Home Exercise #2

A certain grade of steel is graded according to the following conditions:

(i) Hardness must be greater than 50

(ii) Carbon content must be less than 0.7

(iii) Tensile strength must be greater than 5600

The grades are as follows:

- Grade is 10 if all three conditions are met
- Grade is 9 if conditions (i) and (ii) are met
- Grade is 8 if conditions (ii) and (iii) are met
- Grade is 7 if conditions (i) and (iii) are met
- Grade is 6 if only one condition is met
- Grade is 5 if none of the conditions are met

Write a program, which will require the user to give values of hardness, carbon content and tensile strength of the steel under consideration and output the grade of the steel.

A certain grade of steel is graded according to the following conditions:

(i) Hardness must be greater than equal to 50

(ii) Carbon content must be less than equal to 0.7

(iii) Tensile strength must be greater than 5600

```c
#include<stdio.h>
int main()
{
    int H, T;
    float C;
    printf("Enter value of H, C & T");
    scanf("%d %f %d",&H, &C, &T );
```

- Grade is 10 if all three conditions are met

```c
#include<stdio.h>
int main()
{
    int H, T;
    float C;
    printf("Enter value of H, C & T");
    scanf("%d %f %d",&H, &C, &T );
    if(H>=50 && C<=0.7 && T>5600)
        printf("Grade is 10");
```

- Grade is 9 if conditions (i) and (ii) are met

```c
#include<stdio.h>
int main()
{
    int H, T;
    float C;
    printf("Enter value of H, C & T");
    scanf("%d %f %d",&H, &C, &T );
    if(H>=50 && C<=0.7 && T>5600)
        printf("Grade is 10");
    else if (H>=50 && C<=0.7 && T <=5600)
    printf("Grade is 9");
```

- Grade is 8 if conditions (ii) and (iii) are met

```c
#include<stdio.h>
int main()
{
    int H, T;
    float C;
    printf("Enter value of H, C & T");
    scanf("%d %f %d",&H, &C, &T );
    if(H>=50 && C<=0.7 && T>5600)
        printf("Grade is 10");
    else if (H>=50 && C<=0.7 && T <=5600)
    printf("Grade is 9");
    else if(H<50 && C<=0.7 && T>5600)
    printf("Grade is 8");
```

- Grade is 7 if conditions (i) and (iii) are met

```
#include<stdio.h>
int main()
{
    int H, T;
    float C;
    printf("Enter value of H, C & T");
    scanf("%d %f %d",&H, &C, &T );
    if(H>=50 && C<=0.7 && T>5600)
        printf("Grade is 10");
    else if (H>=50 && C<=0.7 && T <=5600)
    printf("Grade is 9");
    else if(H<50 && C<=0.7 && T>5600)
    printf("Grade is 8");
    else if(H>=50 && C>0.7 && T>5600)
    printf("Grade is 7");
```

- Grade is 6 if only one condition is met

```c
#include<stdio.h>
int main()
{
    int H, T;
    float C;
    printf("Enter value of H, C & T");
    scanf("%d %f %d",&H, &C, &T );
    if(H>=50 && C<=0.7 && T>5600)
        printf("Grade is 10");
    else if (H>=50 && C<=0.7 && T <=5600)
    printf("Grade is 9");
    else if(H<50 && C<=0.7 && T>5600)
    printf("Grade is 8");
    else if(H>=50 && C>0.7 && T>5600)
    printf("Grade is 7");
    else if((H>=50 && C>0.7 && T<5600) || (H<50 && C<=0.7 && T<5600) || (H<50 && C>0.7 && T>5600))
    printf("Grade is 6");
```

- Grade is 5 if none of the conditions are met

```c
#include<stdio.h>
int main()
{
    int H, T;
    float C;
    printf("Enter value of H, C & T");
    scanf("%d %f %d",&H, &C, &T );
    if(H>=50 && C<=0.7 && T>5600)
        printf("Grade is 10");
    else if (H>=50 && C<=0.7 && T <=5600)
    printf("Grade is 9");
    else if(H<50 && C<=0.7 && T>5600)
    printf("Grade is 8");
    else if(H>=50 && C>0.7 && T>5600)
    printf("Grade is 7");
    else if((H>=50 && C>0.7 && T<5600) || (H<50 && C<=0.7 && T<5600) || (H<50 && C>0.7 && T>5600))
    printf("Grade is 6");
    else if(H<50 && C>0.7 && T<5600)
    printf("Grade is 5");
    }
```

A certain grade of steel is graded according to the following conditions:
(i) Hardness must be greater than 50
(ii) Carbon content must be less than 0.7
(iii) Tensile strength must be greater than 5600

Grade is 10 if all three conditions are met

```
Enter value of H, C & T50
0.6
5700
Grade is 10
```

Grade is 9 if conditions (i) and (ii) are met

```
Enter value of H, C & T51
0.3
530
Grade is 9
```

Grade is 8 if conditions (ii) and (iii) are met

```
Enter value of H, C & T4
0.6
5700
Grade is 8
```

Grade is 7 if conditions (i) and (iii) are met

```
Enter value of H, C & T54
0.8
5700
Grade is 7
```

Grade is 6 if only one condition is met

```
Enter value of H, C & T51
0.8
5500
Grade is 6
```

Grade is 6 if only one condition is met

```
Enter value of H, C & T34
0.6
55
Grade is 6
```

Grade is 6 if only one condition is met

```
Enter value of H, C & T44
0.8
5700
Grade is 6
```

Grade is 5 if none of the conditions are met

```
Enter value of H, C & T45
0.8
55
Grade is 5
```

The Conditional Operators

The conditional operators **?** and **:** are sometimes called ternary operators since they take three arguments.

expression 1 ? expression 2 : expression 3

"if **expression 1** is true (that is, if its value is non-zero), then the value returned will be **expression 2**, otherwise the value returned will be **expression 3**".

(a)
```
int  x, y ;
scanf ( "%d", &x ) ;
y = ( x > 5 ? 3 : 4 ) ;
```

This statement will store 3 in **y** if **x** is greater than 5, otherwise it will store 4 in y.

The equivalent **if** statement will be,

```
if ( x > 5 )
    y = 3 ;
else
    y = 4 ;
```

(b)
```
char  a ;
int  y ;
scanf ( "%c", &a ) ;
y = ( a >= 65 && a <= 90 ? 1 : 0 ) ;
```

The following points may be noted about the conditional operators:

(a) It's not necessary that the conditional operators should be used only in arithmetic statements. This is illustrated in the following examples:

Ex.:
```
int  i ;
scanf ( "%d", &i ) ;
( i == 1 ? printf ( "Amit" ) : printf ( "All and sundry" ) ) ;
```

Ex.:
```
char  a = 'z' ;
printf ( "%c" , ( a >= 'a' ? a : '!' ) ) ;
```

(b) The conditional operators can be nested as shown below.

```
int  big, a, b, c ;
big = ( a > b ? ( a > c ? 3: 4 ) : ( b > c ? 6: 8 ) ) ;
```

(c) Check out the following conditional expression:

```
a > b ? g = a : g = b ;
```

This will give you an error 'Lvalue Required'. The error can be overcome by enclosing the statement in the **:** part within a pair of parenthesis. This is shown below:

```
a > b ? g = a : ( g = b ) ;
```

In absence of parentheses the compiler believes that **b** is being assigned to the result of the expression to the left of second =. Hence it reports an error.

The limitation of the conditional operators is that after the **?** or after the **:** only one C statement can occur. In practice rarely is this the requirement. Therefore, in serious C programming conditional operators aren't as frequently used as the **if-else**.

What would be the output of the following programs

```
main( )
 {
int i = -4, j ;
j = ( i < 0 ? 0 : i * i ) ;
printf ( "\n%d", j ) ;
}
```

What would be the output of the following programs

```
main( )
 {
int i = -4, j ;
j = ( i < 0 ? 0 : i * i ) ;
printf ( "\n%d", j ) ;
}
```

Ans: 0

(b)
```
main( )
{
    int   k, num = 30 ;
    k = ( num > 5 ? ( num <= 10 ? 100 : 200 ) : 500 ) ;
    printf ( "\n%d", num ) ;
}
```

(b)
```
main( )
{
    int   k, num = 30 ;
    k = ( num > 5 ? ( num <= 10 ? 100 : 200 ) : 500 ) ;
    printf ( "\n%d", num ) ;
}
```

Ans: 30

```
main( ) {
int k, num = 30 ;
k = ( num > 5 ? ( num <= 10 ? 100 : 200 ) : 500 ) ;
printf ( "\n%d", k ) ;
}
```

```
main( ) {
int k, num = 30 ;
k = ( num > 5 ? ( num <= 10 ? 100 : 200 ) : 500 ) ;
printf ( "\n%d", k ) ;
}
```

Ans: 200

```
(c) main( )
{
int j = 4 ;
( !j != 1 ? printf ( "\nWelcome") : printf ( "\nGood
Bye") ) ;
}
```

(c) main( )
{
int j = 4 ;
(!j != 1 ? printf ("\nWelcome") : printf ("\nGood Bye")) ;
}

Ans: Welcome

[H] Point out the errors, if any, in the following programs:

(a)
```
main( )
{
    int   tag = 0, code = 1 ;
    if ( tag == 0 )
        ( code > 1 ? printf ( "\nHello" ) ? printf ( "\nHi" ) ) ;
    else
        printf ( "\nHello Hi !!" ) ;
}
```

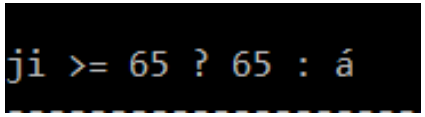
(b)
```
main( )
{
    int   ji = 65 ;
    printf ( "\nji >= 65 ? %d : %c", ji ) ;
}
```

(c)
```
main( )
{
    int   i = 10, j ;
    i >= 5 ? ( j = 10 ) : ( j = 15 ) ;
    printf ( "\n%d %d", i, j ) ;
}
```

[H] Point out the errors, if any, in the following programs:

(a)
```
main( )
{
    int   tag = 0, code = 1 ;
    if ( tag == 0 )
        ( code > 1 ? printf ( "\nHello" ) : printf ( "\nHi" ) ) ;
    else
        printf ( "\nHello Hi !!" ) ;
}
```

(b)
```
main( )
{
    int   ji = 65 ;
    printf ( "\nji >= 65 ? %d : %c", ji ) ;
}
```




```
ji >= 65 ? printf("%d",ji) : printf("%c", ji ) ;
```

(c)
```
main( )
{
    int   i = 10, j ;
    i >= 5 ? ( j = 10 ) : ( j = 15 ) ;
    printf ( "\n%d %d", i, j ) ;
}
```

No Error

(d)
```
main( )
{
    int a = 5 , b = 6 ;
    ( a == b ? printf( "%d",a) ) ;
}
```

(e)
```
main( )
{
    int n = 9 ;
    ( n == 9 ? printf( "You are correct" ) ; : printf( "You are wrong" ) ;) ;
}
```

(f)
```
main( )
{
    int   kk = 65 ,ll ;
    ll = ( kk == 65 : printf ( "\n kk is equal to 65" ) : printf ( "\n kk is not
equal to 65" ) ) ;
    printf( "%d", ll ) ;
}
```

(g)
```
main( )
{
    int   x = 10, y = 20 ;
    x == 20 && y != 10 ? printf( "True" ) : printf( "False" ) ;
}
```

(d)
```
main( )
{
    int a = 5 , b = 6 ;
    ( a == b ? printf( "%d",a) ) ;
}
```

(e)
```
main( )
{
    int n = 9 ;
    ( n == 9 ? printf( "You are correct" ) ; : printf( "You are wrong" ) ;) ;
}
```

(f)
```
main( )
{
    int   kk = 65 ,ll ;
    ll = ( kk == 65 : printf ( "\n kk is equal to 65" ) : printf ( "\n kk is not
equal to 65" ) ) ;
    printf( "%d", ll ) ;
}
```

(g)
```
main( )
{
    int   x = 10, y = 20 ;
    x == 20 && y != 10 ? printf( "True" ) : printf( "False" ) ;
}
```

No error

[I] Rewrite the following programs using conditional operators.

(a)
```
main( )
{
    int   x, min, max ;
    scanf ( "\n%d %d", &max, &x ) ;
    if ( x > max )
          max = x ;
    else
          min = x ;
}
```

[I] Rewrite the following programs using conditional operators.

(a)
```
main( )
{
    int   x, min, max ;
    scanf ( "\n%d %d", &max, &x ) ;
    if ( x > max )
        max = x ;
    else
        min = x ;
}
```

```
main()
{
int x, min, max;
scanf("%d %d", &max, &x);
x>max? (max=x): (min =x);
}
```

(b)
```
main( )
{
    int   code ;
    scanf ( "%d", &code ) ;
    if ( code > 1 )
        printf ( "\nJerusalem" ) ;
    else
        if ( code < 1 )
            printf ( "\nEddie" ) ;
        else
            printf ( "\nC Brain" ) ;
}
```

(b)
```
main( )
{
    int   code ;
    scanf ( "%d", &code ) ;
    if ( code > 1 )
        printf ( "\nJerusalem" ) ;
    else
        if ( code < 1 )
            printf ( "\nEddie" ) ;
        else
            printf ( "\nC Brain" ) ;
}
```

```
main()
{
int code;
scanf("%d",&code);
code>1? printf("\nJerusalem"): code<1? printf("\nEddie"):printf("Brain");
}
```

(c)
```
main( )
{
    float sal ;
    printf ("Enter the salary" ) ;
    scanf ( "%f", &sal ) ;
    if ( sal < 40000 && sal > 25000 )
        printf ( "Manager" ) ;
    else
        if ( sal < 25000 && sal > 15000 )
            printf ( "Accountant" ) ;
        else
            printf ( "Clerk" ) ;
}
```