CloudCoder — A Web-Based Programming Exercise System

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Programming is hard

- **Many students struggle** in intro programming courses
- Pass rates of 60% (or worse!) are not unusual[1]
- Students have difficulty learning syntax and basic concepts
- Exercises can help[2]

Exercises can help

- Introduce syntax and concepts in **small bites**
- **Self-test exercises** to accompany reading assignments
- In-class **assessment**
- Optional **practice** for students who need it

Web-based systems

- Students can **access from anywhere** using a web browser, **no software installation** (except on server)
- Lots of existing systems:
  - Free: CodingBat, PracticeIt!, CodeWrite, CodeAssessor, others
  - Commercial: CodeLab, MyProgrammingLab, others
- *Why create another?*
- Observation: a common model for pedagogical tools is
  1. Implement it
  2. Publish paper(s) about it
  3. *Maybe* release software and get a few other institutions to use it
  4. Then it fades into disuse
- Observation: adopting courseware has a significant cost
  - Need to convince instructors that a tool will be worth the effort

Community!

Idea: **crowdsourced exercises**

- **Users contribute exercises** under a permissive license (e.g., Creative Commons)
  - ALL YOUR EXERCISE ARE BELONG TO US
- **Central exercise repository** where exercises are published
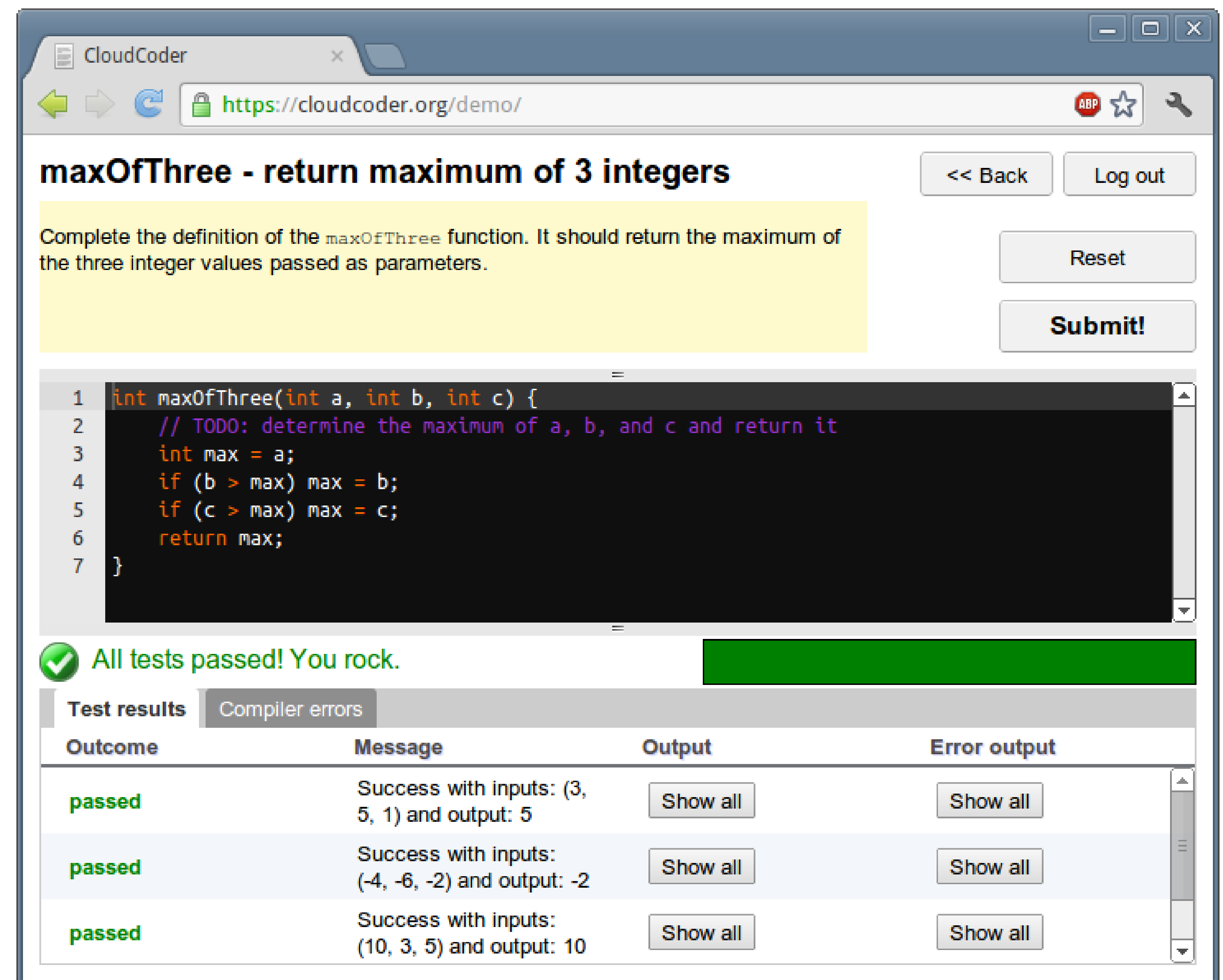- **Open source software** that can be hosted anywhere

CloudCoder

- Website: `http://cloudcoder.org`
- **Open source** (AGPL v3)
- Supports **C**, **Java**, and **Python** exercises
- (Relatively) **easy to host**
  - It's a Java web application
  - Single-jar deployment using Jetty
- Requires two **Linux servers**:
  - One for **webapp**, needs a MySQL database
  - One (or more) to **build/test** student submissions
- **Exercise repository**: `https://cloudcoder.org/repo`
  - **Simple import/export** of exercises
  - **Browsing/searching** to find exercises

Experiences

- Used at 4 institutions (York College, Knox College, Canisius College, University of Auckland)
- Exercise repository: small but growing
- From a student: "Every time I see that green bar makes me WAAAYYY too happy"

Screenshot

We need your help!

- **Try it out**!
- **Use our exercises**!
- **Share your exercises**!

Results?

Can CloudCoder improve learning? **We don't know!**

- Spring 2013: **full study** using CloudCoder exercises for self-test, in-class assessment, and remediation/practice
- At York College and other institutions
- **Join us**! We are actively seeking collaborators

References

[1] Jens Bennedsen and Michael E. Caspersen. Failure rates in introductory programming. *SIGCSE Bull.*, 39(2):32–36, June 2007.

[2] Amruth N. Kumar. Results from the evaluation of the effectiveness of an online tutor on expression evaluation. *SIGCSE Bull.*, 37(1):216–220, February 2005.

Support