

## Nested Loops and Break Statements

10-1-2001

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## Opening Discussion

- What did we talk about last class?
- For loop for integer exponentiation.

```
double exponent(double x,int n) {  
    double ret=1.0;  
    for(int i=0; i<n; i++) {  
        ret*=x;  
    }  
    return ret;  
}
```

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## Nested Loops

- Loops can be "nested". This means that we can put one loop inside of another loop. There is no limit to how deep the nesting of loops can go other than how much you are willing to type.
- There is also no restriction on the type of loops you can nest. Loops can appear in any place where other statements would appear.

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## How Many Times Does it Execute?

- The main effect of nesting loops is that the code in the inner-most loops can be executed many, many times. The number of times grows as the multiple of how many times each loop in the nesting is executed.
- So if you have an outer loop that will execute 10 times and it surrounds a loop that executes 5 times the code in the inner loop will execute 50 times.

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## Standard Nested Loop Example

- One standard example of using nested loops is when you have a set of objects and you want to do something with every possible pair of objects.

```
// Assume we have n objects in the set.  
for(int i=0; i<n; i++) {  
    for(int j=i+1; i<n; i++) {  
        operate(object_i,object_j);  
    }  
}
```

- This executes  $n*(n-1)/2$  times.

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## Break Statements

- You have already seen the break statement used in the switch construct. It can also be used with loops.
- If a break statement is encountered in a loop it will automatically jump the program execution to the end of the loop and continue program execution from there.
- Lots of breaks is poor programming practice.

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## Examples

- Print all the primes between 2 and n.
  - This just takes the code we had written for the last class and nests it inside an outer loop.
- Alternate approach to student assignment grades with nested loops.
  - Loops can save you some typing when reading in and averaging grades.

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## Minute Essay

- Starting next class we will be moving on to talk about arrays. What questions do you have about loops? Arrays will greatly enhance our ability to write meaningful programs (or at least allow me to create more complex meaningless examples). They will also give you more of a change to exercise the previously covered constructs of the language. Would you benefit from me writing simple "drill" problems that you could program in to test your understanding?
- Quiz #3 is Friday. Read 6.1 and 6.2 for it.

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