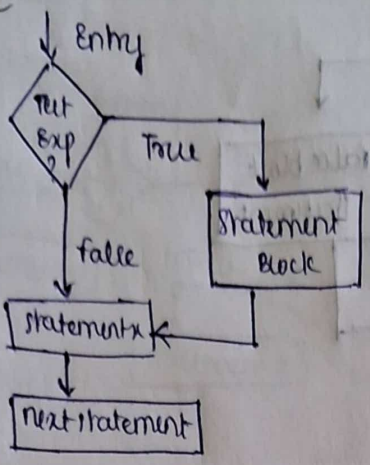
5. Decision making and Branching

* If Statement




1) Evaluate $\frac{(a+b)}{(c-d)}$ print the result if c-d != 0.

```
main()
{
int a,b,c,d;
float ratio;
printf("Enter four integer values\n");
scanf("%d %d %d %d",&a,&b,&c,&d);
if (c-d!=0)
  { ratio=(float)(a+b)/(float)(c-d);
    printf("Ratio = %f\n",ratio);
  }
}
```

2) Counts no. of boys whose weight is less than 50kg and height greater than 170cm.

```
main()
{
  int count,i;
  float weight,height;
  count=0;
  printf("Enter weight and height for 10 boys\n");
  for (i=1;i<=10;i++)
  {
    scanf("%f %f",&weight,&height);
    if (weight<50 && height>170)
      count=count+1;
  }
  printf("no. of boys with weight<50 kg\n");
  printf("and height >170 cm = %d\n",count);
}
```

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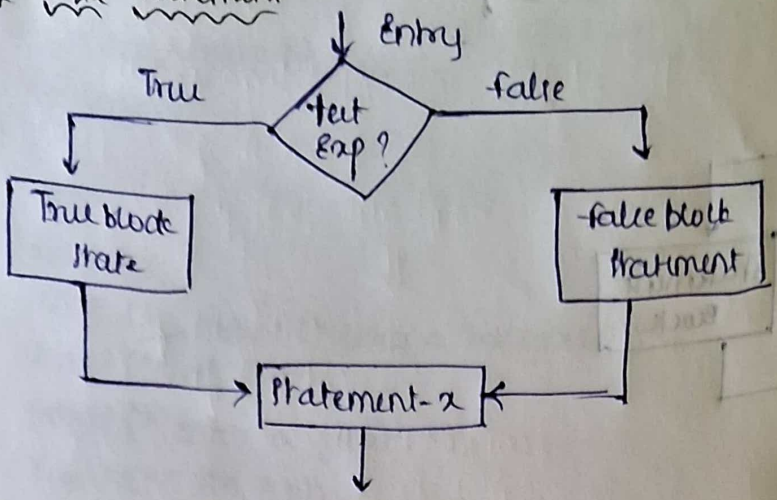
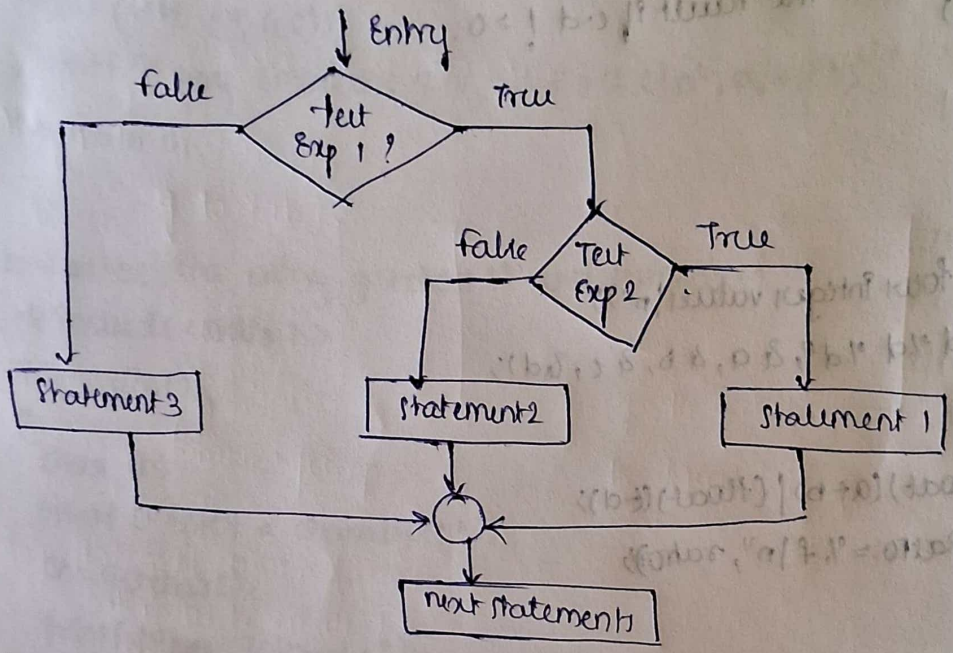
* if-else statement




* nesting of if-else statements

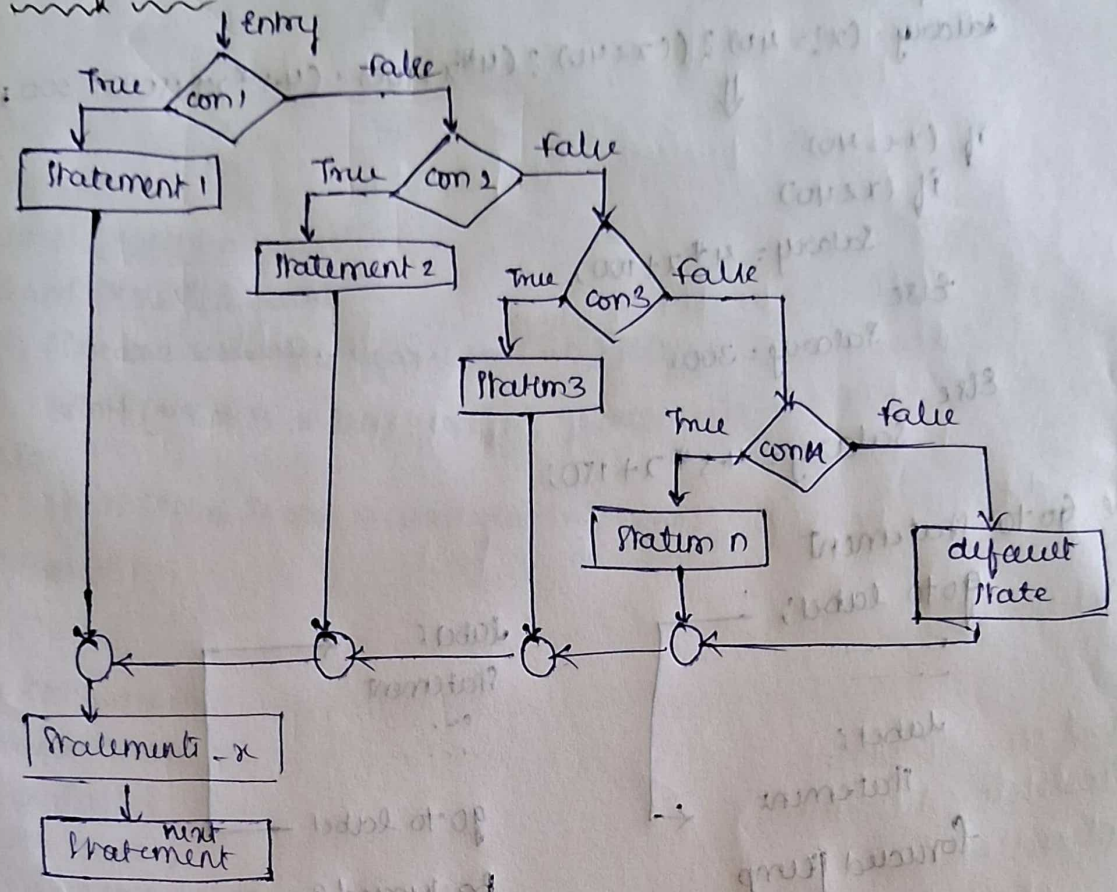



3) largest of three numbers using nested if-else

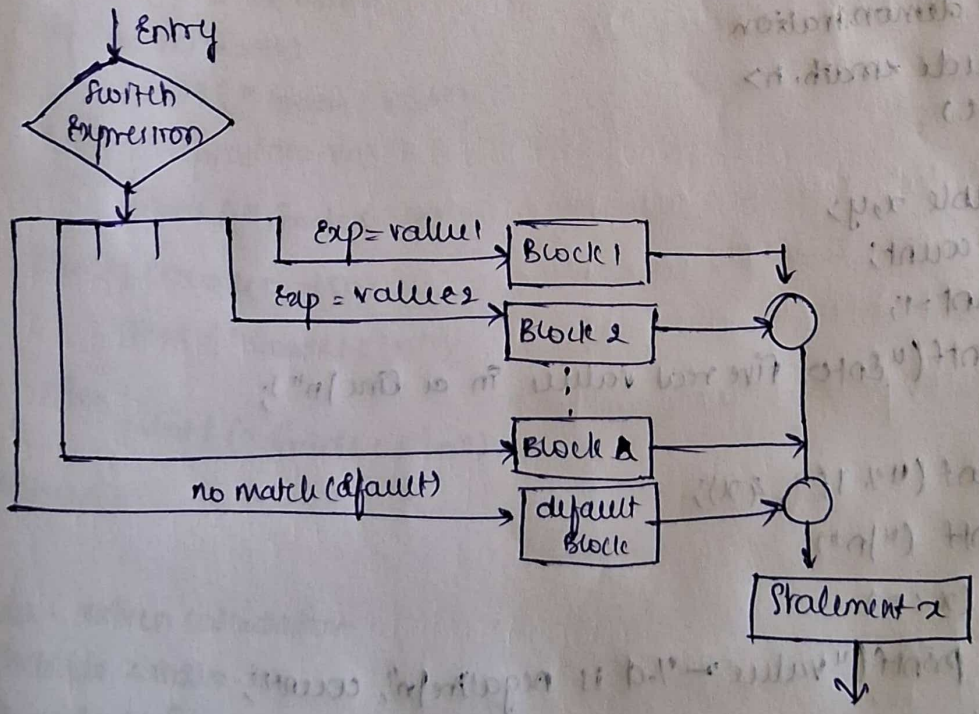
```
main()
{
int A, B, C;
printf("Enter three values\n");
scanf("%d %d %d", &A, &B, &C);
printf("largest value is ");
if (A>B)
{
  if (A>C)
    printf("%d\n", A);
  else
    printf("%d\n", C);
else
{
  if (C>B)
    printf("%d\n", C);
  else
    printf("%d\n", B);
}
```

note:- one of the classic problems encountered when we start using nested if else is the "dangling else problem"?

* The Else If ladder




* The switch statement

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* The ?: operator

conditional Expression ? Exp 1 : Exp 2

Eg: complex equation

```
Salary = (x != 40) ? ((x < 40) ? (4*x+100) : (4.5*x+150)) : 300
```

⇓

```
If (x <= 40)
  If (x < 40)
     Salary = 4*x+100;
  Else
     Salary = 300;
Else
     Salary = 4.5*x+150;
```

* The Go to statement

```
goto label;
.....
label:
  statement
```

forward jump

```
label:
statement
.....
goto label
```

Backward jump.

4) Go go statement demonstration

```
#include <math.h>
main()
{
 double x,y;
 int count;
 count=1;
 printf("Enter five real values in a line\n");
read:
 scanf("%lf", &x);
 printf("\n");
 If (x<0)
    printf("value = %d is negative\n", count);
 Else
 {
    y = sqrt(x);
    printf("%lf\t %lf\n", x, y);
 }
count = count+1;
If (count <= 5)
```

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```
    goto read;
    printf("\n End of computation");
}
```

5) check leap year

```
#include <stdio.h>
int main() {
    int year;
    printf("Enter a year:");
    scanf("%d", &year);
    if ((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0))
        printf("%d is a leap year\n", year);
    else
        printf("%d is not a leap year\n", year);
    return 0;
}
```

6) Grade calculation.

```
#include<stdio.h>
int main() {
    int marks;
    printf("Enter marks (0-100):");
    scanf("%d", &marks);
    if (marks >= 90)
        printf("Grade : A\n");
    else if (marks >= 75)
        printf("Grade : B\n");
    else if (marks >= 50)
        printf("Grade : C\n");
    else
        printf("Grade : F\n");
    return 0;
}
```

7) menu-driven calculator

```
#include <stdio.h>
int main() {
    int choice;
    float a, b;
    printf("Enter two numbers:");
    scanf("%f %f", &a, &b);
    printf("menu 1. Add 2. Sub 3 mul 4. div \n");
    printf("Enter choice:");
```

```
scanf("%d", &choice);
switch(choice) {
    case 1: printf("Sum = %.2f\n", a+b);
            break;
    case 2: printf("difference = %.2f\n", a-b);
            break;
    case 3: printf("product = %.2f\n", a*b);
            break;
    case 4:
        if(b!=0) printf("quotient = %.2f\n", a/b);
        else
            printf("division by zero!\n");
        break;
    default: printf("Invalid choice!\n");
}
return 0;
}
```

8. Vowel or consonant

```
#include<stdio.h>
int main(){
    char ch;
    printf("Enter a character:");
    scanf("%c", &ch);
    switch(ch){
        case 'a': case 'e': case 'i': case 'o': case 'u':
        case 'A': case 'E': case 'I': case 'O': case 'U':
            printf("vowel\n"); break;
        default: printf("consonant\n");
    }
    return 0;
}
```

9. Alphabet, digit or special character.

```
#include<stdio.h>
int main(){
    char ch;
    printf("Enter a character:");
    scanf("%c", &ch);
    if((ch>='A' && ch<='Z') || (ch>='a' && ch<='z'))
        printf("Alphabet\n");
```

```
    else if (ch >= '0' && ch <= '9')
        printf("a digit\n");
    else
        printf("a special character\n");
    return 0;
}
```

10. check divisibility by 3 and 5

```
#include <stdio.h>
int main() {
    int num;
    printf("Enter a number: ");
    scanf("%d", &num);
    if (num % 3 == 0 && num % 5 == 0)
        printf("%d is divisible by 3 and 5\n", num);
    else
        printf("%d is not divisible by both 3 and 5\n", num);
    return 0;
}
```

11. Eligibility for voting

```
#include <stdio.h>
int main() {
    int age;
    printf("Enter your age: ");
    scanf("%d", &age);
    if (age >= 18)
        printf("you are eligible to vote\n");
    else
        printf("you are not eligible to vote.\n");
    return 0;
}
```

```c
/*(a) Without using else*/
#include <stdio.h>
int main()
{
    int num;
    printf("Enter a number: ");
    scanf("%d", &num);
    if (num % 2 == 0)
        printf("NUMBER IS EVEN\n");
    if (num % 2 != 0)
        printf("NUMBER IS ODD\n");
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./even
Enter a number: 45
NUMBER IS ODD
```

```c
/*(b) With else*/
#include <stdio.h>
int main()
{
    int num;
    printf("Enter a number: ");
    scanf("%d", &num);
    if (num % 2 == 0)
        printf("NUMBER IS EVEN\n");
    else
        printf("NUMBER IS ODD\n");
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./evenw
Enter a number: 12
NUMBER IS EVEN
```

```c
/* Integers divisible by 7 between 100 and 200*/
#include <stdio.h>
int main() {
    int i, count = 0, sum = 0;
    for (i = 101; i < 200; i++) {
        if (i % 7 == 0) {
            count++;
            sum += i;
        }
    }
    printf("Count = %d\n", count);
    printf("Sum = %d\n", sum);
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./div
Count = 14
Sum = 2107
```

```c
/* Solve linear equations (Cramer's Rule)*/
#include <stdio.h>
int main()
{
    float a, b, c, d, m, n;
    printf("Enter values of a, b, c, d, m, n: ");
    scanf("%f %f %f %f %f %f", &a, &b, &c, &d, &m, &n);
    float det = a * d - c * b;
    if (det == 0) {
        printf("No unique solution (denominator = 0)\n");
    } else {
        float x1 = (m * d - b * n) / det;
        float x2 = (a * n - m * c) / det;
        printf("x1 = %.2f\n", x1);
        printf("x2 = %.2f\n", x2);
    }
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./linear
Enter values of a, b, c, d, m, n: 1 2 3 4 5 6
x1 = -4.00
x2 = 4.50
```

```
/* Admission eligibility*/
#include <stdio.h>
int main()
{
    int math, physics, chem, total, mpTotal;
    printf("Enter marks in Math, Physics, Chemistry: ");
    scanf("%d %d %d", &math, &physics, &chem);
    total = math + physics + chem;
    mpTotal = math + physics;
    if ((math >= 60 && physics >= 50 && chem >= 40 && total >= 200) || mpTotal
>= 150) {
        printf("Eligible for admission\n");
    } else {
        printf("Not eligible for admission\n");
    }
    return 0;
}
supriya@ubuntu:~/Desktop/c/chp5$ ./adm
Enter marks in Math, Physics, Chemistry: 70 65 67
Eligible for admission
```

```c
/*(a) Floyd's Triangle with Numbers*/
#include <stdio.h>
int main() {
    int n, i, j, num = 1;
    printf("Enter number of rows: ");
    scanf("%d", &n);
    for (i = 1; i <= n; i++) {
        for (j = 1; j <= i; j++) {
            printf("%3d ", num++);
        }
        printf("\n");
    }
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./tri
Enter number of rows: 5
  1
  2   3
  4   5   6
  7   8   9  10
 11  12  13  14  15
```

```c
/*(b) Modified Floyd's Triangle with 0 and 1*/
#include <stdio.h>
int main() {
    int n, i, j, bit = 1;
    printf("Enter number of rows: ");
    scanf("%d", &n);
    for (i = 1; i <= n; i++) {
        for (j = 1; j <= i; j++) {
            printf("%d ", bit);
            bit = 1 - bit;
        }
        printf("\n");
    }
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./num
Enter number of rows: 6
1
0 1
0 1 0
1 0 1 0
1 0 1 0 1
0 1 0 1 0 1
```

```c
/*a) Using Nested if Statements*/
#include <stdio.h>
int main() {
    int x, y;
    printf("Enter the value of x: ");
    scanf("%d", &x);
    if (x <= 0) {
        if (x == 0)
            y = 0;
        else
            y = 1;
    } else {
        y = -1;
    }

    printf("y = %d\n", y);
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./nest
Enter the value of x: 7
y = -1
```

```c
/*(b) Using else if Statements*/
#include <stdio.h>
int main() {
    int x, y;
    printf("Enter the value of x: ");
    scanf("%d", &x);
    if (x < 0)
        y = 1;
    else if (x == 0)
        y = 0;
    else
        y = -1;
    printf("y = %d\n", y);
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./else
Enter the value of x: 7
y = -1
```

```
/*(c) Using Conditional Operator ?:*/
#include <stdio.h>
int main() {
    int x, y;
    printf("Enter the value of x: ");
    scanf("%d", &x);
    y = (x < 0) ? 1 : ((x == 0) ? 0 : -1);
    printf("y = %d\n", y);
    return 0;
}
supriya@ubuntu:~/Desktop/c/chp5$ ./con
Enter the value of x: 7
y = -1
```

```c
/*Check if three sides form a Right-Angled Triangle*/
#include <stdio.h>
int main() {
    int a, b, c;
    printf("Enter three sides of triangle: ");
    scanf("%d %d %d", &a, &b, &c);
    if (a*a + b*b == c*c || a*a + c*c == b*b || b*b + c*c == a*a)
        printf("The sides %d, %d, %d form a Right-Angled Triangle.\n", a, b, c)
;
    else
        printf("The sides do not form a Right-Angled Triangle.\n");
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./side
Enter three sides of triangle: 4 5 6
The sides do not form a Right-Angled Triangle.
```

```c
#include <stdio.h>
#include <string.h>
int main() {
    char name[30];
    int units;
    float amount, surcharge;
    printf("Enter user name: ");
    scanf("%s", name);
    printf("Enter units consumed: ");
    scanf("%d", &units);
    if (units <= 100)
        amount = units * 0.60;
    else if (units <= 300)
        amount = 100 * 0.60 + (units - 100) * 0.80;
    else
        amount = 100 * 0.60 + 200 * 0.80 + (units - 300) * 1.00;
    amount += 100;
    if (amount > 400)
        amount += amount * 0.15;
    printf("Name: %s\nTotal Charges: Rs. %.2f\n", name, amount);
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./ele
Enter user name: supriya
Enter units consumed: 45
Name: supriya
Total Charges: Rs. 127.00
```

```c
/*Sum of numbers divisible by 6 but not 4 (0-100)*/
#include <stdio.h>
int main() {
    int i, count = 0, sum = 0;
    for (i = 1; i <= 100; i++) {
        if (i % 6 == 0 && i % 4 != 0) {
            sum += i;
            count++;
        }
    }
    printf("Count = %d\nSum = %d\n", count, sum);
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./sum
Count = 8
Sum = 384
```

```c
/*Prime Number Check & Count (100-200)*/
#include <stdio.h>
#include <math.h>
int isPrime(int n) {
    if (n <= 1) return 0;
    for (int i = 2; i <= sqrt(n); i++) {
        if (n % i == 0) return 0;
    }
    return 1;
}
int main() {
    int num, count = 0;
    printf("Enter a positive integer: ");
    scanf("%d", &num);
    if (isPrime(num))
        printf("%d is a Prime number.\n", num);
    else
        printf("%d is NOT a Prime number.\n", num);
    for (int i = 100; i <= 200; i++) {
        if (isPrime(i))
            count++;
    }
    printf("Number of primes between 100 and 200: %d\n", count);
    return 0;
}
```

```
supriya@ubuntu:~/Desktop/c/chp5$ ./prime
Enter a positive integer: 123
123 is NOT a Prime number.
```