

Tutorial 2

Control and Iterations

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bool

```
#include<stdbool.h>
```

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

```
int main()
```

```
{
```

```
    bool a;
```

```
    int b;
```

```
        b = 0;
```

```
    for(a=0; a<10 ;a++)
```

```
        <----- infinite loop
```

```
    {
```

```
        b++;
```

```
        printf("%d %d\n", a, b);
```

```
    }
```

```
}
```

Exercise 1:

Assume $i=5$, $j=7$, $k=4$ and $m=-2$.

What does each of the following print?

- a) `printf("%d", i==5);`
- b) `printf("%d", j!=3);`
- c) `printf("%d", i>=5 && j<4);`
- d) `printf("%d", !m && k>m);`
- e) `printf("%d", !k || m);`
- f) `printf("%d", k-m<j || 5-j>=k);`
- g) `printf("%d", j+m<=i && !0);`
- h) `printf("%d", !(j-m));`
- i) `printf("%d", !(k>m));`
- j) `printf("%d", !(j>k));`

Control

if
else
else if
switch

```
if(a!=b)
{
    if(a>b)
        printf("a>b\n");
    else if(a=0)
        printf("a=0\n");

}
else if(a==0)
    printf("a=b=0\n");
else
    printf("a=%d\n",a);
```

Exercise 2

```
#include <stdio.h>

int main()
{
    int a = 10;
    if(!a)
        printf("True\n");
    else
        printf("False\n");

    while(a)
    {
        printf("%d\n", a);
        a--;
    }
}
```

goto

Allows you to 'jump' to somewhere in a program

```
xx:
```

```
...
```

```
if(a>b)
```

```
    goto xx;
```

Iteration

while
do while
for

```
int i=0;  
while(i<10)  
    printf("%d", i);
```

```
do  
{  
    i++;  
    ...  
} while(i<10);
```

```
for(i=0; i<10; i++)  
{  
    ...  
}
```

Break and continue

```
while(true)
{
    if (someone_has_won() || someone_wants_to_quit() == TRUE)
    {break;}
    take_turn(player1);
    take_turn(player2);
}
```

```
for (player = 1; player<100; player++)
{
    if (player > total_number_of_players)
    {break;}
    if (is_bankrupt(player))
    {continue;}
    take_turn(player);
}
```


Frequent mistakes

Three elements in an iteration:

Initial value

Exit condition

Increment

```
for(i=0; i<10; i++)  
{  
    printf("%d\n",i);  
}  
do  
{  
    printf("%d\n",i);  
    i++;  
} while(i<10);
```

Frequent mistakes

Infinite loop: exit condition will never be met

No loop:

```
i = 0;
do
{
    printf("%d\n",i);
} while(i<10);

for(i=0; i>10; i++)
{
    printf("%d\n",i);
    ...
}
```

4.8

What does the following program do?

```
1  #include <stdio.h>
2  int main(void)
3  {
4      int x, i, j;
5      // prompt user for input
6      printf("%s", "Enter an integer in the range 1-20:");
7      scanf("%d", &x); // read values for x
8      for (i = 1; i <= x; i++) { // count from 1 to x
9          for (j = 1; j <= x; j++) { // count from 1 to x
10             if (j==i)
11                 printf("%c", '@'); // output @
12             else
13                 printf(" ");
14             } // end inner for
15             printf("\n");
16         } // end outer for
17     } // end of main
```

Exercise 4

- Design a program to create a menu like this:

