



CMSC 106 Lecture Set #6

Set Started:
Tuesday, October 2, 2007



for loop

- Useful for repeating loop body a fixed number of times
- syntax:

```
for (expr1; expr2; expr3)
    statement;
```
- Each of the three expressions is optional.
- Semicolons and parentheses are required.
- Typically:
 - expr1 initializes
 - expr2 is condition
 - expr3 updates loop control variable
- Action:
 - 1) if present, perform expr1
 - 2) if present, expr2 (condition) tested
 - if false, continue to line after the loop
 - if true (or omitted), continue with step (3)
 - 3) the subsidiary statement, or loop body is executed
 - 4) if present, expr3 executed
 - 5) go back to step (2)



trace examples

- **for (v= 1; v < 5; v++)**
printf("%d %d\n", v, v * v);
- **for (v= 5; v > 0; --v)**
printf("%d %d\n", v, v * v);



More details about the three Expressions

- can initialize to any value
- can do loop control updates other than by one
- can do loop control updates that are negative
- expression 1 and 3 can have multiple expressions
 - connected by the comma operator
- expression 2 can have multiple boolean expressions
 - connected by logical operators therefore building a single boolean expression



The Comma Operator

- to put several expressions in a place where one expression can appear
- Makes a single expression out of any number of individual ones
 - value returned (and its type) is last expression's
 - evaluated left to right
- **`x = y * z, 4.5, 6;`**
- More useful example:
**`for (a= 0, b= 10; a != b; a++, b--)`
`printf("%d %d\n", a, b);`**



One of the for loop expressions missing

- **expression 1 missing**
`for ( ; a != b ; a++, b--)`
`printf("%d %d\n", a, b);`
- **expression 2 missing**
`for (a=1,b=2;; a++,b--)`
`printf("%d %d\n", a, b);`
- **expression 3 missing**
`for (a=1,b=2; a != b ;)`
`printf("%d %d\n", a++, b--);`



Nested Loops

- Follow the same procedure - just view each loop as its own statement following the action rules for that type of loop.

```
for (a= 3; a > 1; a--) {  
    b= 4;  
    while (b > 1) {  
        printf("%d %d\n", b, a);  
        b--;  
    }  
}
```



Not always completely independent

- Inner Loop Dependant On Outer Loop

```
a= 1;  
while (a < 4) {  
    b= a;  
    while (b <= 4) {  
        printf("X");  
        b++;  
    }  
    printf("\n");  
    a++;  
}
```

- inner loop's termination depends on the outer loop control variable

```
a= 1;  
while (a < 4) {  
    b= 1;  
    while (b <= a) {  
        printf("%d\n", b);  
        b++;  
    }  
    a++;  
}
```



break and continue

- break causes loop to immediately quit**
 - Exits only from innermost nested loop (in which it appears)
- continue skips rest of a loop body & begins next iteration**
 - while, do-while**
 - jumps immediately to testing loop termination condition
 - for loops**
 - jumps to third expression in for loop header
- VERY IMPORTANT:** break and continue should ONLY be used in loops when they improve a **program's clarity**
