

Price is Right

Teacher Materials

In this activity, students will attempt to guess the price of different items by playing the “Hi/Low” game. They are exposed to the binary search algorithm and compare that to a linear search for performance.

Acknowledgements and License

Images used in this activity were taken from walmart.com, amazon.com, and jeep.com. All prices retrieved as of July 8, 2018.

This activity is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. Others may freely adapt, reuse, and distribute this for non-commercial purposes provided that they provide attribution.

Lesson Details

Grade Level: 6th-12th graders

Activity Length: 20-30 minutes

Format: Students working in groups of 3, materials for 3 groups

Connection to Standards

This activity contains content and practices addressing elements of the following CSTA K-12 Computer Science Standards (2017):

CSTA Std	Description
1A-AP-08	Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.
1A-AP-10	Develop programs with sequences and simple loops, to express ideas or address a problem.
1A-AP-11	Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.
1A-AP-12	Develop plans that describe a program’s sequence of events, goals, and expected outcomes.
1B-AP-11	Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.
1B-AP-13	Use an iterative process to plan the development of a program by including others’ perspectives and considering user preferences.
2-AP-10	Use flowcharts and/or pseudocode to address complex problems as algorithms.
3B-AP-10	Use and adapt classic algorithms to solve computational problems.

This activity contains content and practices addressing elements of the following Nebraska K-12 Technology Scope & Sequence Standards:

NE Tech Standard	Description
Computational Thinking 1	Create algorithms, or series of ordered steps, to solve problems.
Computational Thinking 2	Decompose a problem into smaller more manageable parts.
Computational Thinking 5	Optimize an algorithm for execution by a computer.
Computational Thinking 7	Evaluate algorithms by their efficiency, correctness, and clarity.

Bin Materials Checklist

#	Description
12	Pictures of items (3 of each)
3	Timers
3	paper

Lesson Vocabulary Words

algorithm an ordered sequence of instructions

Lesson Setup / Introduction

Students need to be in groups of three and assigned to be either the guesser, the “host”, or the counter. Student will then read their corresponding role cards for further instructions. Students may switch roles in between items.

Connection to Computing

Searching and sorting is a fundamental action for many applications and an area where computers excel. There are hundreds of different sorting algorithms, with new ones still being discovered. Because computers can do the same thing continually over and over again, at a phenomenal speed, they are excellent at sorting large numbers of items.

Another common task is to find information from a collection. There are fewer ways for a computer to search than sort. The two most common searches are a linear search and a binary search. For a linear search the computer just starts at the first element and compares each element to the target until the target is found or there are no more elements to look at. This is much like searching for a specific student’s paper from a stack of papers. You look at each paper until you find the one you want.

But a linear search is an inefficient way to find a word in the dictionary. You would not start at the first word in the dictionary and continue to search until you find the word you are looking for. Instead, because you know the words in the dictionary are *ordered* you can use that knowledge to improve the efficiency of the search, which is where binary search comes in.

In a binary search, you begin by comparing the target to the middle element in the collection. If the element matches the target then you are done. Otherwise, if the element is smaller than the target you will repeat the process in the second half of the list. If the element is larger than the target, you repeat the process in the first half of the list. Binary search works because the list is sorted and each time you do a comparison you are eliminating half of the list that is remaining. You can find any element in a list in $(\log(\text{base}))$

2) $n + 1$) where n is the number of elements in the list.

Further Related Resources

- Binary Search explanation <https://www.geeksforgeeks.org/binary-search/>
- Price is Right Clock game <https://www.youtube.com/watch?v=JfykodhR0-E>
- Price is Right Clock game miracle <https://www.youtube.com/watch?v=AEBbsZK39es>
- Hacker Rank video <https://www.youtube.com/watch?v=P3YID7liBug>
- Binary Search explained using security footage
<https://medium.freecodecamp.org/binary-search-algorithm-7170ae244438>



Answer Key

Price is Right

Student Instructions

The goal of this activity is to guess the price of 4 different items in less than 2 minutes.

Within your group, choose one person to be the “Guesser,” one person to be the “Host,” and the third person will be the counter. You may switch roles between items. Read the following description of your role.

Host

- Show the item to the Guesser and ask them to guess the price of the item, to the closest whole dollar.
- Each time there is a guess, tell the Guesser if the price guessed is too high (“Lower”) or too low (“Higher”) until the correct price is guessed.
- The timer begins with the first guess and ends when the correct price is guessed and can be paused between items.

Guesser

- The host will show you the first item.
- You will try and guess the price of the item, to the closest whole dollar. Each time you guess, the host will tell you to guess “Higher” or “Lower” to guide you to the price of the item.
- The timer begins with the first guess and ends when the correct price is guessed and can be paused between items.

Counter

- The counter is responsible for controlling the timer.
- Set the timer to 2 minutes.
- The timer begins with the first guess and ends when the correct price is guessed (or time runs out).
- The counter should count the number of guesses before the correct price is guessed. Maintain a separate count for each item.
- The timer can be paused between items.

To begin:

1. **Counter:** Set the timer at 2 minutes.
2. **Host:** Show the Guesser a picture of the item.
3. **Guesser:** Guesses a price of the item. **Host:** Responds as appropriate with Higher, Lower, or Correct. **Counter:** Keeps track of the number of guesses.
4. When the correct price has been given, **Counter:** pauses the timer.
5. You may now switch roles.
6. Repeat until you run out of time or you have correctly guessed all the prices.

Answer the following questions:

- Which item had the fewest number of guesses?
- Which item had the most number of guesses?
- Can you think of the most efficient way to guess the price of an item?
- What is the minimum number of guesses if the price of the item is between \$1 and \$10?
- What is the minimum number of guesses if the price of the item is between \$1 and \$100?
- What is the minimum number of guesses if the price of the item is between \$1 and \$1000?
- What is the minimum number of guesses if the price of the item is between \$1 and \$1,000,000?
- Is there a pattern to the minimum number of guesses required?



Hand-Outs



\$3



**G-Project G-Boom
Bluetooth Wireless
Boombox**

\$80



**Google Pixel 2
Unlocked
64gb
by Google**

\$735



\$31,711

**2018 Jeep Wrangler Unlimited
Sport 4x4**

8 speed automatic transmission

Trailer and Tow package



Resupply

- Make sure all pictures are there.