Recursion and Repetition

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Opening Discussion

- Let's look at solutions to the interclass problem.
- Minute essay comments:
  - Calculating grades and GPA.
  - Accessing the Internet and reading things off the web.
  - I/O in Scala.
  - Resource collection rates on SC2.
  - Solving physics homework.
  - Image manipulation. Games and graphics.
  - Security.

The match Expression

- There is a second conditional expression in Scala called match.
  - *expr* match {
    - case *pattern* => *expr*
    - case *pattern* => *expr*
    - ...
  - }
- There are lots of options for the pattern, but the simplest one is literal values.

Motivation

- We have the ability to do things once and to control whether or not certain things happen that once.
- Computers are really great for doing things multiple times.
- Reading a whole file or doing something until the user tells us to stop.

Mathematical Recursion

- The idea of recursion comes from mathematics.
- A function is recursive if it is defined in terms of itself.
- All recursive functions will have at least two cases.
  - One where the function refers to itself.
  - A base case where it doesn't refer to itself.
- Let's look at some examples of this.

Programmatic Recursion

- Now I want us to write some Scala functions that are recursive.
- They will look much like the math functions.
- We have to provide a return type.
- One argument changes to tell us when to stop.

Using Source

- At least two people asked about things that include reading information so I'm going to talk about that a little earlier than normal.
- Scala has a class called Source (technically scala.io.Source).
- We can make a new Source by calling fromFile or fromURL with arguments.
- The Source is an iterator on type Char.
- An Iterator has methods next and hasNext.

More Source

- Also has a method called getLines that provides an iterator on String.
- Let's write a recursive function that will read and print all the contents of an Iterator.

Ray Tracing

- Now I want to start having us write some more significant code.
- I want to write some functions that deal with 3-D geometry with the eventual goal of being able to do ray tracing.
- What could we use to represent these in Scala?
  - Vectors
  - Points
  - Spheres
  - Planes

Minute Essay

- Make sure you are reading.
- What questions do you have about this topic?
- Interclass problem:
  - Write recursive functions that print values counting up and down.