

## **Problem Solving: Strategies and Obstacles**

- Algorithms
- Heuristics
- Insight

### **Barriers to Problem Solving**

- Confirmation Bias
- Mental Sets
- Functional fixedness (not in your textbook)
  - Examples of overcoming functional fixedness
- Mental Representations (not in your textbook)

## **Trial and error**

A strategy that involve attempting different solutions and eliminating those that do not work. Trial and error strategies can lead to superstitious behavior or heuristical thinking through accidental or coincidental reinforcement (see Chapter 6).

### **Examples:**

- If this keystroke doesn't make the computer work, the next one might...
- Thomas Edison tried thousands of filaments for a light bulb before finding one that was appropriate.
- If you forgot where your friend lives, you can randomly try a variety of streets to see if you can find it.
- The cats in Thorndike's Puzzle Box

What are the advantages of the trial and error strategy?  
What are the disadvantages of the trial and error strategy?

Drug treatments, public policies, and launching a space shuttle would be bad trial and error decisions.

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## Algorithms

A methodical, logical rule or procedure that guarantees solving a particular problem. Contrasts with the usually speedier—but also more error-prone—use of heuristics.

### Examples:

- Trying all possible combinations on a combination lock to unlock it.
  - Trying all keys on your key chain to unlock the door.
  - The movie Sneakers: SETEC ASTRONOMY or MY SOCRATES NOTE or TOO MANY SECRETS
  - Trying to find your friends house, except for instead of just driving around hoping you are going to find it, you go up and down each street in a systematic manner.
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- What are the advantages of the algorithm strategy?
  - What are the disadvantages of the algorithm strategy?
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## Heuristics

A simple thinking strategy that often allows us to make judgments and solve problems efficiently; usually speedier but also more error-prone than algorithms.

### Examples:

- Means-Ends Analysis
    - Working backwards to solve a maze.
  - Sub-goal Analysis
    - Break a large problem into smaller ones.
    - Write a “to do list”
  - If you are trying to remember a person’s name, you can go through each letter of the alphabet as a retrieval cue. Does it start with an A, B, C....
  - Taking a broken car into the dealer (a specific strategy), compared to a general strategy—get it fixed—take it to the dealer or do it yourself, a mechanic, Firestone, etc.
  - Looking in the manual when a game, VCR, car doesn’t work like it is suppose to.
  - What works in the past might work now.
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- What are the advantages of using heuristics to solve problems?
  - What are the disadvantages of using heuristics to solve problems?

## Insight

A sudden realization of a problem's solution; contrasts with strategy-based solutions. Prior experiences in solving similar problems increases the likelihood that you will be able to solve a particular class of problems.

### Examples:

- The circle problem.
- An unsuccessful attempt to sell a car called the Nova in Spanish speaking country (actually, this is an urban myth).
- Discovering a strategy to remember the following sequence of 20 numbers  
1 7 7 6 1 8 1 2 1 8 6 1 1 9 1 4 1 9 4 2.
- The Hotel murder problem.
- Using insight to reorganize information (see previous chapter on memory)
- The inspiration for one of the first computers (called a tabulator) for the 1890 census came from the Jacquard loom.
- The inspiration for velcro (velvet crochet) came from nature (a cocklebur). “People have been removing burs since we were wearing saber-toothed tiger pelts, and no one else had thought to make a virtue (and millions of dollars) out of how tenaciously the burs cling”, (page 77, When Sparks Fly).
- A melted candy bar led to the invention of the microwave.

- Fischer-Price and “action-heroes”. The action hero toy is a lucrative market, however, Fischer-Price has a strong prohibition to create violent toys. How could they pursue this important market without creating a “shoot-‘em-up Rambo style toy (such as G.I. Joe, X-men, Star Wars, etc.)? How can you solve this problem?
  
- What are the advantages of insight as a problem solving strategy?
- What are the disadvantages of insight as a problem solving strategy?

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## **Insight: Velcro**

Sometimes solving a problem requires insight, looking at the problem in a different way (reframing the problem), or reframing the question.

The inspiration for velcro (velvet crochet) came from nature (a cocklebur). “People have been removing burs since we were wearing saber-toothed tiger pelts, and no one else had thought to make a virtue (and millions of dollars) out of how tenaciously the burs cling”.

## Barriers to Problem Solving

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- Mental Sets
- Functional fixedness (not in your textbook)
- Mental Representations (not in your textbook)

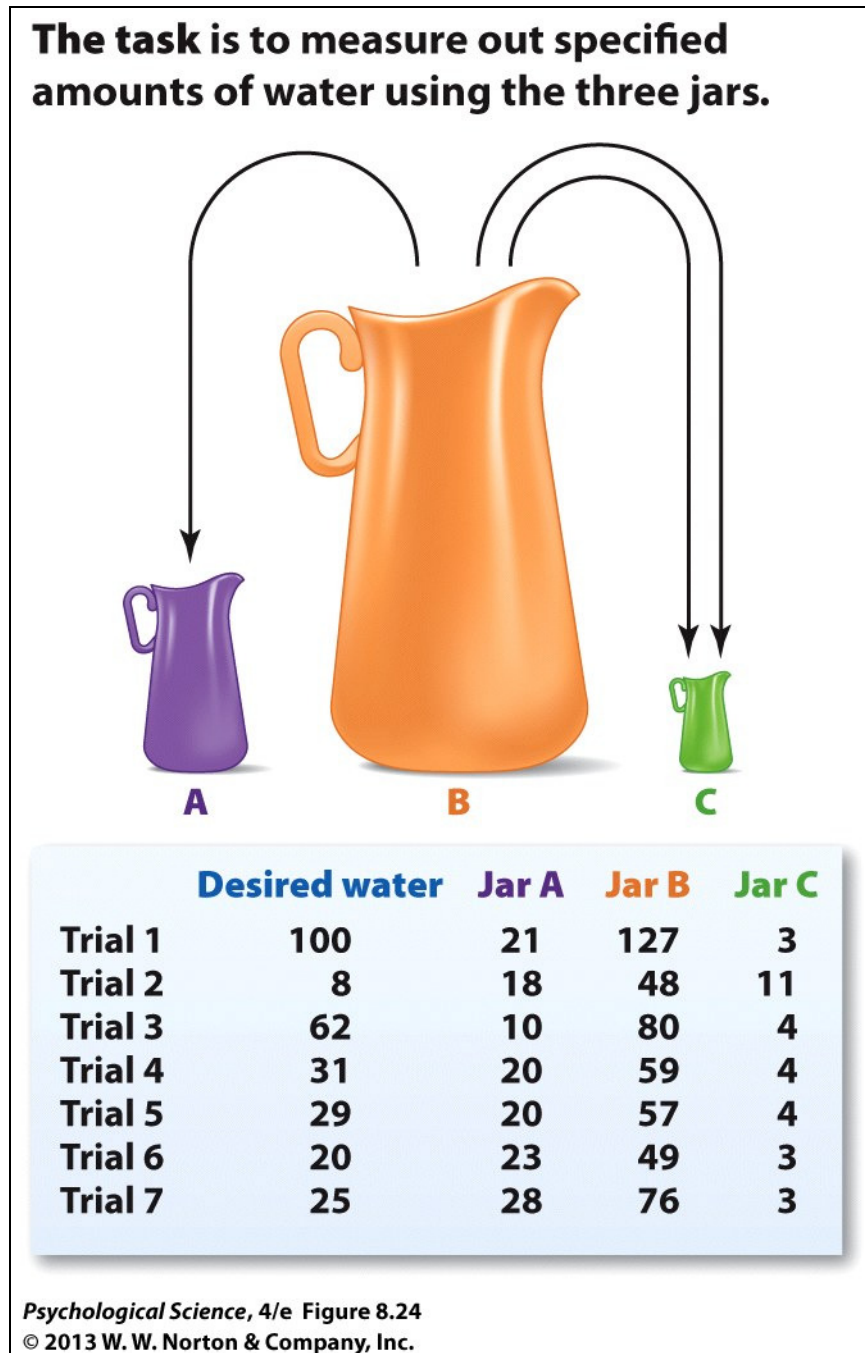


## **Barriers to Problem Solving: Confirmation Bias**

The tendency to search for information that supports our preconceptions and to ignore or distort contradictory evidence.

## Barriers to Problem Solving: Mental Sets

The tendency to persist in solving a problem with solutions that have worked in the past (also see heuristics).



(B-A-2C)

- “Oil change service”: How have they changed in the last 10 years?
- Raising Arizona with Nicholas Cage and Holly Hunt
- “When something breaks, throw it away and buy a new one versus fixing it”.

## Mental Sets

Mental Sets is the tendency to solve problems with the strategies that have been used in the past. Overcoming mental sets can come up with creative solutions such as with reverse graffiti. Instead of spraying paint to create art, you clean dirty surfaces to create art.





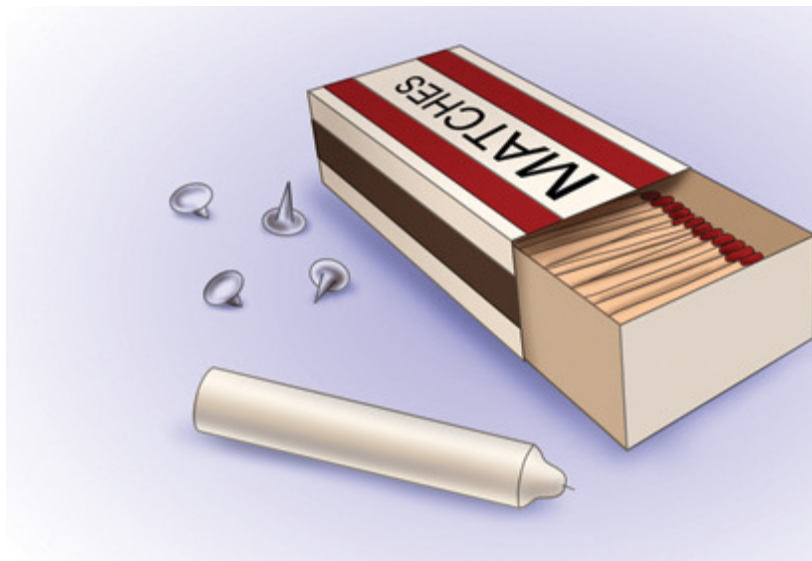


## Barriers to Problem Solving: Functional fixedness (not in your textbook)

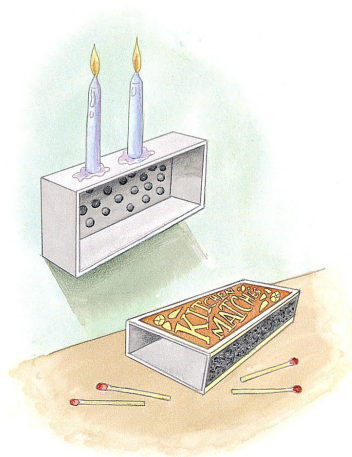
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Functional fixedness      The tendency to view objects as functioning only in their usual or customary way.

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How can you use these objects—a box of matches, thumbtacks, and a candle—to mount the candle on the wall so that it illuminates the room.



## **Examples of Overcoming Functional Fixedness**

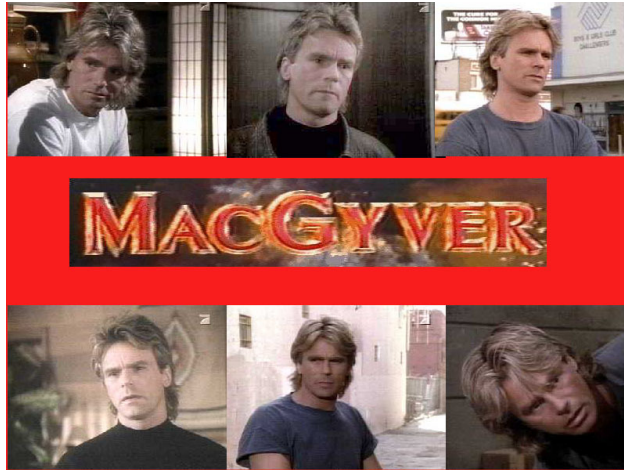
- In high school I stayed at a friend's house the night before a class trip. Our bus left very early in the morning and we were running late. It was time to go and she still had wet hair. She said, "No problem, I'll dry it in the car." I didn't understand but rushed around to get ready. Once in the car, she turned the heater on high and dried her hair as I drove us to catch the bus. I would have never thought of using the car heater as a hair dryer.
- I bought frozen orange juice. When I got home, Nicole told me we didn't have a pitcher to put it in. I simply went over and grabbed an empty 2 liter bottle from ginger ale and used that.
- Have you ever spent a lot of time looking for a flat-headed screwdriver when a dime would have worked just as well?
- I have a kitchen hammer that I saw kitchen chefs use to crush garlic with (observational learning). However, it is packed away somewhere, and I don't want to take the effort to go find it. Instead, I take a can of chili (the glass jars are too risky) and use it to crush the garlic.
- When a friend was overseas on a tour group, he needed some thread to fix his backpack. How about dental floss instead?
- An archaeological team went into the desert (Gobi?) in China looking for fossils. Several hundred miles into the remote desert, a gasket in one of their



vehicles needed replacing. Unfortunately, the nearest shop was hundreds of miles away and they didn't have a spare.

- Large size “binder clips” are used to hold large stacks of papers. What else can they be used for?

- Richard Dean Anderson often displayed overcoming functional fixedness as the star of the television show

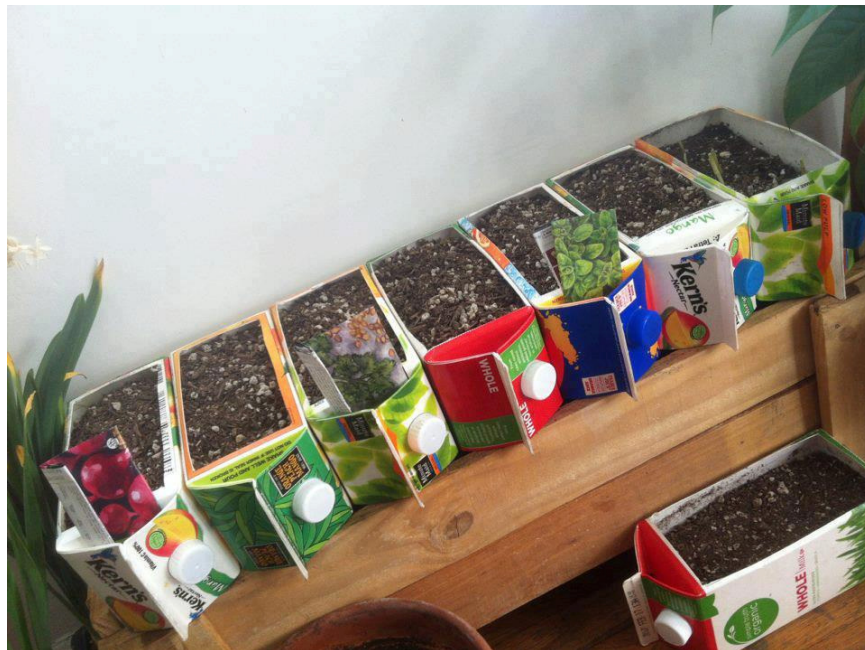


- In the movie \_\_\_\_\_, Tom Hanks was shipwrecked with several items that appeared to be useless, but later found a use for them.



## Overcoming Functional Fixedness

This kid's parents built his Halloween costume around his wheelchair...



## Overcoming Functional Fixedness

**Carpet Alarm Clock. Forces you to get up and stand on it to turn it off. I need this in my life.**



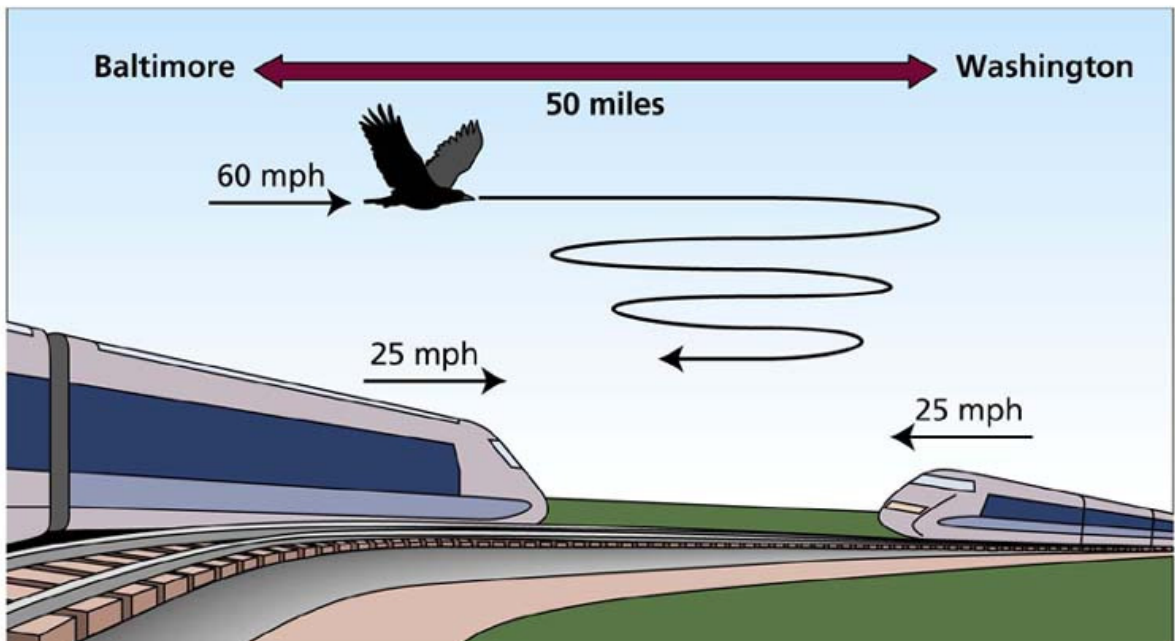
## Overcoming Functional Fixedness



## Barriers to Problem Solving: Mental Representations (not in your textbook)

Train A leaves Baltimore for its 50 mile trip to Washington D.C. at a constant speed of 25 mph. At the same time, train B leaves Washington D.C. bound for Baltimore at the same speed of 25 mph.

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A crow that happened on a methamphetamine lab and sampled its product leaves Baltimore at the same time as train A, flying above the tracks toward Washington D.C. at a speed of 60 mph. When the crow encounters train B, it turns and flies toward train A, then instantly reverses its direction and flies back to train B. This supercharged bird continues this sequence until Train A and Train B meet midway between Baltimore and Washington D.C.

How far has the crow flown?

## **Mental Representations: Barriers for Insight**

### **Horse problem**

A man bought a horse for \$60 and sold it for \$70. Then he bought the same horse for \$80 and sold it again for \$90.

- Write down how much money was made in both transactions combined.

## Mental Representations: Barriers for Insight

### Horse problem

If you try to do this in your head without writing things down, it makes it more challenging due to the limits of working memory. When you tax your limits of working memory, you are relying on a lot of mental shortcuts and intuition

A man bought a horse for \$60 and sold it for \$70. Then he bought the same horse for \$80 and sold it again for \$90.

- Write down how much money was made in both transactions combined.

Bought: Horse for \$60

Sold: Horse for \$70

Bought: Same Horse for \$80

Sold: Same Horse for \$90



## Hotel Problem

A hotel detective was making his rounds through the corridors of the hotel. As he passed by a room, he heard a voice behind the closed door. The voice yelled, "Don't shoot, John!" Immediately afterwards, the detective heard a gun discharge. He immediately broke into the room and encountered the following scene.

*A dead woman was lying on the floor. Next to her was a gun. Three people were standing around her. They were a judge, a soldier, and a mail carrier. The detective immediately arrested the mail carrier for murder.*

Based on the information provided, how did the hotel detective know to arrest the mail carrier?

If you know the answer, raise your hand, and I will tally how many people know the answer. **DO NOT** reveal how you know the answer. We may need to create a visual representation to help solve the problem.

How does the representation affect your ability to solve the problem?