

CloudCoder: Building a Community for Using and Sharing Programming Exercises

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tl;dr

- CloudCoder is a free, open-source, web-based **programming exercise system**
- **Multiple languages:** C/C++, Java, Python, Ruby
- It has a **repository of free exercises** (contributions welcome)
- Ask us for a **demo server account**
- Did we mention that it's **free**?

<http://cloudcoder.org>

Programming exercises!

- Automatically-evaluated exercises are useful in introductory programming courses[1]
 - For learning **syntax**
 - For learning **basic concepts** (variables, decisions, loops, etc.)
 - For extra **practice**
 - For **assessment**
- They can be **incorporated easily** into an existing course **without major changes**
 - Use them to supplement readings, for quizzes, for practice, etc.

We need another system?

- Many **existing systems:** CodingBat, PracticeIt!, CodeLab, etc.
- We didn't know of one which
 - Was **open source**
 - Was **community-supported**
 - Had **freely-redistributable exercises**
 - Allowed self-hosting and **full access to student data**
 - Supported **in-class assessment** (i.e., quizzes)
 - Supported C/C++

Requirements

- Students need **just a web browser**
 - **No plugin** required: client is 100% HTML/CSS/JavaScript
- System runs on **two Linux servers**
 - One (network-facing) for webapp and database: EC2 micro instance works well
 - One (network connected) to build and test submissions: can be any PC connected to network
- Relatively easy installation

Need for a community

- Thesis: for a programming exercise system to be as useful as it can be, it needs a *community*
 - To **provide exercises** that can be freely reused and improved
 - To **share experience** about how to use exercises most effectively

Exercise repository

- Writing good exercises is a challenge: but **many hands make light work**
- More generally: preparing curriculum materials is labor intensive
 - We spend a lot of time preparing materials that are used only in one course at one institution
 - Effective mechanisms for sharing materials could make all of us more efficient

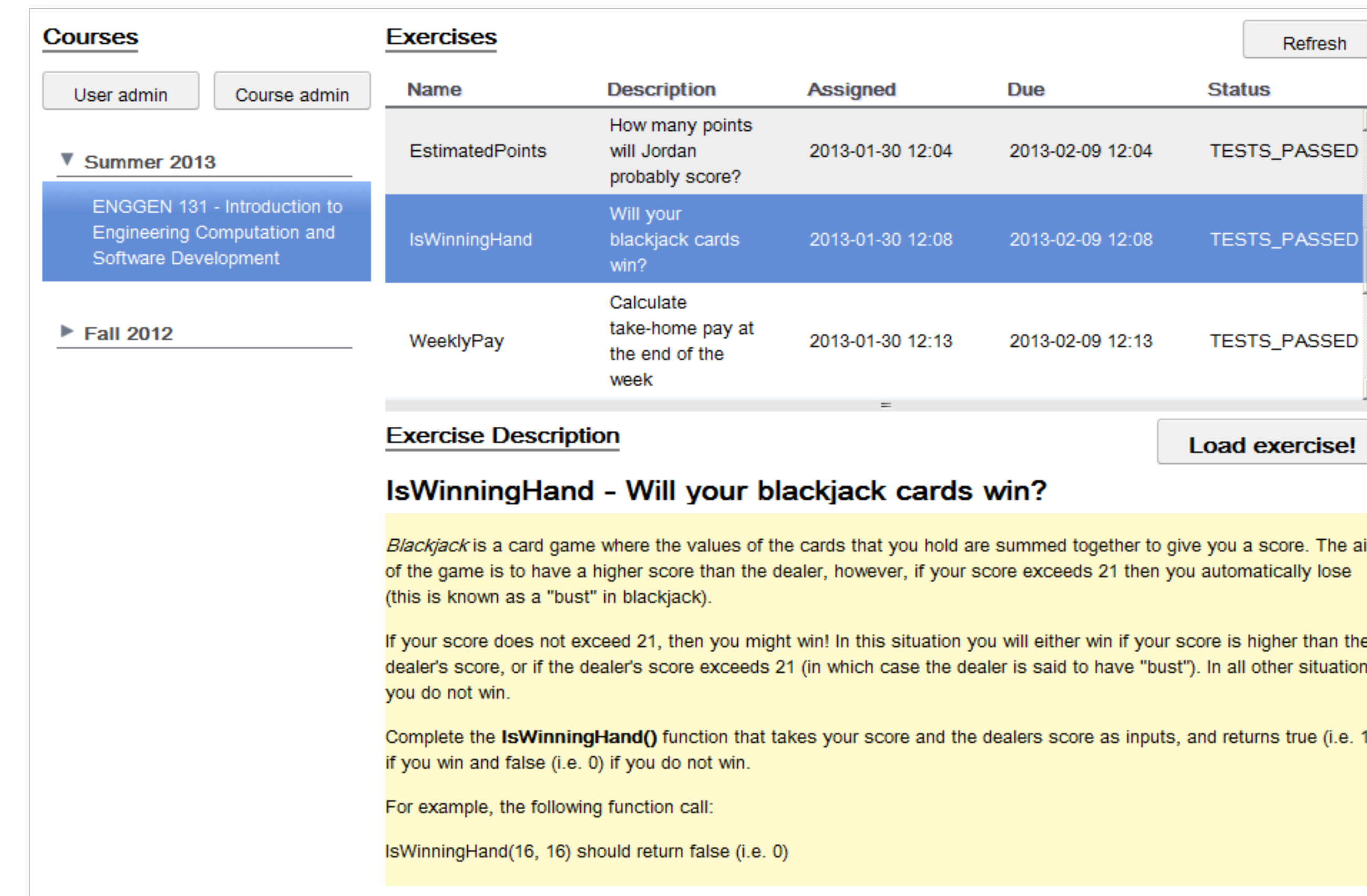
<https://cloudcoder.org/repo>

- **User-contributed** exercises
- All exercises available under **permissive licenses** (Creative Commons or GNU FDL)

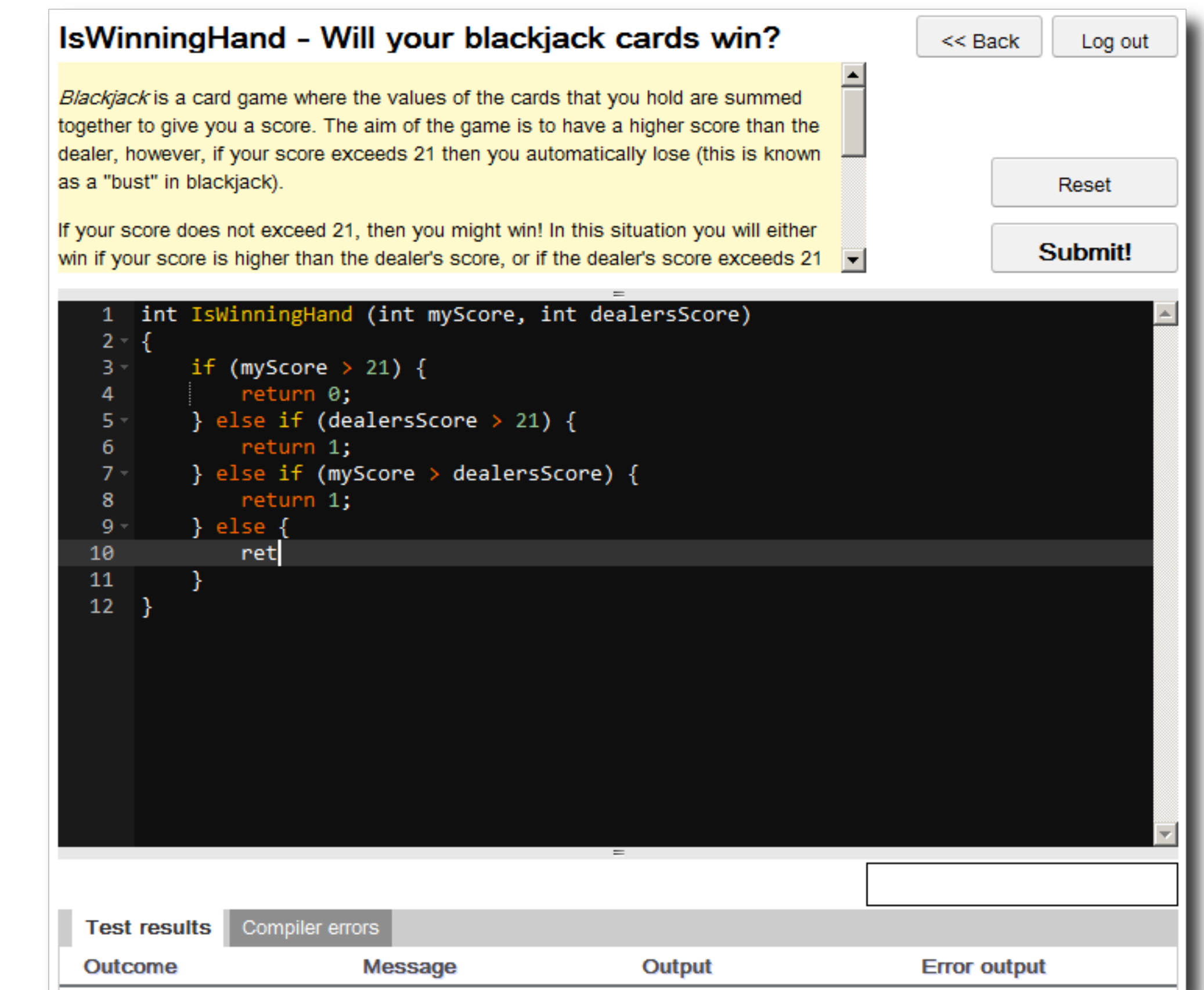
We need your help!

Screenshots

Main menu, choosing an exercise

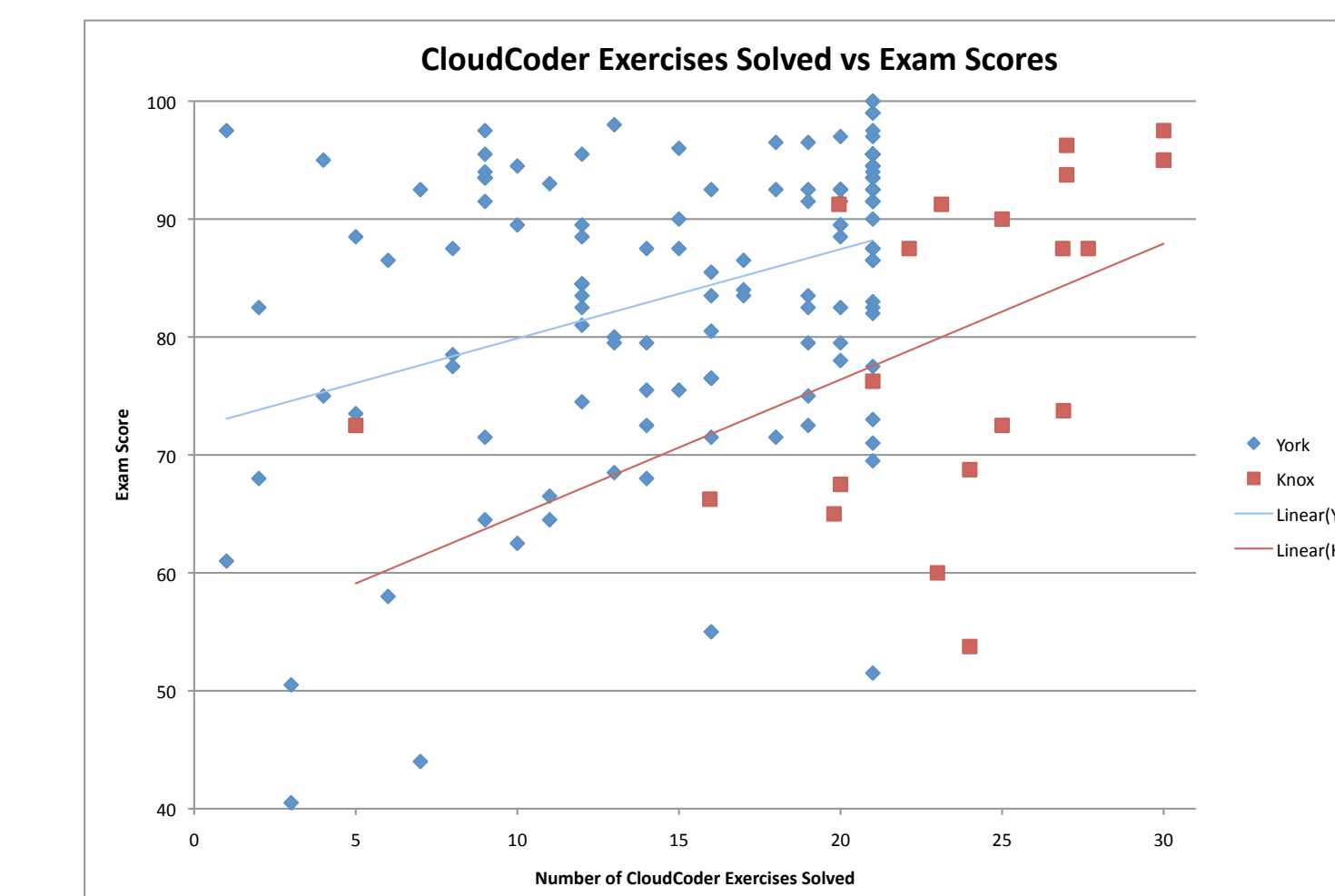
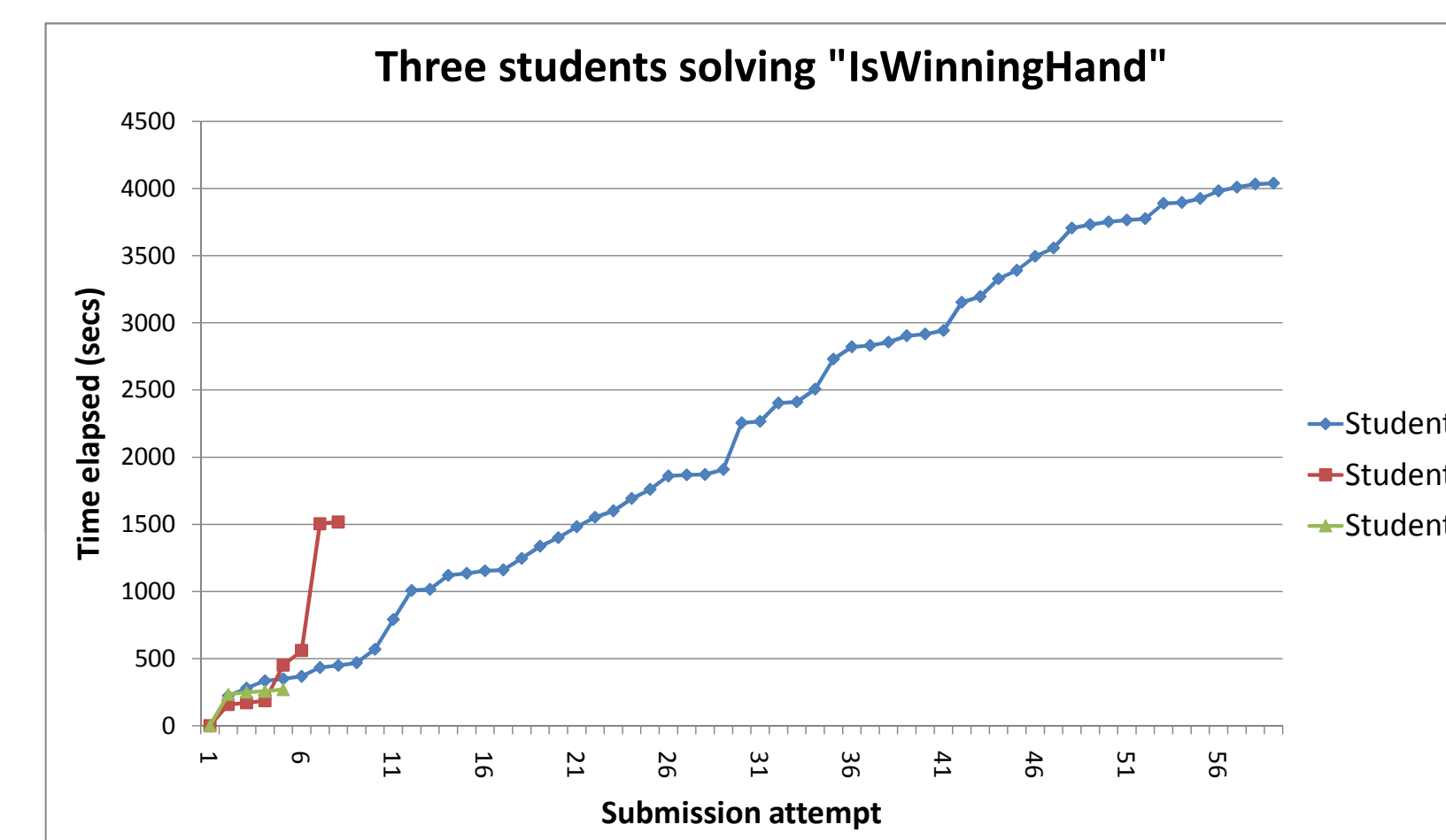


Working on an exercise



Research questions, preliminary data

- Can we detect students engaging in unproductive trial and error coding?
- Do we see improved outcomes when students do exercises? Exams in CS 101 at York College and CS 141 at Knox College, Spring 2013



- Are exercises an effective "prescription" for students who are struggling?
- How can we motivate students to do practice problems?
 - Badges? Other forms of rewards/encouragement?
- What are student perceptions of exercises?
- Can exercises be reused effectively?
 - In different courses?
 - At different institutions?
- Can instructors find appropriate exercises to reuse?
- Can we add social features to the exercise repository to allow users to
 - Classify exercises? (tagging)
 - Rate exercises?
 - Improve existing exercises?
 - Recommend exercises?
 - Recommend sequences of exercises?

References

- [1] Kirsti M Ala-Mutka. A survey of automated assessment approaches for programming assignments. *Computer Science Education*, 15(2):83–102, 2005.

Support

Supported by a SIGCSE special projects grant, May 2012

Get involved!

We want to expand our user base for Fall 2013!

- We already have over 100 C/C++ and Java exercises to get you started!
- Are your exercises better than ours?
- What are you waiting for?

Check it out!
<http://cloudcoder.org>

