COMP10002 Foundations of Algorithms

Workshop Week3

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GitHub Repo: https://github.com/AlanChaw/COMP10002-FoA

Recap

Chapter3 Making Choices

- Relational and Logical Operators
- Selection
    - if ... else... statement
- Switch Statement

Chapter4 Loops

- for loop
- while loop

Chapter5 Functions

Relational and Logical Operators

- Type: **int**
  - Non-zero - **True**
  - Zero - **False**

Relational Operator	Name	Logical Operator	Name
==	Equal to	&&	and
>	Greater than	||	or
<	Less than	!	not
!=	Not equal to		
>=	Greater than or equal to		
<=	Less than or equal to		

Selection

- Example1

```c
if (class_size == 50) {
    printf("Class is now full\n");
} else {
    printf("More students can be accepted\n");
}
```

- Example2

```c
int x=3, y=4, z=6;
if (x>2)
    if (y>6)
        z = 7;
    else
        z = 8;
```

Switch Statement

```c
switch (month) {
    case 2:
        length_of_month = 28 +
        (year%4==0 && (year%100!=0 || year%400==0));
        break;
    case  4:
    case  6:
    case  9:
    case 11:
        length_of_month = 30;
        break;
    default:
        length_of_month = 31;
        break;
}
printf("month=%2d, length_of_month=%2d\n", month,length_o
```

"for" loop

- Grammar

```
for (initialize; guard; update){
    statement
}
```

- Example

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

"while" loop

- Grammar

```
while (guard){
    statement
}
```

- Example

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

Discussion

Exercise 4.1

a.

```
for (int i = 0; i < 20; i = i + 3){
        printf("%2d\n", i);
}
```

b.

```
for (i = 1; i < 2000000; i = 2*i){
    printf("%7d\n", i);
}
```

c.

```c
int sum = 0;
for (i = 1; i < 10; i++){
    sum = sum + i;
    printf("S(%2d) = %2d\n", i, sum);
}
```

d.

```c
int i, j;
for (i = 0; i < 8; i++) {
    for (j = i + 1; j < 8; j += 3) {
        printf("i = %d, j = %d\n", i, j);
    }
}
```

e.

```c
int i, j;
for (i = 0; i < 8; i++) {
    for (j = i + 1; j < 8; j += 3) {
        if (i + j == 7) {
            break;
        }
        printf("i = %d, j = %d\n", i, j);
    }
}
```

f.

```
int i, j;
j = 5;
for (i = 0; i < j; i++) ; {
    printf("i = %d, j = %d\n", i, j);
}
```

g.

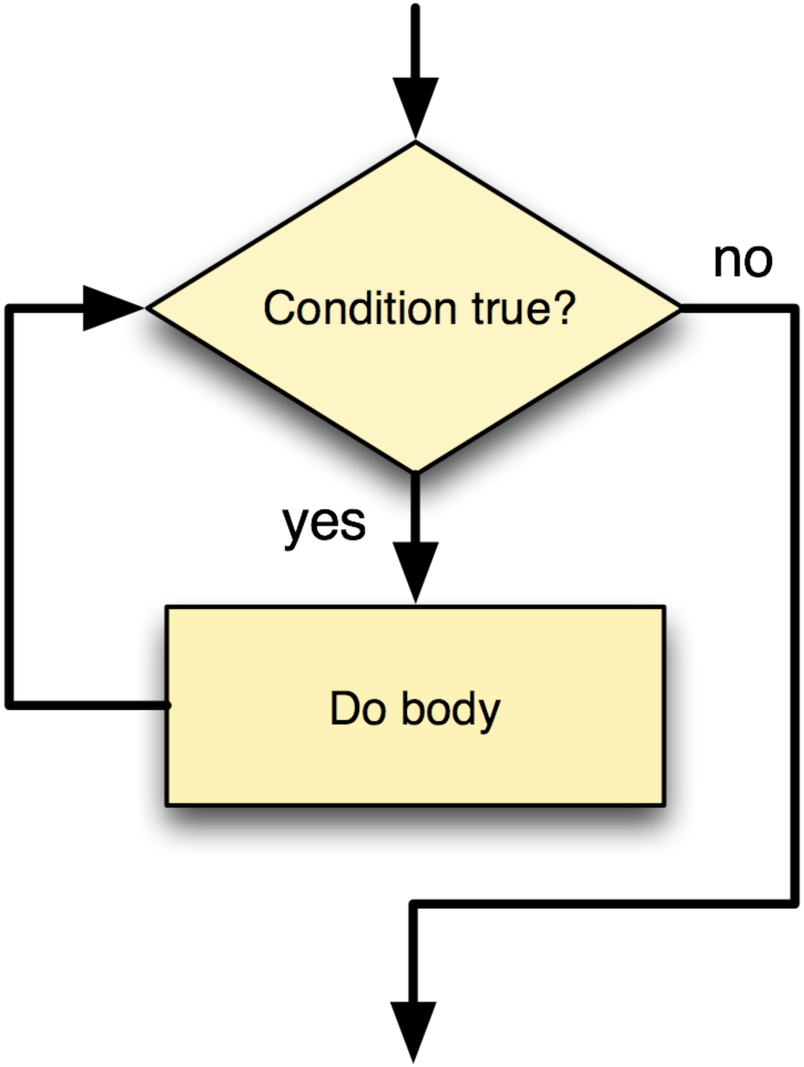
```
int i, j;
j = 5;
for (i = 0; i < j; j++) {
    printf("i = %d, j = %d\n", i, j);
}
```

Discussion

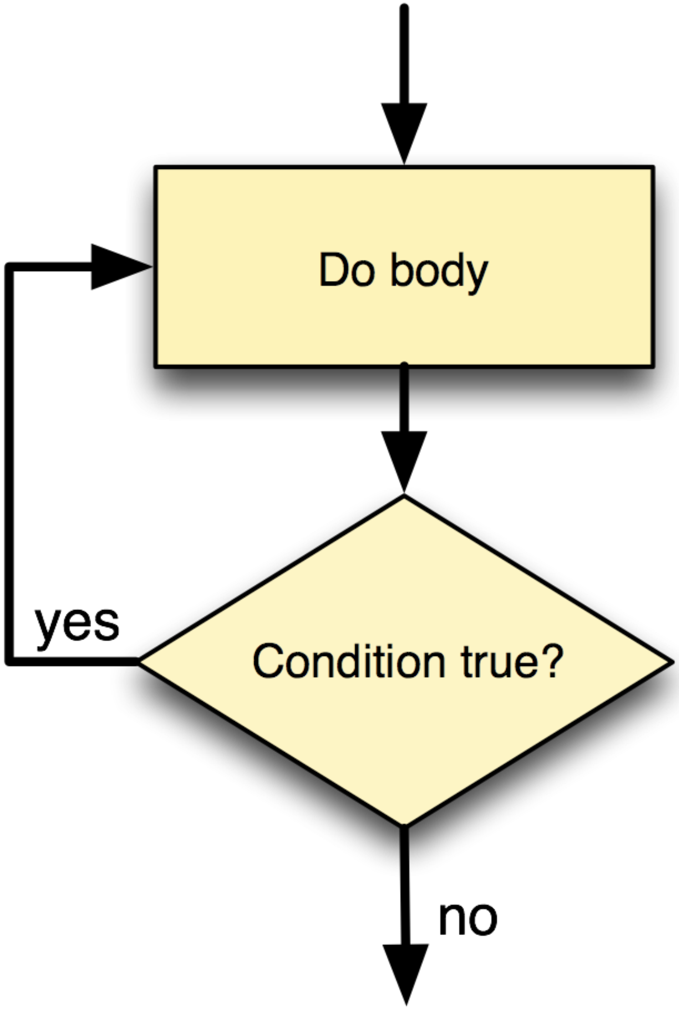
Exercise 4.2

Given a general construction that shows how any ***do*** statement can be converted into an equivalent ***while*** statement

while() vs. do...while()



`while` flowchart



`do/while` flowchart

while() vs. do...while()

- do...while()

```
int i = 0;
do{
    printf("i = %d\n", i);
    i++;

}while(i < 10);
```

- while()

```
int j = 0;
printf("j = %d\n", j);
j++;
while (j < 10) {
    printf("j = %d\n", j);
    j++;
}
```

Hands On Exercises

Exercise 4.5

- Hint: **^D** means use **Ctrl+D** to jump out of input loop

Exercise 4.6

Exercise 4.7

Exercise 5.6

- Hint: You may require a help function to find the sum of all the factors of a number.