  -  □  ×  
int main(int argc, char * argv){  
    printHello();  
    return 0;  
}  
~  
<ght.c" 4L, 63C 1,1 All
```

```
elinux2 experimental) > gcc makeright.c makeleft.c  
makeright.c: In function 'main':  
makeright.c:2:2: warning: implicit declaration of function 'p  
rintHello' [-Wimplicit-function-declaration]  
    printHello();  
    ^  
elinux2 experimental) > ./a.out  
hello  
elinux2 experimental) >
```

makefile

```
elinux.cs.umass.edu - PuTTY
main: makeleft.o makeright.o
    gcc -o makeprogram makeright.o makeleft.o

"makefile" 2L, 72C          1,1          All

elinux.cs.umass.edu - PuTTY
elinux2 experimental) > make
cc      -c -o makeleft.o makeleft.c
cc      -c -o makeright.o makeright.c
makeright.c: In function 'main':
makeright.c:2:2: warning: implicit declaration of function 'printHello' [-Wimplicit-function-declaration]
    printHello();
    ^
gcc -o makeprogram makeright.o makeleft.o
elinux2 experimental) >
```

makefile

elinux.cs.umass.edu - PuTTY

```
elinux2 experimental) > ls -l |grep make
-rw-r----- 1 nscarrci grad  72 Oct 17 19:03 makefile
-rw-r----- 1 nscarrci grad  60 Oct 17 18:57 makeleft.c
-rw-r----- 1 nscarrci grad 1504 Oct 17 19:04 makeleft.o
-rwxr-x--- 1 nscarrci grad 8680 Oct 17 19:04 makeprogram
-rw-r----- 1 nscarrci grad  63 Oct 17 18:57 makeright.c
-rw-r----- 1 nscarrci grad 1392 Oct 17 19:04 makeright.o
elinux2 experimental) > ./a.out
hello
elinux2 experimental) > █
```

makefile

```
elinux.cs.umass.edu - PuTTY
#include<stdio.h>

void printHello() {
    printf("goodbye\n");
}
<.c" 5L, 62C    1,1    All
```

```
elinux.cs.umass.edu - PuTTY
elinux2 experimental) > ls -l |grep make
-rw-r----- 1 nscarrci grad   72 Oct 17 19:03 makefile
-rw-r----- 1 nscarrci grad   62 Oct 17 19:07 makeleft.c
-rw-r----- 1 nscarrci grad 1504 Oct 17 19:04 makeleft.o
-rwxr-x--- 1 nscarrci grad 8680 Oct 17 19:04 makeprogram
-rw-r----- 1 nscarrci grad   63 Oct 17 18:57 makeright.c
-rw-r----- 1 nscarrci grad 1392 Oct 17 19:04 makeright.o
elinux2 experimental) >
```

makefile

elinux.cs.umass.edu - PuTTY

```
elinux2 experimental) > make
cc -c -o makeleft.o makeleft.c
gcc -o makeprogram makeright.o makeleft.o
elinux2 experimental) > ./makeprogram
goodbye
elinux2 experimental) > █
```

elinux.cs.umass.edu - PuTTY

```
elinux2 experimental) > ls -l |grep make
-rw-r----- 1 nscarrci grad 72 Oct 17 19:03 makefile
-rw-r----- 1 nscarrci grad 62 Oct 17 19:07 makeleft.c
-rw-r----- 1 nscarrci grad 1504 Oct 17 19:09 makeleft.o
-rwxr-x--- 1 nscarrci grad 8680 Oct 17 19:09 makeprogram
-rw-r----- 1 nscarrci grad 63 Oct 17 18:57 makeright.c
-rw-r----- 1 nscarrci grad 1392 Oct 17 19:04 makeright.o
elinux2 experimental) > █
```

Implicit Declaration

elinux.cs.umass.edu - PuTTY

```
#include<stdio.h>

int main(int argc, char * argv[]){
    printf("%f\n",square(5));
    return 0;
}

double square(double base){
    return power(base,2);
}

double power(double base, int exp){
    double product=1;
    int i;
    for(i=0;i<exp;i++){ product*=base; }
    return product;
}
```

"mathwrong.c" 16L, 269C

1,1

Top

The Problem with Implicit Declarations

```
elnux2 experimental) > gcc mathwrong.c
mathwrong.c: In function 'main':
mathwrong.c:4:16: warning: implicit declaration of function 'square' [-Wimplicit-function-declaration]
  printf("%d\n", square(5));
                   ^
mathwrong.c: At top level:
mathwrong.c:7:8: error: conflicting types for 'square'
  double square(double base){
             ^
mathwrong.c:4:16: note: previous implicit declaration of 'square' was here
  printf("%d\n", square(5));
                   ^
mathwrong.c: In function 'square':
mathwrong.c:8:8: warning: implicit declaration of fu
```


Explicit Declarations

elinux.cs.umass.edu - PuTTY

```
#include<stdio.h>
double square(double);
double power(double, int);

int main(int argc, char * argv[]){
    printf("%f\n", square(5));
    return 0;
}
double square(double base){
    return power(base, 2);
}
double power(double base, int exp){
    double product=1;
    int i;
    for(i=0;i<exp;i++){ product*=base; }
}
"mathright.c" 18L, 319C 1,1 Top
```

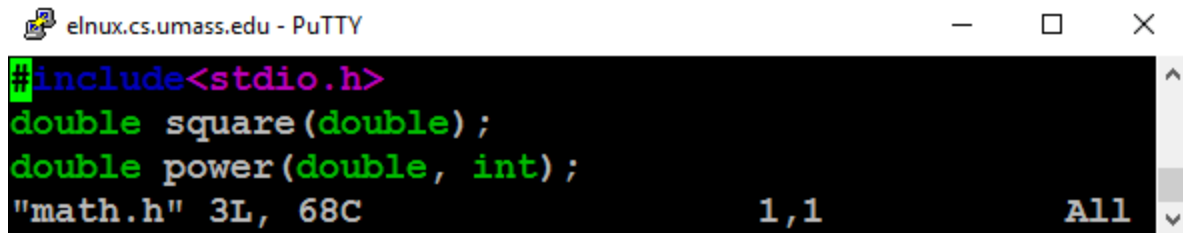
Explicit Declarations



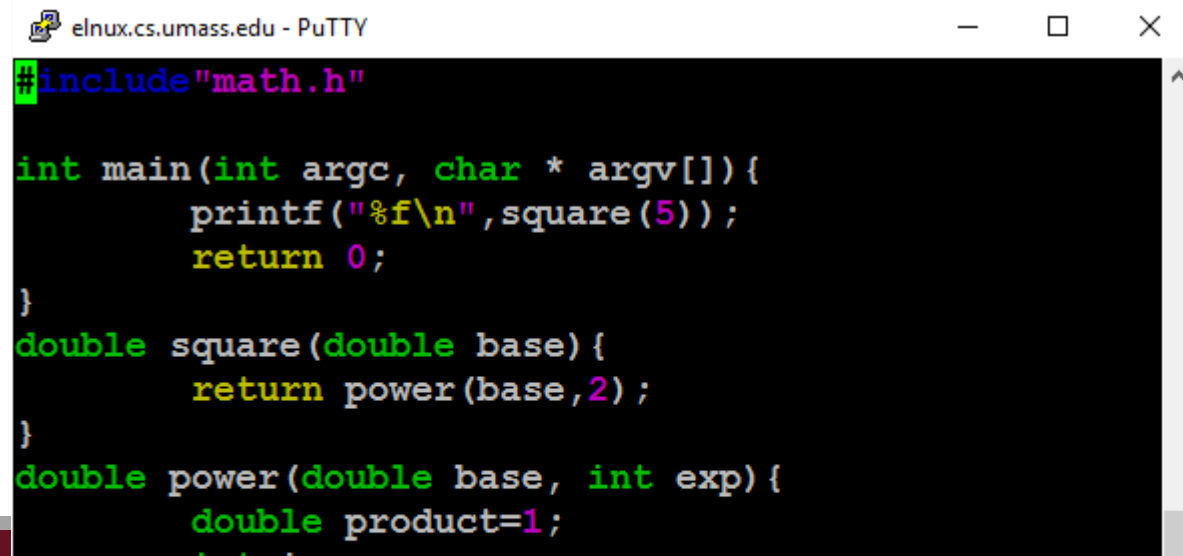
A terminal window titled "elnux.cs.umass.edu - PuTTY" with standard window controls. The terminal output shows the compilation of "mathright.c" into "a.out", followed by its execution which prints "25.000000". The prompt is currently at "elnux2 experimental) > " with a green cursor.

```
elnux2 experimental) > gcc mathright.c
elnux2 experimental) > ./a.out
25.000000
elnux2 experimental) > █
```

Custom Header Files



```
elinux.cs.umass.edu - PuTTY
#include<stdio.h>
double square(double);
double power(double, int);
"math.h" 3L, 68C 1,1 All
```



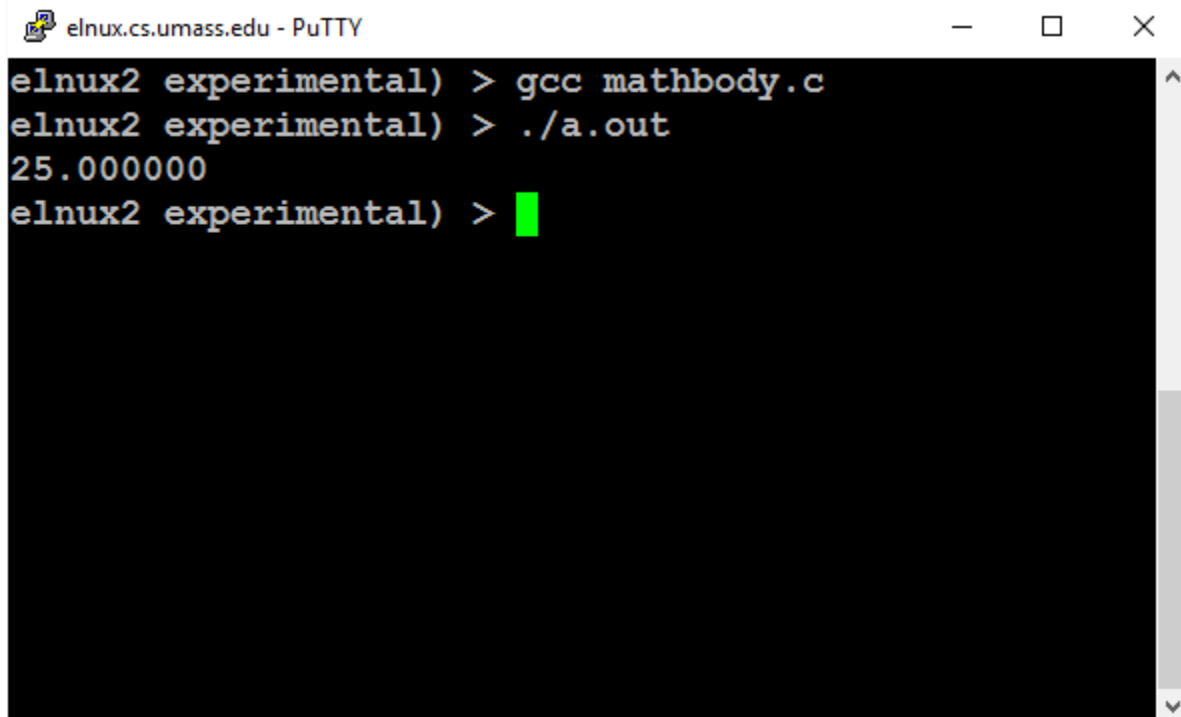
```
elinux.cs.umass.edu - PuTTY
#include "math.h"

int main(int argc, char * argv[]){
    printf("%f\n", square(5));
    return 0;
}

double square(double base){
    return power(base, 2);
}

double power(double base, int exp){
    double product=1;
```

Custom Header Files




A terminal window titled "elnux.cs.umass.edu - PuTTY" with standard window controls (minimize, maximize, close). The terminal shows the following commands and output:

```
elnux2 experimental) > gcc mathbody.c
elnux2 experimental) > ./a.out
25.000000
elnux2 experimental) > █
```

What goes in a header file?

Variable declarations
External variable declarations
enum declarations
Struct/typedef declarations

 elnux.cs.umass.edu - PuTTY

```
int i;  
extern char letter;  
enum example{GOOD,BAD};  
typedef struct{  
    int a;  
    int b;  
} exampleStruct;  
"declarations.h" 7L, 100C
```

Anything without an = sign or ()s.

Definitions

```
elnuX.cs.umass.edu - PuTTY
#include<stdio.h>
#include"declarations.h"
int i=5;
char letter = 'N';
enum example anEnum = GOOD;
exampleStruct aStruct = {5,6};

int main(int argc, char * argv[]){
    printf("i:\t\t%i\n",i);
    printf("letter:\t\t%c\n",letter);
    printf("anEnum:\t\t%i\n", (int) anEnum);
    printf("aStruct.a:\t\t%i\n",aStruct.a);
    printf("aStruct.b:\t\t%i\n",aStruct.b);
    return 0;
}
"definitions.c" 16L, 359C          1,1          Top
```

Definitions

elnu2 experimental) - PuTTY

```
elnu2 experimental) > gcc definitions.c
elnu2 experimental) > ./a.out
i:          5
letter;     N
anEnum:     0
aStruct.a:  5
aStruct.b:  6
elnu2 experimental) > █
```

A photograph of a UMass Amherst campus scene, overlaid with a semi-transparent dark red filter. In the foreground, a row of tulips in shades of pink and yellow is in bloom. Behind them, a paved walkway leads towards a large, modern building with horizontal bands of windows. Bare trees are visible on the left, and a few evergreens are on the right. The overall mood is serene and academic.

UMassAmherst
The Commonwealth's Flagship Campus