

Introduction to Problem Solving



Why Learn Problem Solving?

- improve critical thinking
- explore, understand, and analyze problems
- think creatively about multiple possible solutions
- develop techniques that can be applied to real-world problems

Computer Programming

- problem solving skills are critical to understanding and writing programs
- the types of problems solved in software are constantly changing and evolving
 - the programmer must also be flexible in their thinking to handle new problems
- even with constant change, there are often patterns in problems and their solutions
 - practising problem solving increases ability to see patterns and try variations on solutions

Bridge Problem

- four people come to a river in the night
- there is a narrow bridge that can only hold two people at a time
- they have a single flashlight that must be used whenever a crossing is made
- each person takes a different amount of time to cross the bridge:
 - A=1, B=2, C=5, and D=8 minutes
- when two people cross together, they must move at the slowest pace

Bridge Problem

- how can we get everybody across?
- is there more than one way to accomplish this?
- what do you think is the **real** problem you are being asked to solve here?

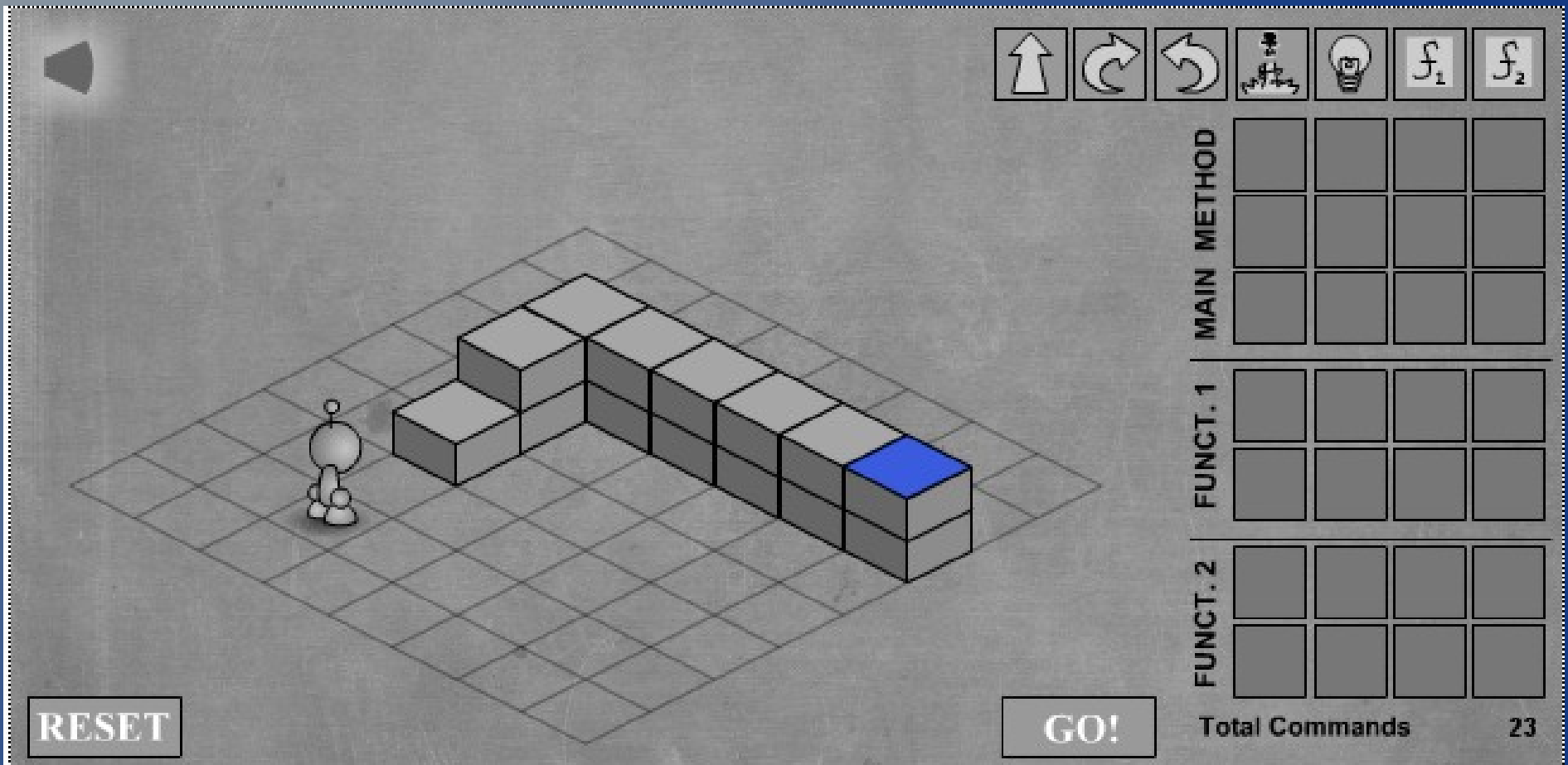
Bridge Problem

- how can we get everybody across?
- is there more than one way to accomplish this?
 - there are many ways to solve this problem
 - this is called an **open solution** (many acceptable solutions)
- what do you think is the **real** problem you are being asked to solve here?
 - we really want to know **the best** (fastest) way to cross the bridge
 - this is called the **optimized solution**
 -

Problem Solving in Video Games!

- many video games involve a problem solving component
- players will try various solutions, sometimes for hours on end
 - it may involve refining a promising strategy
 - a strategy may be an obvious failure, requiring a completely new strategy

Lightbot



The image shows the Lightbot game interface. A small robot stands on a grid next to a structure of grey blocks. The top right contains a toolbar with icons for movement (up, left, right), a lightbulb, and function keys f_1 and f_2 . Below the toolbar are three 4x4 grids for 'MAIN METHOD', 'FUNCT. 1', and 'FUNCT. 2'. At the bottom left is a 'RESET' button, and at the bottom right is a 'GO!' button. The 'Total Commands' counter shows 23.

	f_1	f_2	Lightbulb	Right	Left	Up
MAIN METHOD						
FUNCT. 1						
FUNCT. 2						

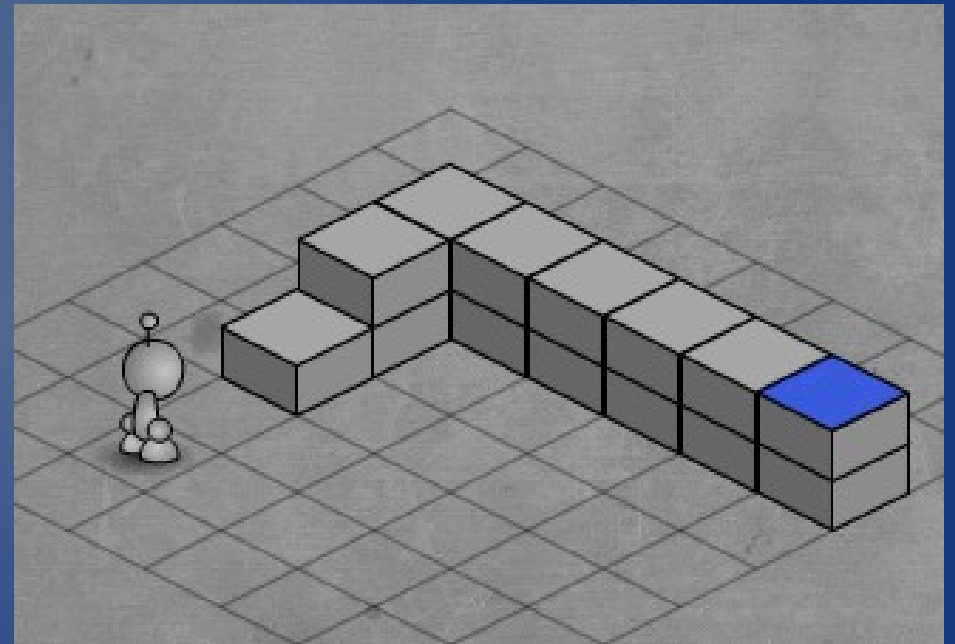
RESET

GO!

Total Commands 23

Lightbot

- possible movements
 - forward
 - left
 - right
 - jump (+ forward)
 - toggle light on/off



Lightbot

- possible solutions?
 - one or many?
 - is there an optimized, or most efficient, solution?

