Announcements

- First HW will be up on Friday
- Quiz on Friday
A Sample Algorithm: the GCD

Ex: write $\frac{54}{42}$ in reduced form

How? $\frac{9}{7}$

 communauté du diosor $\rightarrow 6$

another is $\frac{27}{21}$
How to find the gcd?

One idea: Given \(x, y\) with \(x < y\).

Try \(x\).

Try \(42\): need \(42\) to divide \(42 + 54\).

Given \(x, y\), try \(g = x\)

Does \(g\) divide \(x\) and \(y\)?

Yes

Output \(g\)

No

Set \(g = g - 1\)
Efficiency:

Does 42 divide 54 and 42?
Does 41 divide 54 and 42?

Does 6 divide 54 + 42?
Better Algorithm (Euclid, 300 BC)

Set \( u + v \) equal to the numbers \( v < u \)

Reset \( u + v \) to values \( u \) and \( v \), respectively

Divide \( u \) by \( v \) and let \( r \) = remainder

Is \( v = 0 \)?

No

Yes

\( u = 6 \) \( v = 0 \)

\( u = 12 \) \( v = 0 \)

\( u = 42 \) \( v = 0 \)

Output \( u \)
Euclid's algorithm

- Requires number theory to analyze, but much faster.
- Even if #s are near a billion, takes <50 rounds.
Object orientation

Classes and objects:
We will write classes — these are essentially pieces of data that are similar.
An instance of a class is called an object.

Ex: Student record
Bank account
Television Class

Objects:
- on/off
- volume
- channel
- inputs
- brightness settings
- parental blocks
- resolution
- brand

Methods:
- toggle OnOff()
- volume Up()
- volume Down()
- no method to alter this
- set Channel(value)
- channel Up()
- channel Down()
Multiple Classes: Student Registration System

Some times, classes will interact.

alice: Professor

bob: Student

cs102: Course

enroll(cs102)

requestSeat(bob)

hasTaken(cs101)

True

True
**Inheritance:**

Sometimes, different classes will share similar data.

**Ex:**

<table>
<thead>
<tr>
<th>Student</th>
<th>Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>name</td>
</tr>
<tr>
<td>phone Number</td>
<td>phone Number</td>
</tr>
<tr>
<td>schedule</td>
<td>schedule</td>
</tr>
<tr>
<td>transcript</td>
<td>department</td>
</tr>
<tr>
<td>address</td>
<td>office</td>
</tr>
<tr>
<td>major</td>
<td>office hours</td>
</tr>
<tr>
<td>minor</td>
<td>address</td>
</tr>
</tbody>
</table>
Parent & child classes:

- **Person**
  - name
  - address
  - schedule
  - phone number

- **Student**
  - major
  - minor

- **Professor**
  - department
We will do our work on the lab computers in 121 Ritter (door code: 72444)

Remote connections:
- SSH
- NX client