Branches

`if statement`

if (*expression*)
    statement

- Determines whether a statement or block is executed.
- Implements the selection instructions within an algorithm.
- Decides what to do by evaluating a Boolean expression.
- If the expression is true (non-zero), the statement or block is executed.

What is a statement

- Statements are lines of instructions in our programs ending with a semicolon (;).
- A compound statement or block is a series of statements surrounded by braces.

Example

```
{
    number = number + 1;
    printf("%d\n", number);
}
```

- An empty statement is a single semicolon.

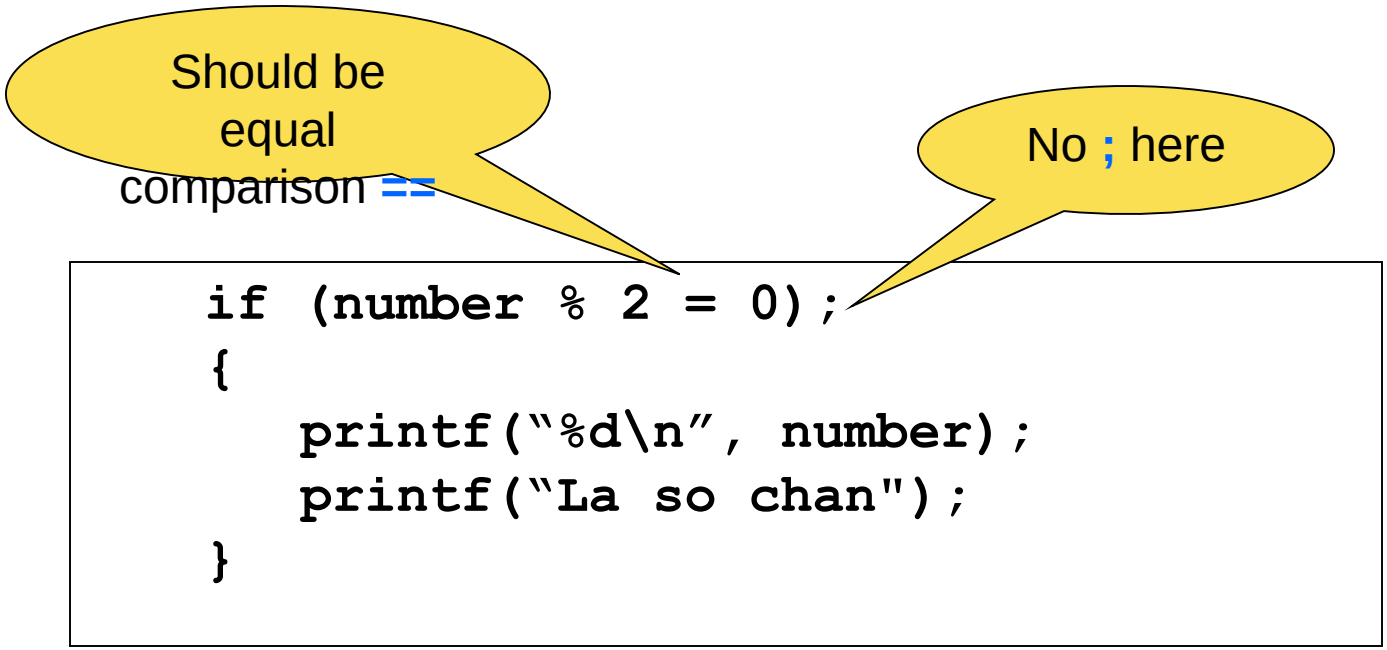
Example

- Read in a number, and echo it if it is odd.

```
#include <stdio.h>
int main()
{
    int number;

    printf("Enter an integer: ");
    scanf("%d", &number);

    if (number % 2 != 0)
       printf("%d is an odd number", number);

    return 0;
}
```

there is no **then** here

Common errors



; creates an empty statement after **if**

else statement

if (*expression*)

statement1

else *statement2*

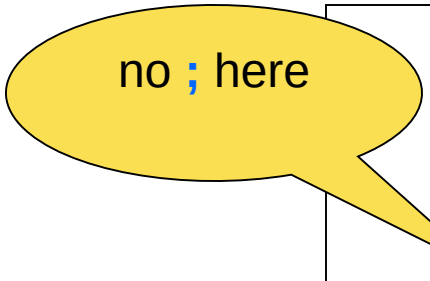
- else statement can only occur after an if statement
- else statement is only executed when the if block does not execute

Example

- Check whether an interger is odd or even

```
#include <stdio.h>

int main()
{
  int number;

  printf(“Enter an integer: ");
  scanf("%d", &number);

  if (number % 2 != 0)
     printf("%d is an odd number\n", number);
  else
     printf("%d is an even number\n", number);

  return 0
}
```

Common errors




```
if (number % 2 != 0)
{
   printf(“%d\n”, number);
   printf(“is an odd number");
};
else
{
   printf(“%d\n”, number);
   printf(“is an even number");
}
```

Cascading if (`else-if`)

```
if (expr1)
    statement1
else if (expr2)
    statement2
else if (expr3)
    statement3
else
    statement4
```

Example

```
if (ch >= 'a' && ch <= 'z')
{
   printf("%c is a lowercase", ch);
}
else if (ch >= 'A' && ch <= 'Z')
{
   printf("%c is a upper case". ch);
}
else if (ch >= '0' && ch <= '9')
{
   printf("%c is a number", ch);
}
```

- Cascading if: Multiple alternative blocks but at most only one block will be executed
- Cascading if is used when we need to choose one among several conditions

Exercise

1. Write a program to compute the total days of a month

- Algorithm

```
if (month in September, April, June, November) then
   output “30 days”
else if (month is February)
   output “28 or 29 days”
else   output “31 days”
```

Exercises

2. Write a program to get three numbers from input and print out the maximum and minimum of those
3. Write a program to solve $ax^2 + bx + c = 0$
4. Write a program to get two numbers a,b from input and compute $y = 15x^2 + x + 12$, in which:

$$x = \begin{cases} \dfrac{a+b}{3} + b & if \quad a < b \\ 15{,}172 & if \quad a = b \\ \dfrac{a-b}{a^2+b^2} & if \quad a > b \end{cases}$$

`switch` statement

```
switch (integer value)
  {
  case 1:  statement1;
           break; /* optional line */
  case 2:  statement2;
           break; /* optional line */
  ....
  default: default statement;
           break; /* optional line */
  }
```

- When a switch statement is encountered, the expression in the parentheses is evaluated and the program checks to see whether the result of that expression matches any of the constants labelled with case.
- If a match is made execution will start just after that case statement and will carry on until either the closing brace } is encountered or a break statement is found.
- Statements which follow the default case are executed for all cases which are not specifically listed.

Example 1

```
printf("Yes/No (Y/N)?");
scanf("%c", &ch)
switch (ch)
{
   case 'y' :
   case 'Y' :
     printf("say yes");
     break;
   default :
     printf("say no");
}
```

Example 2

```
switch (digit){
   case 0 : printf ("zero");
            break;
   case 1 : printf ("one");
            break;
   case 2 : printf ("two");
            break;
   ...
   case 9 : printf ("nine");
            break;
   default:
       printf ("others");
}
```

Exercises

- Display grade of a student based on marks
- diem = 9, 10: excellent
- diem = 7, 8: good
- diem = 5, 6: average
- other: weak

Solution

- Display grade of a student based on marks

```
switch (diem)
{
  case 9:
  case 10:
    printf("Loai gioi\n");
    break;
  case 7:
  case 8:
    printf("Loai kha\n");
    break;
  case 5:
  case 6:
    printf("Loai TB\n");
    break;
  default:
    printf("Loai yeu\n");
}
```

```
if (diem==9||diem==10)
{
   printf("Loai gioi\n");
}
else if (diem==7||diem==8)
{
   printf("Loai kha\n");
}
else if (diem==5||diem==6)
{
   printf("Loai TB\n");
}
else
{
   printf("Loai yeu\n");
}
```

using **break**

- When a case of the switch statement is found, statements are carried out from this point
- All following statements are carried out until a break statement
- break is a handy way of jumping straight out of the switch block

```
int a=1;
switch ( a ) {
   case 1:
      printf("a=1\n");
   case 2:
      printf("a=2\n");
      break;
   case 3:
      printf("a=3\n");
}
```

Output:

a=1
a=2

Exercises

1. Write a program to get two numbers a,b from input and compute $y = 15x^2 + x + 12$, in which:

$$x = \begin{cases} \dfrac{a+b}{3} + b & if \quad a < b \\ 15{,}172 & if \quad a = b \\ \dfrac{a-b}{a^2+b^2} & if \quad a > b \end{cases}$$

2. Write a program to get an integer n ($1 \le n \le 10$) and display the English name of that number. For example, n = 2, display 2 → two.