Name: _____

Today's Date: _____

Today's Goals

- Practice using change of variables to convert loops to summations
- Explain the goals of testing code
- Identify the interface, encoding, and implementation of a class

Today's Question(s)

Convert to a summation, using *the number of times* `total` *is incremented* as your proxy for time:

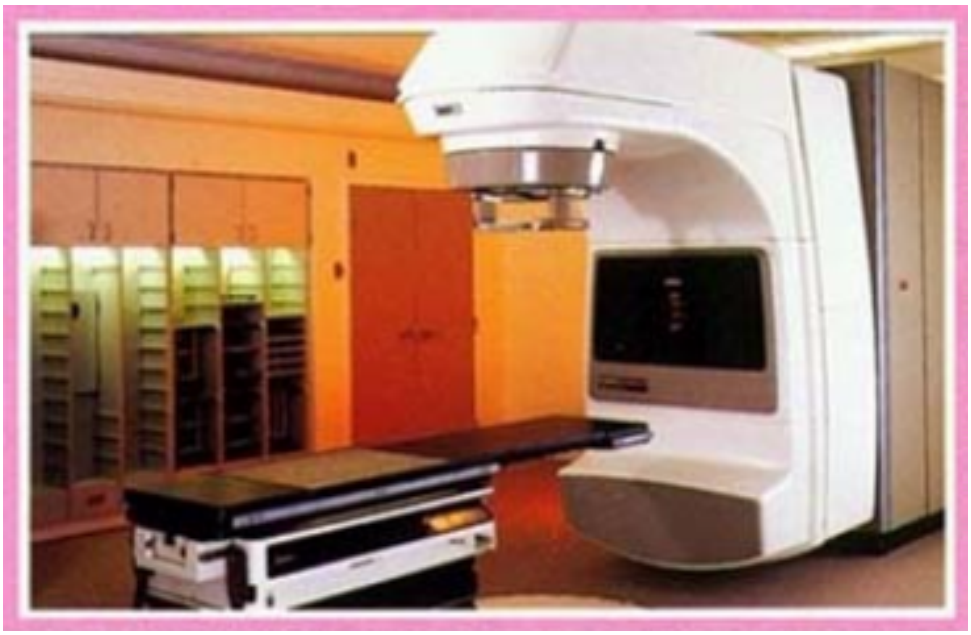
```
size_t total = 0;

for (size_t i=1; i <=N; ++i) {
    for (size_t j=1; j <= i; ++j) {
        ++total;
    }
}
```

Lingering Questions

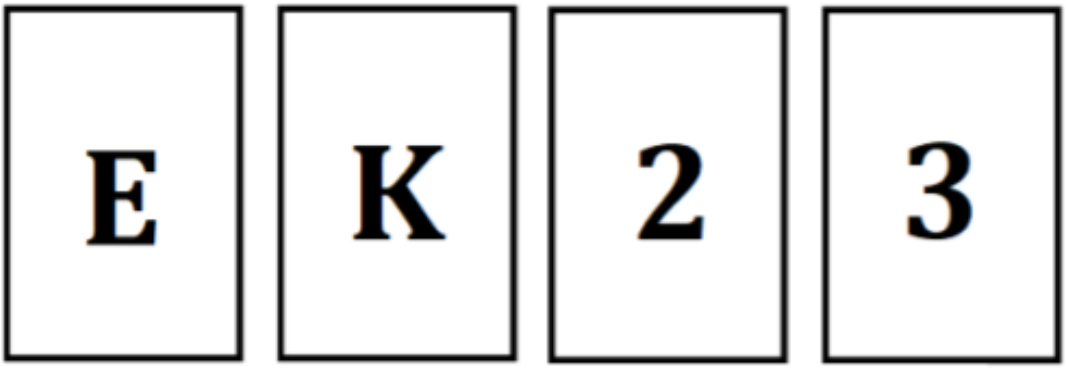
More Fun With Summations

```
int main() {
    int data[N+1];

    for (int i=1; i < N; i *= 2) {
        for (int j=1; j < i; j += 2) {
            data[i] += j;
        }
    }

    return 0;
}
```

Evaluating code/algorithms: correctness



Let's Play A Card Game



Rule: If a card has a vowel on one side, then it has an even number on the other side

Which cards should we flip over to decide if the rule is true?

Testing: Philosophy of Science Point of View

"My proposal is based on an asymmetry between verifiability and falsifiability; an asymmetry which results from the logical form of universal statements. For these are never derivable from singular statements, but can be contradicted by singular statements."

- Karl Popper: The Logic of Scientific Discovery 1959

"Program testing can be used to show the presence of bugs, but never to show their absence!"

- Edsger Dijkstra. Notes On Structured Programming 1970

What is the purpose of testing?

Testing in Homework 4

We give you . . .

You give us . . .

Interface, Encoding, and Implementation

The *interface* of a class is...

The *encoding* of a class is...

The *implementation* of a class is...

```
class Barn {
public:
    Barn();
    Barn(const Barn& otherBarn);
    ~Barn();

    void visit();
    void addCow(const string& cowName);
    bool hasCow(const string& cowName);
    static const size_t MAX_COWS = 10;
private:
    Cow cows_[MAX_COWS];
}
```