



The serious side of coding for fun

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Working for fun

Enjoyment adds to long term retention on a task

Discovery is a powerful driver, contrasting with direct instructions

Gaming joins these two, and is hugely popular

Can we add these elements to coding?



Write a program to determine all the sets of effectively identical rooms in a maze. (A page of background, sample input and output given)

Curious?
Learn More!

Pex



My Duels▼ | Settings▼ | Sign In
Coding Duel
for fun

Random Puzzle

Learn

APCS

New

1,577,055 clicked 'Ask Pex!'

C#

Visual Basic

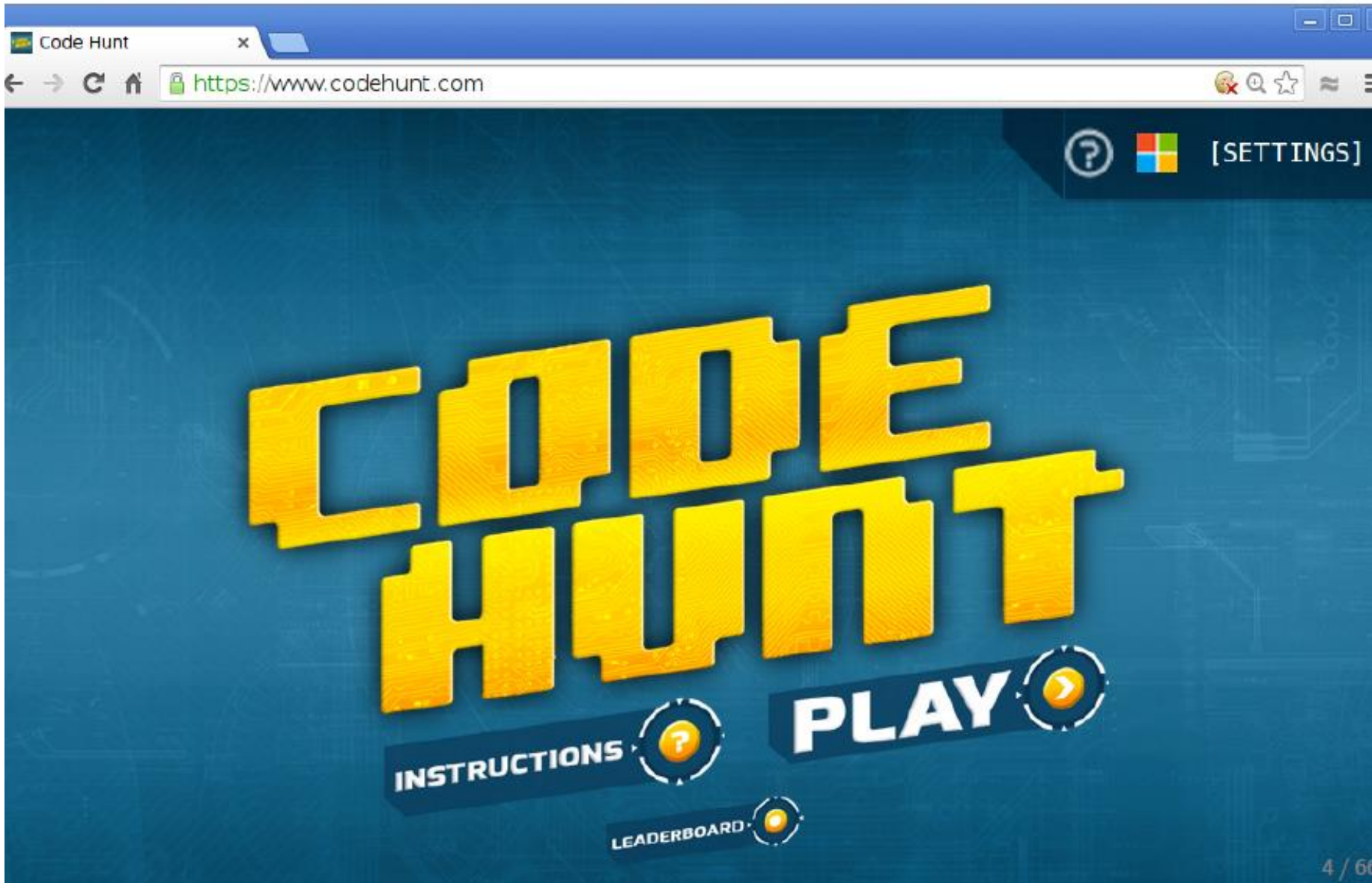
F#

This puzzle is an interactive Coding Duel. Can you write code that matches a secret implementation? Other people have already won this Duel 1911 times! [Help](#)

```
using System;
```

```
public class Program {  
    public static int[] Puzzle(int[] a, int[] b) {  
        // Can you write code to solve the puzzle? Ask Pex to see how close you are.  
        return null;  
    }  
}
```

Code Hunt programming game



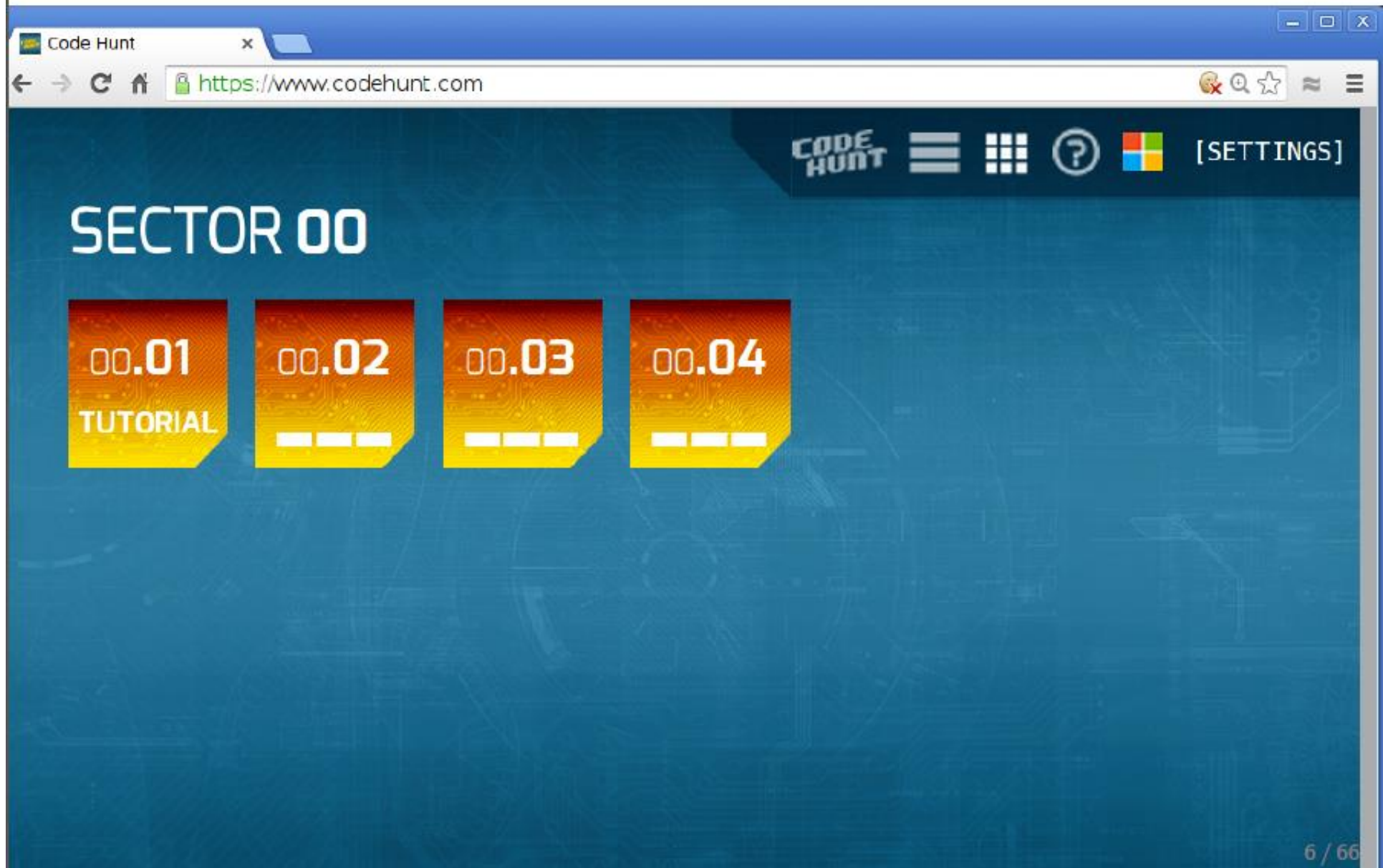
Code Hunt programming game

The screenshot shows a web browser window with the URL <https://www.codehunt.com>. The page title is "Code Hunt". The main content area is titled "SELECT SECTOR" and displays 15 numbered options arranged in a grid. Each option consists of a number and a topic name. The options are:

- 00 TRAINING
- 01 ARITHMETIC
- 02 LOOPS
- 03 LOOPS 2
- 04 CONDITIONALS
- 05 CONDITIONALS 2
- 06 STRINGS
- 07 STRINGS 2
- 08 NESTED LOOPS
- 09 1D ARRAYS
- 10 JAGGED ARRAYS
- 11 ARRAYS 2
- 12 SEARCH SORT
- 13 CYPHERS
- 14 PUZZLES

The interface also includes a navigation bar with the "CODE HUNT" logo, a hamburger menu icon, a question mark icon, a flag icon, and a "[SETTINGS]" button. The browser window shows standard navigation and window control buttons.

Code Hunt programming game



LEVEL: 00.02 ▶

CODE
HUNT

[SETTINGS]

Discover the arithmetic
operation applied to 'x'.

CAPTURE CODE

RESET LEVEL

SWITCH TO C#

Java

```
1  
2 public class Program {  
3     public static int Puzzle(int x) {  
4         return 0;  
5     }  
6 }
```

LEVEL: 00.02 ▶

CODE
HUNT

[SETTINGS]

Discover the arithmetic operation applied to 'x'.

CAPTURE CODE

RESET LEVEL

SWITCH TO C#

Java

	X	EXPECTED RESULT	YOUR RESULT	DESCRIPTION
1				
2				
3				
4				
5				
6				
public class Program {				
public static int Puzzle(int x) {	×	0	1	Mismatch
return 0;	✓	-1	0	
}				
}				

LEVEL: 00.02 ▶

CODE
HUNT

[SETTINGS]

Discover the arithmetic operation applied to 'x'.

CAPTURE CODE

RESET LEVEL

SWITCH TO C#

Java

	X	EXPECTED RESULT	YOUR RESULT	DESCRIPTION
1				
2				
3				
4				
5				
6				

```
1 public class Program {  
2     public static int Puzzle(int x) {  
3         return 1;  
4     }  
5 }  
6 }
```

✓	0	1	1	
✗	1	2	1	Mismatch

LEVEL: 00.02 ▶

CODE
HUNT

[SETTINGS]

Discover the arithmetic operation applied to 'x'.

CAPTURE CODE

RESET LEVEL

SWITCH TO C#

Java

```
1  
2 public class Program {  
3     public static int Puzzle(int x) {  
4         if(x == -1) {  
5             return 0;  
6         } else if(x == 0) {  
7             return 1;  
8         } else if(x == 1) {  
9             return 2;  
10        } else {  
11            return 0;
```

X

EXPECTED
RESULTYOUR
RESULT

DESCRIPTION



-1

0

0



0

1

1



1

2

2



2

3

0

Mismatch

LEVEL: 00.02 ▶

CODE
HUNT

[SETTINGS]

Discover the arithmetic operation applied to 'x'.

CAPTURE CODE

RESET LEVEL

SWITCH TO C#

Java

```
1
2 public class Program {
3     public static int Puzzle(int x) {
4         return x+1;
5     }
6 }
```

x

EXPECTED
RESULTYOUR
RESULT

DESCRIPTION

0

1

1

LE

[TINGS]

You repaired and captured the code fragment.

SKILL RATING: 

you wrote elegant code!

TOTAL SCORE: 6

KEEP TRYING

NEXT



Disco
opera

Java

DESCRIPTION

- 1
- 2
- 3
- 4
- 5
- 6

More difficult level

The screenshot shows a web browser window with the URL <https://www.codehunt.com>. The page features a dark blue header with the 'CODE HUNT' logo, a hamburger menu icon, a help icon, a flag icon, and a '[SETTINGS]' link. The main content area is titled 'SELECT SECTOR' and displays 15 difficulty levels in a grid. Levels 00-08 are highlighted in orange and yellow, while levels 09-14 are in dark blue. Each level includes a number, a topic name, and a circular arrow icon.

Level	Topic	Color
00	TRAINING	Orange
01	ARITHMETIC	Orange
02	LOOPS	Orange
03	LOOPS 2	Orange
04	CONDITIONALS	Orange
05	CONDITIONALS 2	Orange
06	STRINGS	Orange
07	STRINGS 2	Orange
08	NESTED LOOPS	Orange
09	1D ARRAYS	Dark Blue
10	JAGGED ARRAYS	Dark Blue
11	ARRAYS 2	Dark Blue
12	SEARCH SORT	Dark Blue
13	CYPHERS	Dark Blue
14	PUZZLES	Dark Blue

13 / 66

Try to capture the code fragment!



RESET LEVEL SWITCH TO C# Java

```
1  
2 public class Program {  
3     public static int Puzzle(int lowerBound, int upperBound) {  
4         return lowerBound * upperBound;  
5     }  
6 }
```

	LOWERBOUND	UPPERBOUND	EXPECTED RESULT	YOUR RESULT	DESCRIPTION
✗	1	8	40320	8	Mismatch
✗	15	24	244963328	360	Mismatch
✓	16	17	272	272	

Try to capture the code fragment!



```
1 public class Program {  
2     public static int Puzzle(int lowerBound, int upperBound) {  
3         return lowerBound * upperBound;  
4     }  
5 }  
6 }
```

RESET LEVEL SWITCH TO C# Java

	LOWERBOUND	UPPERBOUND	EXPECTED RESULT	YOUR RESULT	DESCRIPTION
X	1	8	40320	8	Mismatch
X	15	24	244963328	360	Mismatch
✓	16	17	272	272	
@	You may find a loop useful on this level.				

Try to capture the code fragment!



RESET LEVEL SWITCH TO C# Java

```

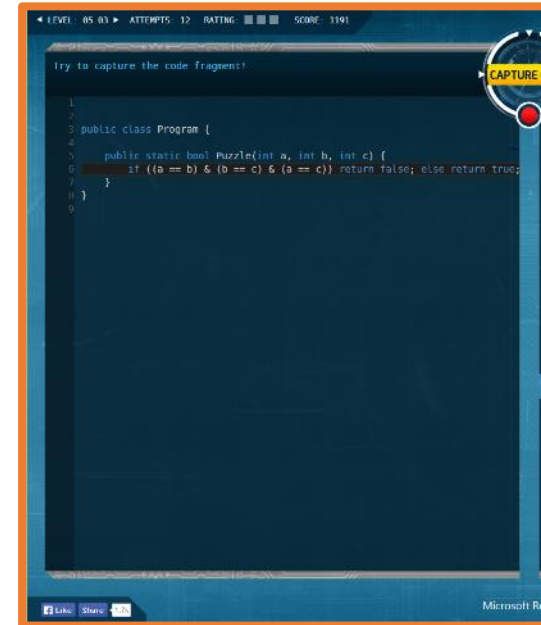
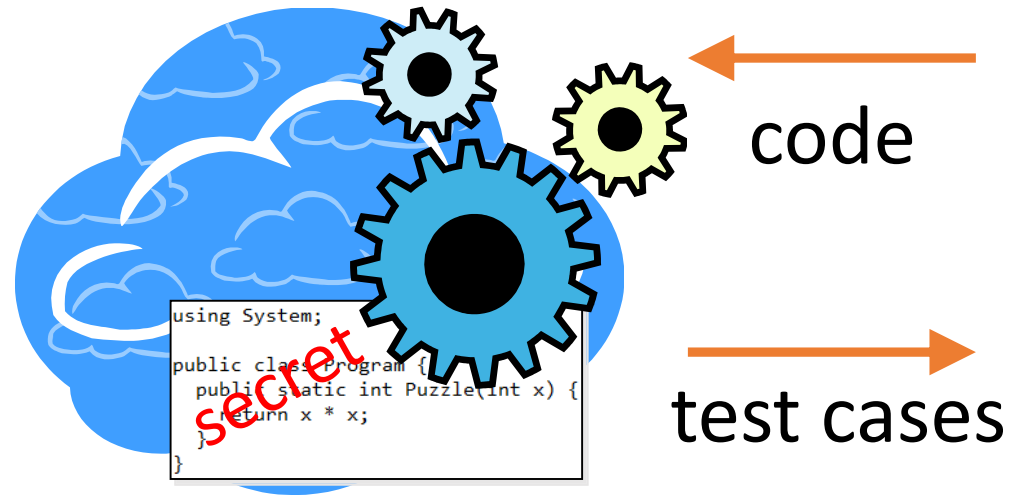
1 public class Program {
2     public static int Puzzle(int lowerBound, int upperBound) {
3         int r = 1;
4         for(int i = lowerBound; i < upperBound; i++)
5             r *= i;
6         return r;
7     }
8 }

```

	LOWEROBOUND	UPPERBOUND	EXPECTED RESULT	YOUR RESULT	DESCRIPTION
X	1	8	40320	5040	Mismatch
X	16	22	859541760	39070080	Mismatch
@	You may find the expression <int> <=> <int> useful on this level.				

It's a game!

iterative gameplay
adaptive
personalized
no cheating
clear winning criterion



CODE HUNT

INSTRUCTIONS PLAY

SELECT SECTOR

00 TRAINING 00/04	01 ARITHMETIC	02 LOOPS	03 LOOPS 2
04 CONDITIONALS	05 CONDITIONALS 2	06 STRINGS	07 STRING 2
08 NESTED LOOPS	09 1D ARRAYS	10 JAGGED ARRAYS	11 SEARCH & SORT
12 CYPHERS	13 PUZZLES		

HUNTER STATS 101/14 SECTORS UNLOCKED 100/14 SECTORS COMPLETED



Audiences

Students: proceed through a sequence on puzzles to learn and practice.

Educators: exercise different parts of a curriculum, and track students' progress

Recruiters: use contests to inspire communities and results to guide hiring

Researchers: mine extensive data in Azure to evaluate how people code and learn

Code Hunt Usage

Code Hunt has had several **hundred thousands** of users since launch in March 2014

Stats from Visual Studio Analytics over the period May 22-June 26 indicate 40,235 users

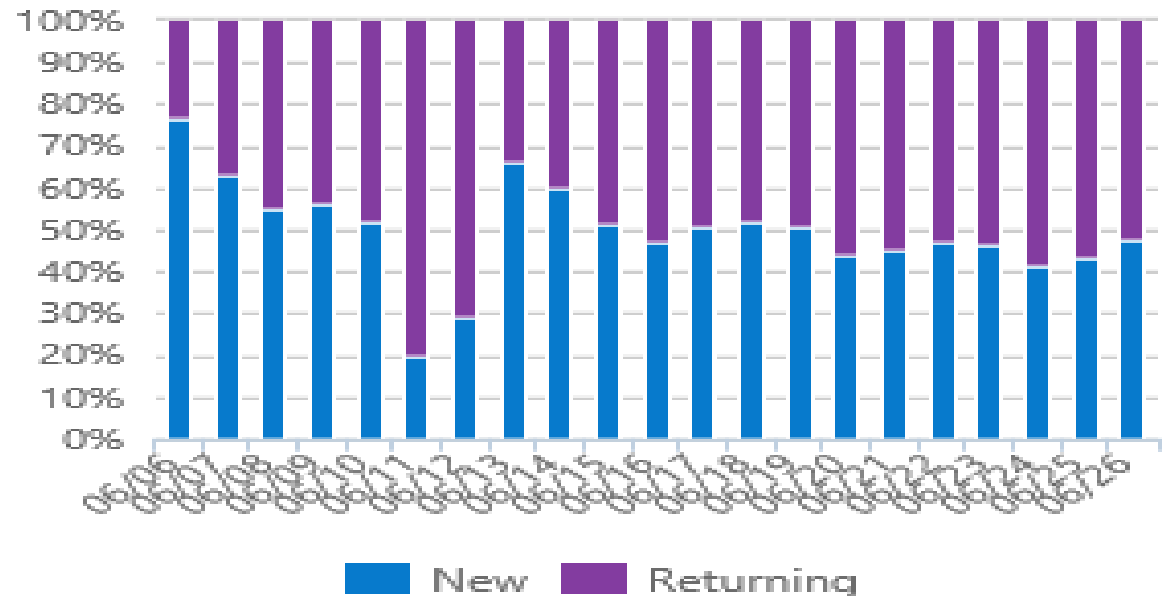
Stickiness (loyalty) is very high

% Returning
< 14 days

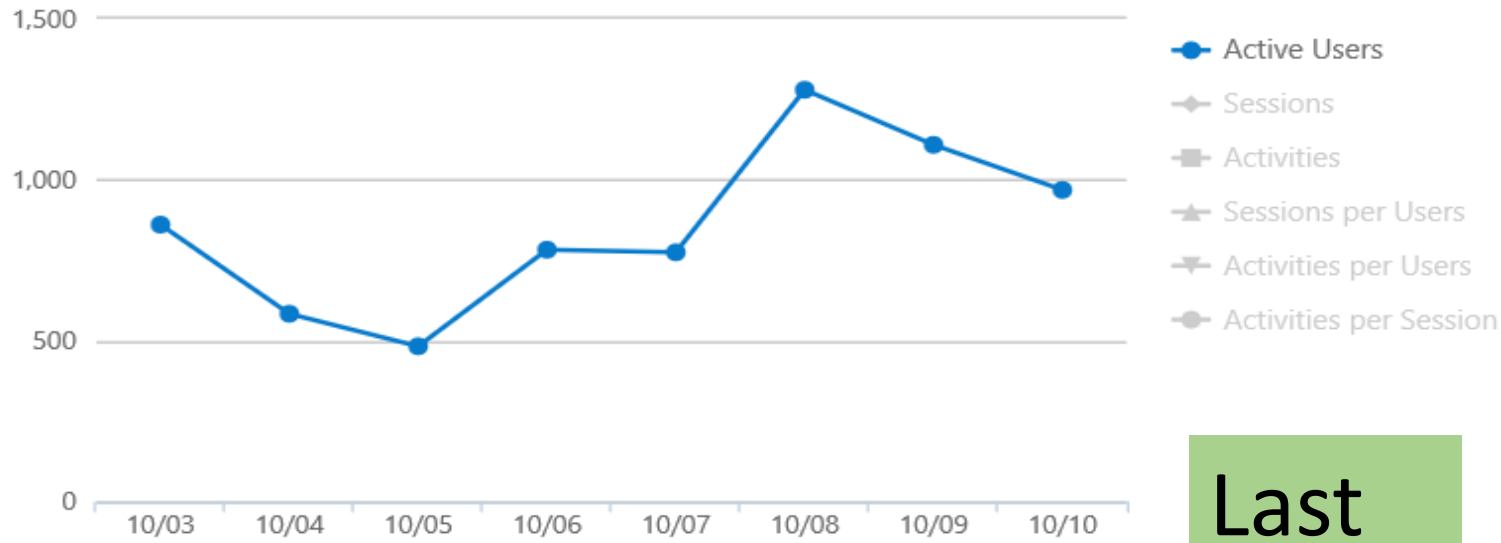
99.79%

New vs. Returning

What percentage of sessions are from new users?

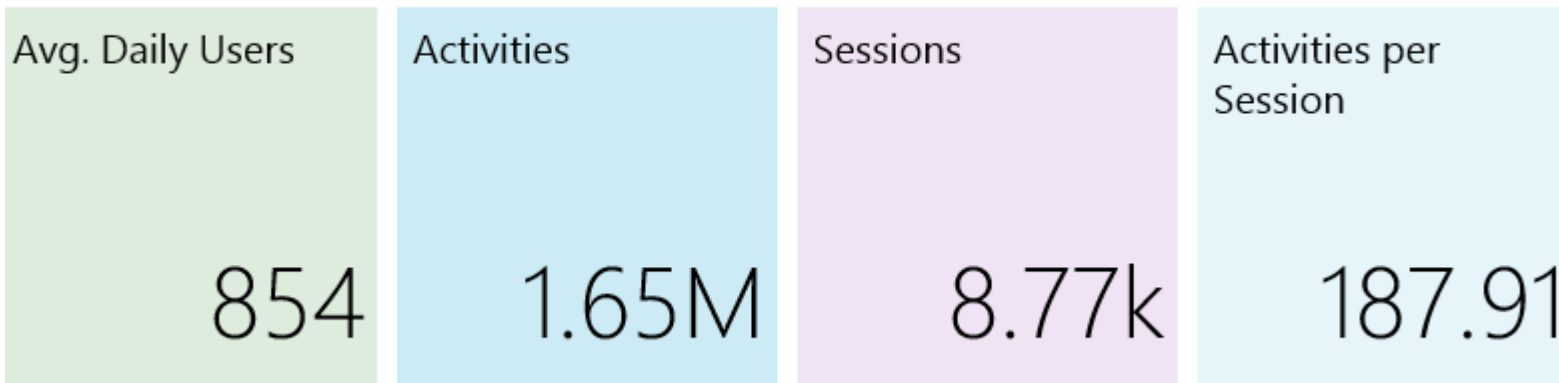


Trend of active users by day



Active user key performance indicators

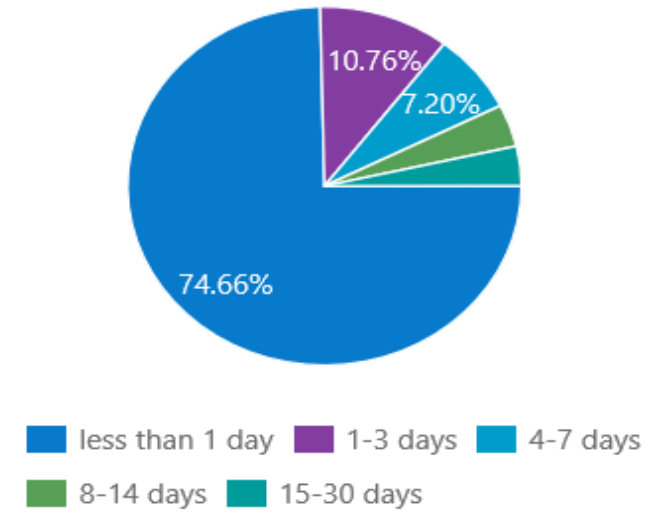
Active user key performance indicators



Last week

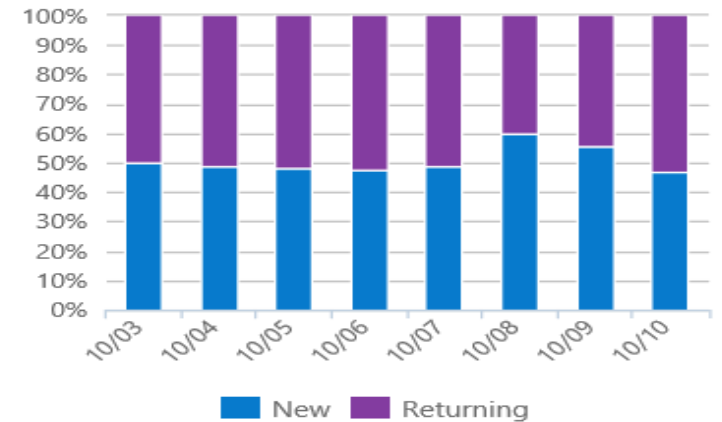
User Frequency

How long before my known users return?



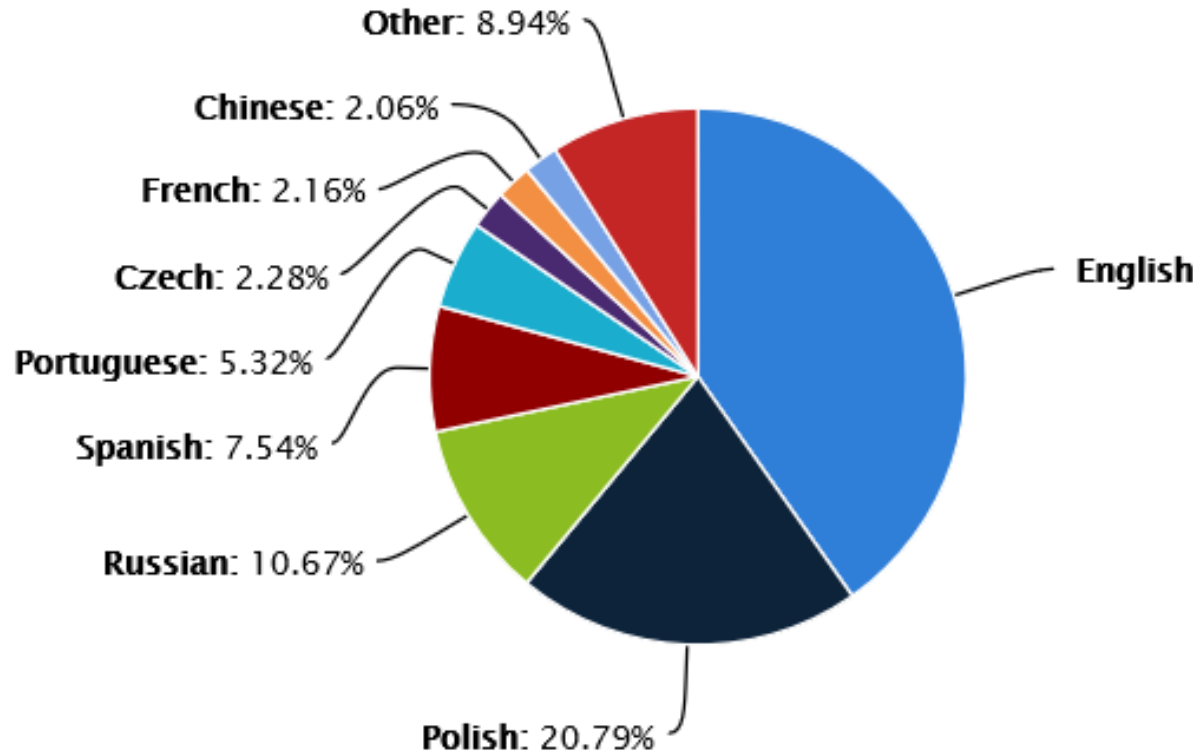
New vs. Returning

What percentage of sessions are from new users?



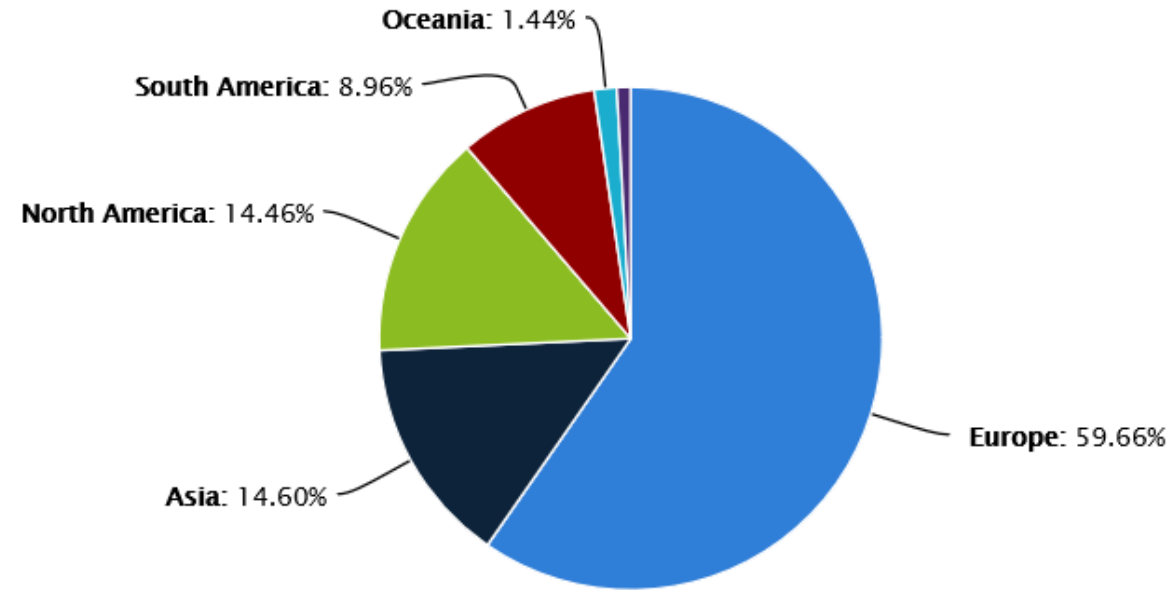
Period 3-10 October, 2014

Languages



Sessions: **8,769** Activities: **1,647,76**

Global



Sessions: **6,909** Activities: **1,444,846**



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Microsoft Research launches Code Hunt, an educational Web game for learning programming

Jade Mulders 27 May 2014 12:57 AM |  0

Blog originally posted on [thenextweb.com](#)

Microsoft Research today launched [Code Hunt](#), a browser-based game for anyone interested in learning how to code by playing. The premise is straightforward: the player must write code to advance in the game.

The built-in tutorial introduces you to the game:

Greetings, program! You are an experimental application known as a CODE HUNTER. You, along with other code hunters, have been sent into a top-secret computer system to find, restore, and capture as many code fragments as possible. Your progress, along with your fellow code hunters, will be tracked. Good luck.

Code Hunt uses puzzles, which players explore by means of clues presented as test cases, and encourages players to iterate on their code to "capture" it. Their work is then scored depending on the elegance of their solution, and players are encouraged to continue on to the next challenge.



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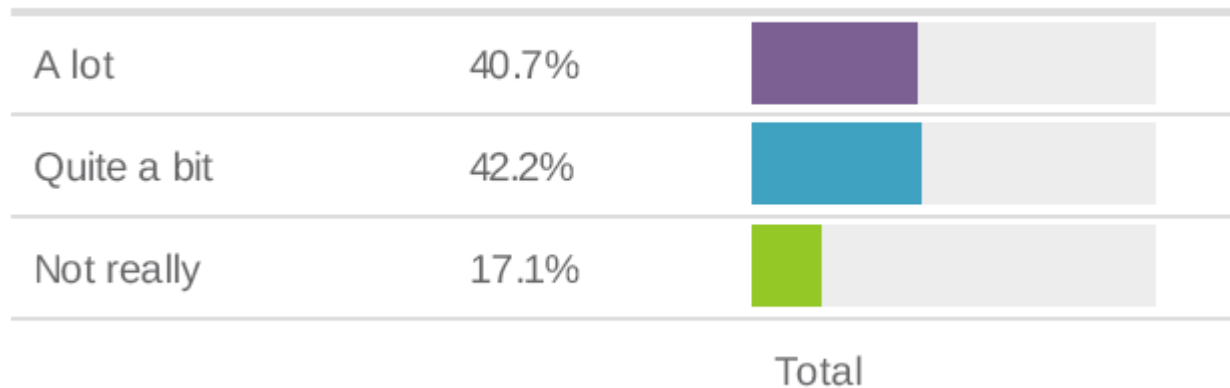
[Wymondham High Academy O-Series v collection: how to up from Windows 7 to Windows 8.1 in Edu](#)

[Furness Academy, a finding that the iPad not fulfil their learning vision, moves to a Microsoft-based environment](#)

[Wymondham High Academy O-Series v collection: Visual Stu](#)

Survey results (735 respondents)

How much did the puzzle aspect of Code Hunt keep you interested in reaching a solution?



In your opinion, were your final solutions well-structured code?



We have many other statistics, but not so relevant to contests

Contest Goals

identify top coders

make online competitions more fun



2,353 players	41.0 average tries per level
350 top players	7.6 average tries per level



Completed in 2014

Beauty of Programming, Microsoft China – 2,500 players in four rounds

TEALS – high schoolers across the USA

Computer Science Teachers Association Conference

High School Intern Boot Camp

Imagine Cup September, Oct 2014 – April 2014

LASER Summer School, Elba, September 2014

Upcoming

Code Hunt Polska, 17 October 2014

Creating new contests

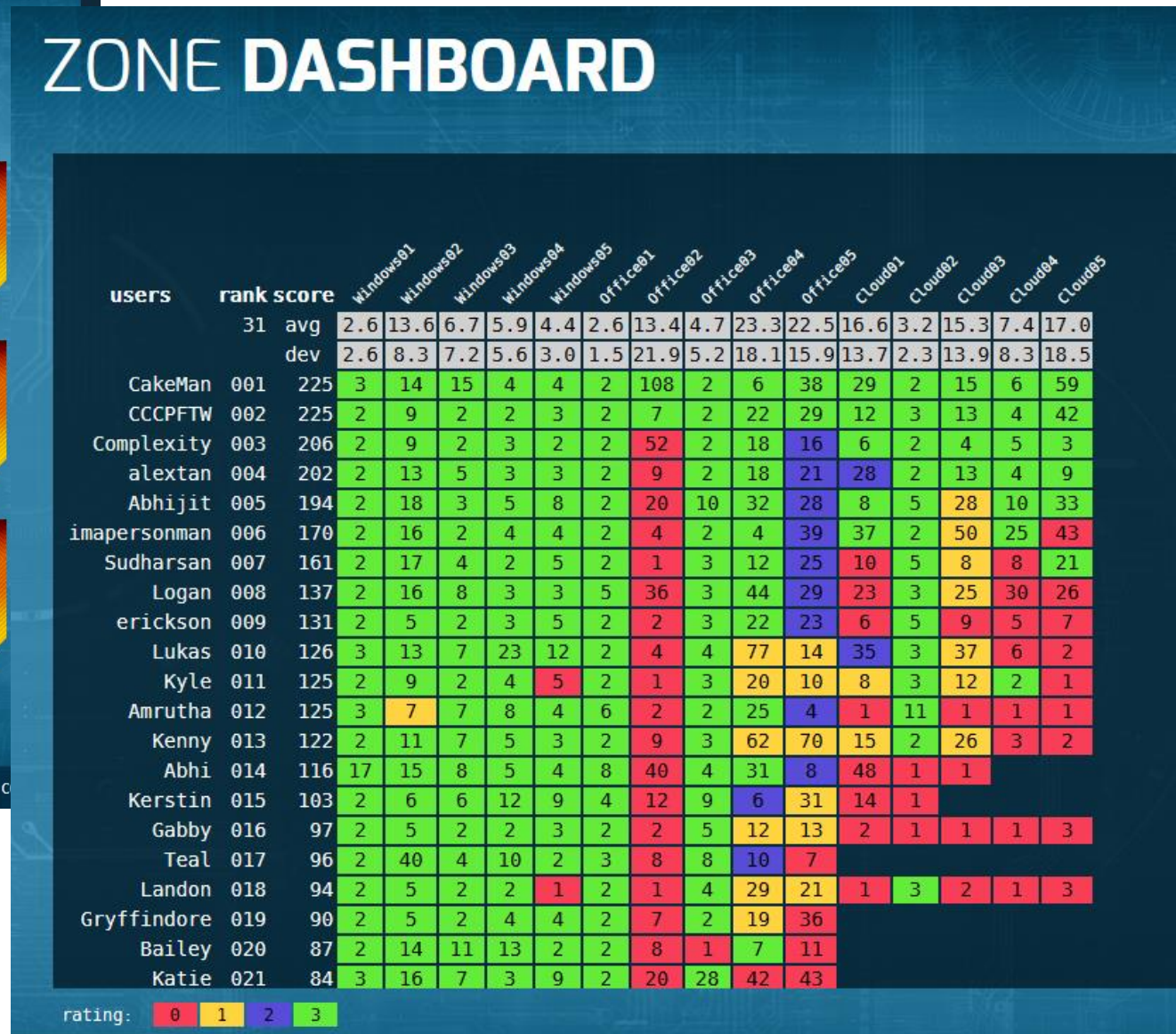
- Creating new puzzles
- Requires curation of a puzzle bank
- Original data about each puzzle
 - Group – numbers, arrays, strings, booleans, binary
 - Subjective difficulty
 - Source – who wrote the puzzle
 - Features
- Each contest should have a sequence of sectors in increasing difficulty
- Avoid “Bad” puzzles early on – those that fool users

Leaderboard and Dashboard

Visible only to the organizer



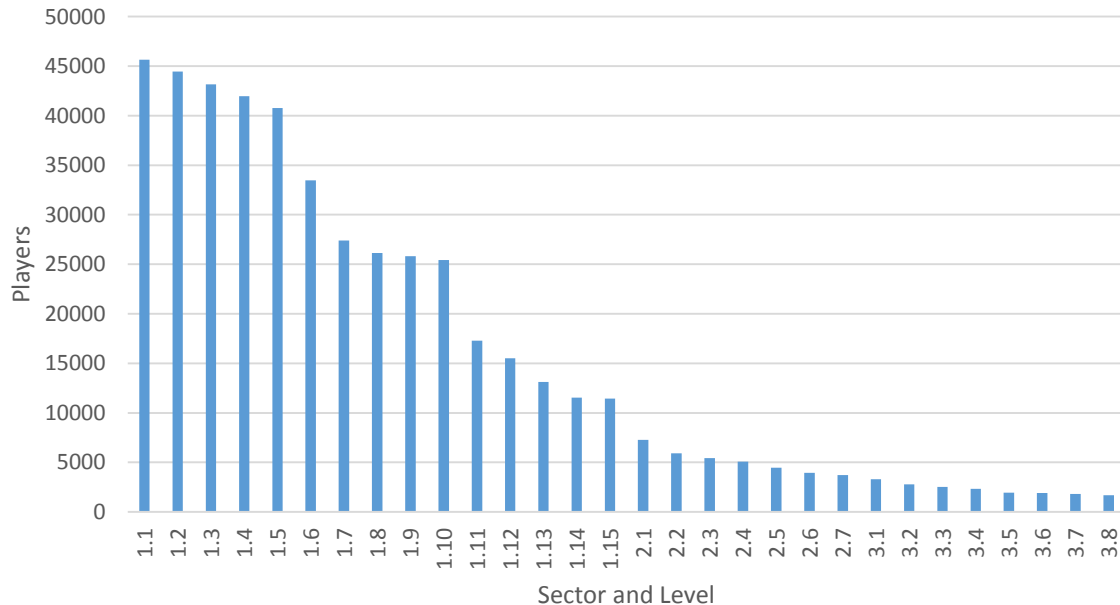
Publically visible, updated during the contest



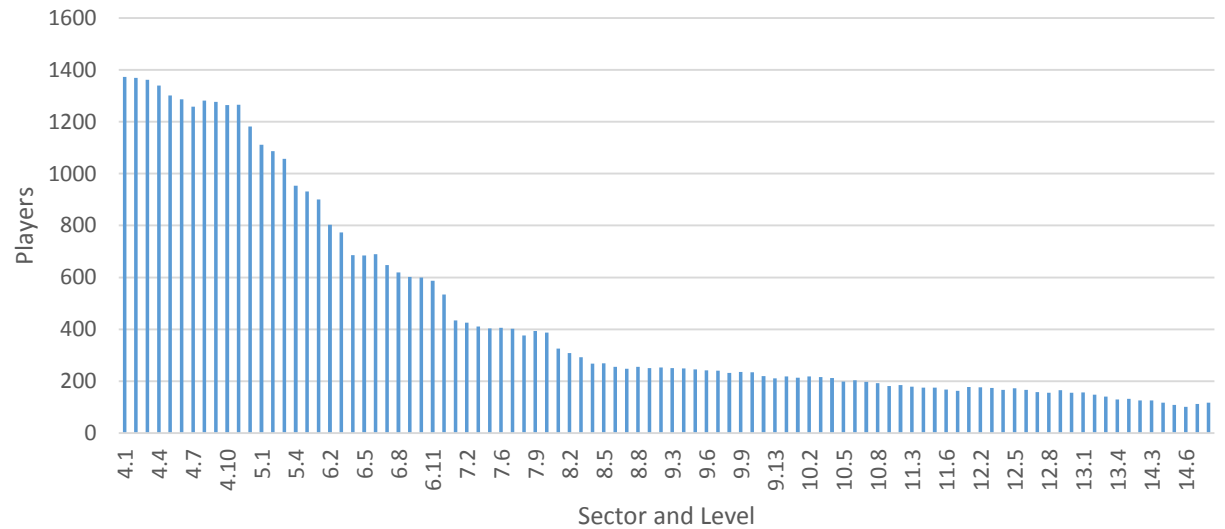
Code Hunt - the APCS (default) Zone

- Opened in March 2014
- 129 problems covering the Advanced Placement Computer Science course
- So far, over 45,000 users started.

APCS Zone, First three sectors, 45K to 1K



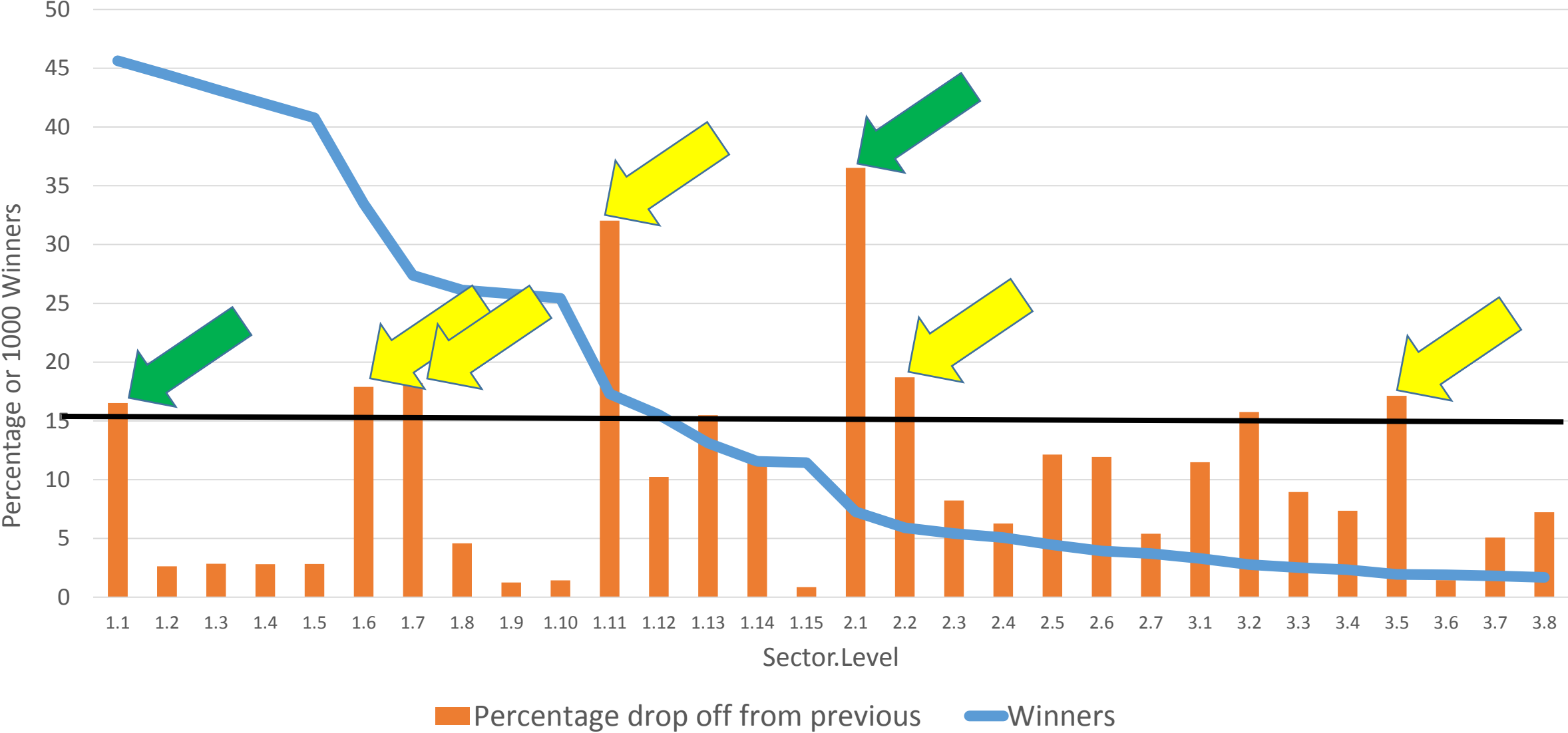
APCS Players, Sectors 4 to 14, 1.3K to 110



Updating the puzzle bank statistics

- Updating the used field
- Modifying the difficulty rating based on user experience
- Options
 - Score – but the score is 1-3 and we know from the survey that 77% of users improve their code to get a 3
 - Tries – a fairly objective reflection of how long it took to find the pattern and program a correct solution
- CAVEAT!!! Users in areas with poor internet are known to use the Capture Code button less

Effect of difficulty on drop off in sectors 1-3



Formula for perceived difficulty

For a particular puzzle

$$a + b * \text{tries} + c * \text{tries} * \text{distance}$$

$$a = 1, b = 0.05, c = 0.02, \text{ or for APCS } c = 0.001$$

tries are the average tries for all winners
distance is the number of levels so far

Examples

1683	8.88	3.8
Players	Tries	Sector.Level

$$D = 1 + 8.88/20 + 8.88 * 29 / 1000 \\ = 1.74$$

Original difficulty was 2

$$D = 1 + 45.08/20 + 45.08 * 69 / 1000 \\ = 6.36$$

Original difficulty was 2

376	45.08	7.8
Players	Tries	Sector.Level

How players perceive difficulty

BoP China (same community)

a=1, b=0.05, c=0.02

	Subjective difficulty	Perceived difficulty	Starting players	Ending players	Levels with average tries over 10
BoPQuali	1.59	2.86	13773	307	3 out of 17 = 18%
BoPPrelimA	2.17	1.93	1017	125	3 out of 6 = 50%
BoPPrelimB	2.50	1.97	141	131	2 out of 6 = 33%
BoPSemi	2.60	2.49	1164	113	2 out of 10 = 20%

CSTA and TEALS (identical contests)

a=1, b=0.05, c=0.02

	Subjective difficulty	Perceived difficulty	Starting players	Ending players	Levels with average tries over 10
TEALS (students)	1.96	5.22	61	3	5 out of 23 = 22%
CSTA (teachers)	1.96	4.38	14	4	7 out of 23 = 30%

Planned Developments

Technical enhancements

- Catalog tool for puzzles
- Editing tool for universes
- Automatic testing tool for new universes
- Universe management tool
- Crowdsourcing puzzle creation
- Live feed showing active game play
- Website integrated dashboard
- Content testing of Office Mix plug in
- Maintaining the Java translator
- Support for user-defined types (objects)
- Management tool for data access
- Plug-in infrastructure for new APIs

Community engagement

- New content semi-annually
- Working with contest Organizers
- Building a research community
- Building a user community
- Collecting usage statistics and answering bug reports

- Some of these can be done by stakeholders/partners

Summary:

Code Hunt: A Game for Coding



For **individuals** (K12, introductory courses, geeks)

For **competitions** at any level, world-wide or in house

Based on long-term **research** on symbolic program analysis (Pex, Z3)

Works with **Java** and C#

Runs in any modern **browser**

Now working on **tablets** and **phones**

www.codehunt.com
aka.ms/codehuntpolska