

Puzzles and Algorithms

Certain puzzles have algorithms as solutions. They require computational thinking: Finding a solution means *coming up with* an algorithm. This is different than algorithmic thinking which just involves *following directions*. Consider this well-known puzzle:

A villager must cross a wobbly rope bridge over a gorge to get to market. She has with her a hungry cat, a hungry chicken, and a sack of grain to sell. She can only carry one of the three across the bridge at a time. If she leaves the cat alone with the chicken, then the cat will eat the chicken, and if she leaves the chicken alone with the sack of grain, the chicken will break open the sack and start eating the grain. How can she get across the bridge with the chicken alive and the sack intact?

The solution is clearly a series of instructions for the villager (for example, pick up the sack of grain and move across the bridge is a valid instruction). The villager plays the role of the computing agent, and you must give the right series of instructions (the right program) in order to achieve the stated goal.

Solve this problem and write your solution down on the next page. More important than knowing the solution is becoming aware of what techniques one might deploy in order to discover the solution. For example, it is helpful here to make a diagram of the situation (with letters standing for the characters).

Each instruction *must* start one of the first two phrases:

1. pick up _____
2. put down _____
3. and may conclude with *or* without the phrase: and move across

The _____ must be filled in with either the cat, the chicken, or the grain.

The Villager and the Bridge

A villager must cross a wobbly rope bridge over a gorge to get to market. She has with her a hungry cat, a hungry chicken, and a sack of grain to sell. She can only carry one of the three across the bridge at a time. If she leaves the cat alone with the chicken, then the cat will eat the chicken, and if she leaves the chicken alone with the sack of grain, the chicken will break open the sack and start eating the grain. How can she get across the bridge with the sack intact and the chicken alive?

Solution:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

Each instruction *must* start with one of the first two phrases and either end with or omit the third phrase.

1. pick up _____
2. put down _____
3. and move across

The _____ must be filled in with either the cat, the chicken, or the grain.