

# 第8章

编译预处理

# 编译预处理

- 以#开头
- 在编译之前执行
  - 宏定义
  - 文件包含
  - 条件编译

# 宏定义

# 不带参数的宏定义

```
#define <标识符> <替换序列>  
#define PI 3.14
```

- 宏名一般用全大写字母表示
- 只做替换，不做语法检查
- 不替换字符串中的宏
- 用\换行
- 层层替换

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

```
#define PI 3.14159265358979
```

```
int main()
```

```
{
```

```
    float r =10.0;
```

```
    printf("PI: %f\n", PI);
```

```
    printf("PI/2: %f\n", PI/2);
```

```
    printf("area: %f\n", PI*r*r);
```

```
    printf("circumference: %f\n", 2*PI*r);
```

```
    return 0;
```

```
}
```

```
#include <stdio.h>

int main()
{
    float r =10.0;

#define PI 3.14159265358979
    printf("PI: %f\n", PI);
    printf("PI/2: %f\n", PI/2);
    printf("area: %f\n", PI*r*r);
    printf("circumference: %f\n", 2*PI*r);

    return 0;
}
```

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

```
int main()
```

```
{
```

```
    float r =10.0;
```

```
    printf("PI: %f\n", PI);
```

```
#define PI 3.14159265358979
```

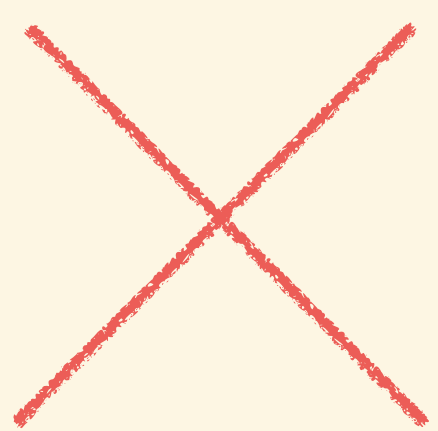
```
    printf("PI/2: %f\n", PI/2);
```

```
    printf("area: %f\n", PI*r*r);
```

```
    printf("circumference: %f\n", 2*PI*r);
```

```
    return 0;
```

```
}
```



```
pi.c:9:24: error: use of undeclared identifier 'PI'
    printf("pi: %f\n", PI);
                        ^
1 error generated.
```

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

```
#define X 3.14
```

```
#define PI X
```

```
int main()
```

```
{
```

```
    float r =10.0;
```

```
    printf("pi: %f\n", PI);
```

```
    printf("pi/2: %f\n", PI/2);
```

```
    printf("area: %f\n", PI*r*r);
```

```
    printf("circumference: %f\n", 2*PI*r);
```

```
    return 0;
```

```
}
```



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

```
#define PI X
```

```
#define X 3.14
```

```
int main()
```

```
{
```

```
    float r =10.0;
```

```
    printf("pi: %f\n", PI);
```

```
    printf("pi/2: %f\n", PI/2);
```

```
    printf("area: %f\n", PI*r*r);
```

```
    printf("circumference: %f\n", 2*PI*r);
```

```
    return 0;
```

```
}
```

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

```
#define PI X
```

```
int main()  
{
```

```
    float r =10.0;
```

```
#define X 3.14
```

```
    printf("pi: %f\n", PI);
```

```
    printf("pi/2: %f\n", PI/2);
```

```
    printf("area: %f\n", PI*r*r);
```

```
    printf("circumference: %f\n", 2*PI*r);
```

```
    return 0;
```

```
}
```

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

```
#define PI X
```

```
int main()
```

```
{
```

```
    float r = 10.0;
```

```
    printf("pi: %f\n", PI);
```

```
#define X 3.14
```

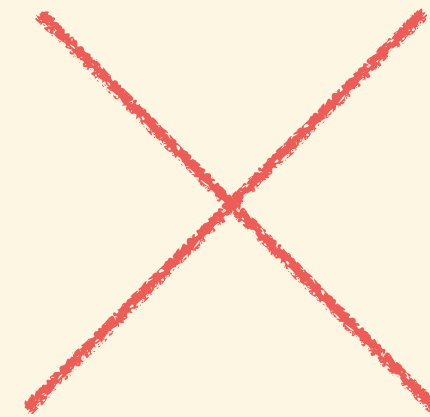
```
    printf("pi/2: %f\n", PI/2);
```

```
    printf("area: %f\n", PI*r*r);
```

```
    printf("circumference: %f\n", 2*PI*r);
```

```
    return 0;
```

```
}
```



```
pi.c:9:24: error: use of undeclared identifier 'X'
    printf("pi: %f\n", PI);
                        ^
pi.c:3:12:      expanded from macro 'PI'
#define PI X
           ^
1 error generated.
```

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

```
#define M 3
```

```
#define N M + 1
```

```
#define NN N * N / 2
```

```
int main()
```

```
{
```

```
    printf("%d\n", NN);
```

```
    printf("%d\n", 5 * NN);
```

```
    return 0;
```

```
}
```

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

```
#define M 3
```

```
#define N M + 1
```

```
#define NN N * N / 2
```

```
int main()
```

```
{
```

```
    printf("%d\n", NN);
```

```
    printf("%d\n", 5 * NN);
```

```
    return 0;
```

```
}
```

6  
18

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

```
#define VALUES 1, 2, 3, 4, 5
```

```
int main()
```

```
{
```

```
    int a[] = {VALUES};
```

```
    int i;
```

```
    int n = sizeof(a) / sizeof(a[0]);
```

```
    for (i = 0; i < n; i++)
```

```
        printf("%d\n", a[i]);
```

```
    return 0;
```

```
}
```

# 带参数的宏定义

*#define* <宏名> (<参数列表>) <替换列表>

# 求最大值

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

```
#define MAX(x, y) x > y ? x : y
```

```
int main()  
{  
    printf("%d\n", MAX(3, 5));  
  
    return 0;  
}
```



# 求圆面积

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

```
#define PI 3.14
```

```
#define AREA(r) PI * r * r
```

```
int main()
```

```
{
```

```
    int x = 1;
```

```
    printf("Area = %f", AREA(x + 1));
```

```
    return 0;
```

```
}
```

# 求圆面积

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

```
#define PI 3.14
```

```
#define AREA(r) PI * r * r
```

```
int main()
```

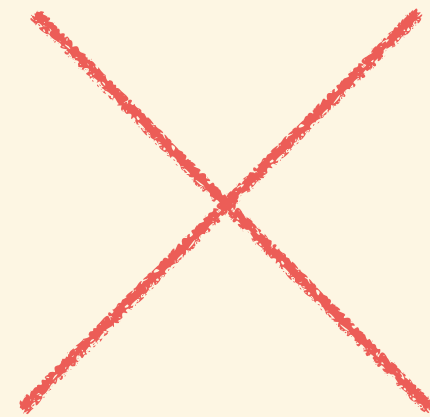
```
{
```

```
    int x = 1;
```

```
    printf("Area = %f", AREA(x + 1));
```

```
    return 0;
```

```
}
```



# 求圆面积

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

```
#define PI 3.14
```

```
#define AREA(r) PI * (r) * (r)
```

```
int main()
```

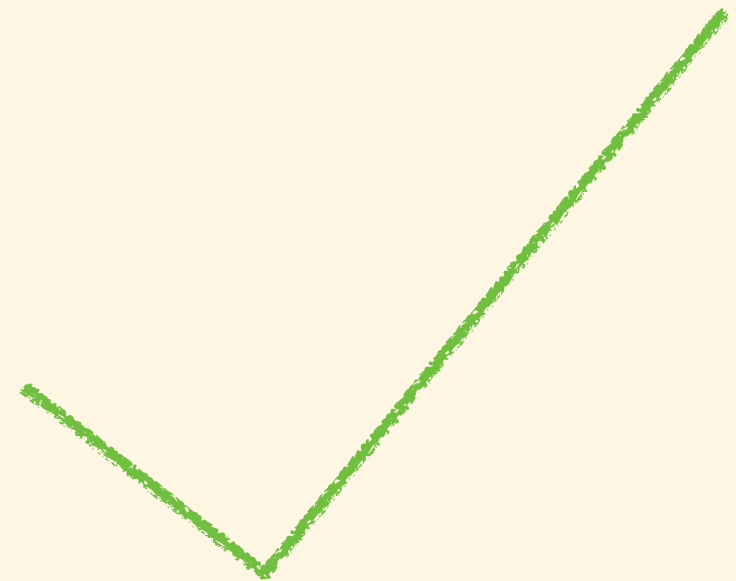
```
{
```

```
    int x = 1;
```

```
    printf("Area = %f", AREA(x + 1));
```

```
    return 0;
```

```
}
```



# 取消宏定义

*#undef* <宏名>

*#undef* *PI*

# 求圆面积

```
#include <stdio.h>

#define PI 3.14

int main()
{
    int x = 1;

#define SQUARE(x) (x) * (x)
    printf("Area = %f", PI * SQUARE(x));
#undef SQUARE

    /* SQUARE not available here */

    return 0;
}
```

宏相对函数的优点？

# 条件编译

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

```
int main()
```

```
{
```

```
#ifdef __unix__
```

```
    printf("Unix\n");
```

```
#elif defined __APPLE__
```

```
    printf("Apple\n");
```

```
#elif defined _WIN32
```

```
    printf("Windows\n");
```

```
#else
```

```
    printf("Other system\n");
```

```
#endif
```

```
    return 0;
```

```
}
```

当宏被定义时执行下列语句



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

```
int main()
```

```
{
```

```
#ifndef _WIN32
```

```
    printf("Goodbye Windows!\n");
```

```
#else
```

```
    printf("Welcome to Windows\n");
```

```
#endif
```

```
    return 0;
```

```
}
```

当宏未定义时执行下列语句

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

```
#define VERBOSE 2
```

```
int main()
```

```
{
```

```
#if VERBOSE == 1
```

```
    printf("Debug message\n");
```

```
#elif VERBOSE == 2
```

```
    printf("More messages\n");
```

```
#endif
```

```
    return 0;
```

```
}
```

当表达式为真时执行

```
#include <stdio.h>

#define FLAG 0

int main()
{
#ifdef FLAG
    printf("FLAG defined\n");
#endif

#if FLAG
    printf("FLAG is true\n");
#endif

#undef FLAG

#ifdef FLAG
    printf("FLAG defined\n");
#endif

#if FLAG
    printf("FLAG is true\n");
#endif

    return 0;
}
```

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

```
#define FLAG 0
```

```
void f()
```

```
{
```

```
#ifdef FLAG
```

```
    printf("FLAG defined\n");
```

```
#endif
```

```
#if FLAG
```

```
    printf("FLAG is true\n");
```

```
#endif
```

```
}
```

```
int main()
```

```
{
```

```
    f();
```

```
#undef FLAG
```

```
    f();
```

```
    return 0;
```

```
}
```

文件包含

# 文件包含

*#include <foo.h>*

*#include "foo.h"*

- 可包含任何文件
- 相当于在该位置插入文件的内容

# 如何组织你的工程？

- 声明放在.h文件
- 定义放在.c文件
- 相似功能放在同一模块

# 计算圆的面积和周长



# circle.h

```
#ifndef __CIRCLE_H_  
#define __CIRCLE_H_
```

```
#define PI 3.14
```

```
float area(float r);
```

```
float circumference(float r);
```

```
#endif
```

# circle.c

```
#include "circle.h"
```

```
float area(float r)
{
    return PI * r * r;
}
```

```
float circumference(float r)
{
    return 2 * PI * r;
}
```

# main.c

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

int main()
{
    float r;

    scanf("%f", &r);

    printf("area = %f\n", area(r));
    printf("circumference = %f\n", circumference(r));

    return 0;
}
```