

Worksheet Conditionals

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Week 2

1. Below are three variable declarations, followed by 5 code fragments, each ending with a conditional. State for each fragment whether it will print 'True' or not.

```
int a = 5 ;  
int b = 7 ;  
int c = 11
```

```
if( (a <= 5) && (b > 7) ) {  
    printf("Fragment 1 True\n" ) ;  
}
```

```
if( ((a < 5) && (b > 7)) || (a < b) || (b > 1000) ) {  
    printf("Fragment 2 True\n" ) ;  
}
```

```
if( (!(a <= 5) && !(b > 7)) ) {  
    printf("Fragment 3 True\n" ) ;  
}
```

```
if( ((a <= 5) && (b > 7)) != 0 || ( c >= a*b ) ) {  
    printf("Fragment 4 True\n" ) ;  
}
```

```
if( (c = 1) || (b > 9) || (a < -3) ) {  
    printf("Fragment 5 True\n" ) ;  
}
```

Fragment 1 false: true and false is false

Fragment 2 true: false or true or false is true

Fragment 3 true: not (not true or not false) is not (false) is true

Fragment 4 false: (true and false) != false or false is false or false is false

Fragment 5 true (watch out c=1 means assign 1 to c, and has the value '1', true):
true or false or false is true

2. Simplify the three expressions in func:

```

int func( int a, int b, int c ) {
    int x0 = (a <= 5) && (b > 7) || (a < 7) ;
    int x1 = !(!(a <= 5) && !(b > 7)) ;
    int x2 = ((a <= 5) || (a >= 7)) == 0 ;
    ...
}

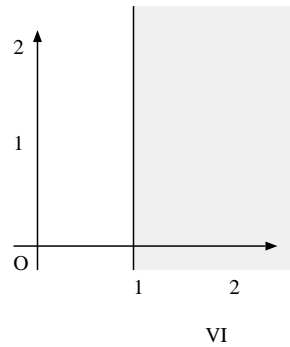
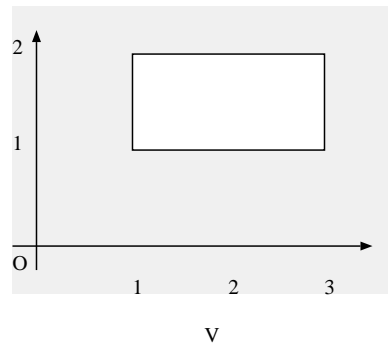
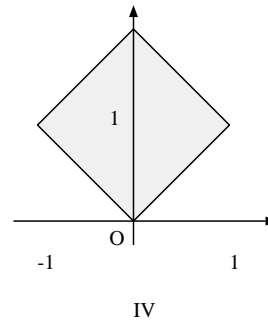
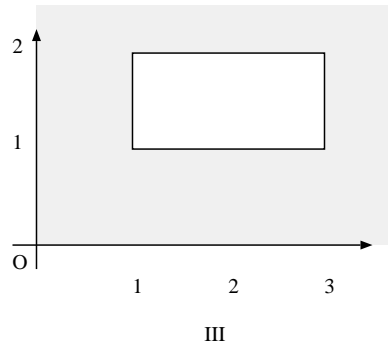
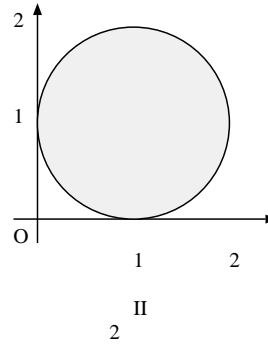
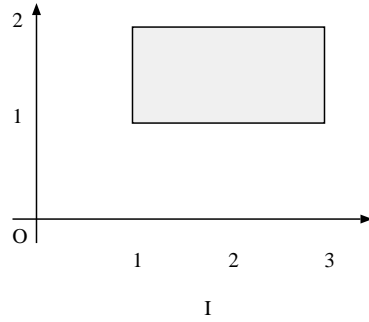
```

int x0 = a < 7 ; - if a < 7 is false then a <= 5 is false, false and anything is false therefore x0 depends on a < 7

int x1 = a <= 5 || b > 7 ; - x or y is not(not(x or y)) is not(not x and not y)

int x2 = a == 6 ; - true if a!=6, false if a==6, reversed by '== 0'

3. For each of I-V below, write down the condition in C that yields true if the point (x,y) is in the shaded area. Assume there are two variables x and y , both of type double. You can assume that the line is 'in'. For example, the solution to 'VI' is " $x \geq 1$ ".



I: $(x \geq 1 \ \&\& \ x \leq 3 \ \&\& \ y \geq 1 \ \&\& \ y \leq 2)$

II: $(x-1) * (x-1) + (y-1) * (y-1) \leq 1$

V: $!(x > 1 \ \&\& \ x < 3 \ \&\& \ y > 1 \ \&\& \ y < 2) \ \&\& \ x \geq 0 \ \&\& \ y \geq 0$

IV: $(y >= x \ \&\& \ y >= -x \ \&\& \ y <= 2-x \ \&\& \ y <= x+2)$

V: $!(x > 1 \ \&\& \ x < 3 \ \&\& \ y > 1 \ \&\& \ y < 2)$

VI: ($x \geq 1$)

4. What do each of the following functions print, if called from a main program with the parameter 5? Note: not all functions will terminate. Indicate for each function whether it will terminate or not.

```
a(int y) {
    while( y >=0 ) {
        printf( "%d", y ) ;
        y = y - 1 ;
    }
}
```

```
b(int y) {
    if( y >=0 ) {
        b( y - 1 ) ;
        printf( "%d", y ) ;
    }
}
```

```
c(int y) {
    printf( "%d", y ) ;
    c( y - 1 ) ;
}
```

```
d(int y) {
    while( y > 0 ) {
        printf( "%d", y ) ;
        d( y - 1 ) ;
    }
    printf( "%d", y ) ;
}
```

```
e(int y) {
    while( y > 0 ) {
        printf( "%d", y ) ;
        y = y - 1 ;
    }
    e( y - 1 ) ;
    printf( "%d", y ) ;
}
```

```
f(int y) {
    if( y >=0 ) {
        printf( "%d", y ) ;
    }
    f( y - 1 ) ;
}
```

- a: 543210 TERMINATES
- b: 012345 TERMINATES
- c: 543210-1-2-3... DOES NOT TERMINATE
- d: 543210101010... DOES NOT TERMINATE
- e: 543210 TERMINATES
- e: 543210 DOES NOT TERMINATE