

# Problems of Unusual Thinking

As explained in *Motivating and Inspiring Students: Strategies to Awaken the Learner* (Marzano, Scott, Boogren, & Newcomb, 2017), there are a number of effective *mental dispositions*—attitudes taken during difficult or challenging situations—that are necessary when setting and pursuing long-term goals. One such disposition, staying focused when answers are not immediately apparent, can be fostered in students by asking them to solve difficult problems and encouraging them to continue with their efforts, even when they struggle. As noted by Robert J. Marzano, Darrell Scott, Tina H. Boogren, and Ming Lee Newcomb (2017), students can practice this disposition by working on problems of unusual thinking. Here, we provide additional problems of unusual thinking in the form of puzzles and riddles.

## Puzzles

### Burning Strings

#### *Problem*

A person is given two strings of different lengths and a book of matches. The longer string will burn for exactly ten minutes from end to end, and the shorter string will burn for exactly one minute. Without using scissors, how can the person measure exactly five minutes and thirty seconds using the matches and the strings?

For a more difficult variation, note that the string is too rigid to be folded perfectly in half to find the midpoint.

#### *Solution*

For the simpler version, the person should fold the longer string in half and identify the exact middle; it should take five minutes for the string to burn to this point. The person repeats this with the shorter string, though the halfway point represents thirty seconds of burning, rather than five minutes. The person lights the longer string first and, as soon as the first flame reaches the midpoint of the first string, lights the shorter string.

For the more difficult variation, the person brings the ends of the longer string together and lights them at the same time, as the flames will meet in the middle after five minutes of burning. As soon as this happens, the person lights both ends of the shorter string in the same way so the flames will meet in the middle after thirty seconds (PuzzlesAndRiddles.com, n.d.a).

## Parking Lot

### Problem

Determine the parking spot number of the car shown in figure 1.

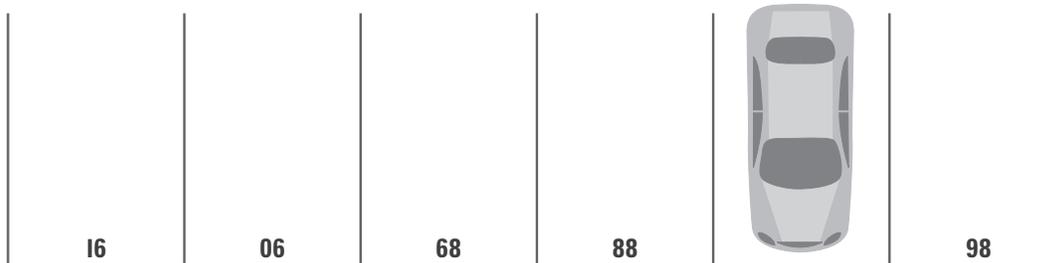


Figure 1: Parking lot puzzle.

### Solution

The answer is spot 87. This solution becomes clear when looking at figure 1 upside down (Genius Puzzles, n.d.).

## Ten Matches

### Problem

Take away six matches from the arrangement shown in figure 2 to make ten.

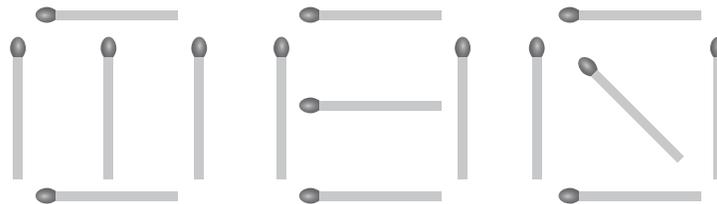


Figure 2: Ten matches puzzle.

### Solution

Remove six matches so that the formation of matches spells the word *ten*, as pictured in figure 3 (Expand Your Mind, n.d.b).

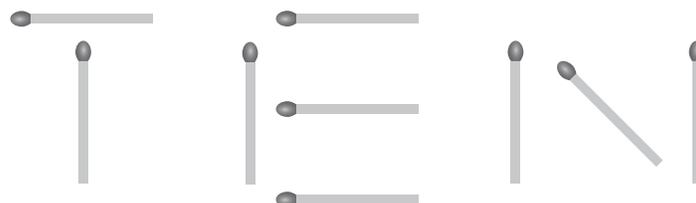


Figure 3: Ten matches solution.

## Switch the Fish

### *Problem*

Consider the arrangement of the wooden matches shown in figure 4. What is the minimum number of matches that must be moved to make the fish face the opposite direction?

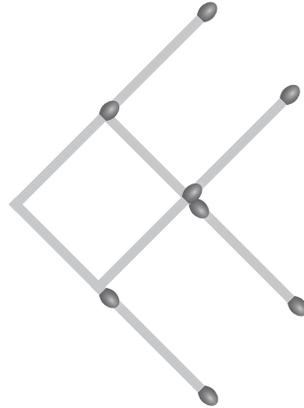


Figure 4: Switch the fish puzzle.

### *Solution*

The answer is three. See figure 5 (A+Click, n.d.).

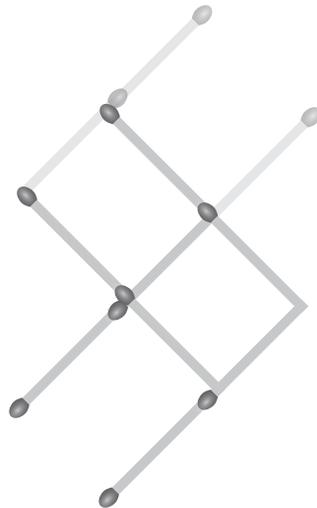


Figure 5: Switch the fish solution.

## Twelve Matches

### *Problem*

What is the maximum number of squares that can be made using twelve identical matches without having the matches cross one another?

### *Solution*

The answer is six squares. The matches can be arranged into a three-dimensional cube with six faces, as shown in figure 6 (A+Click, n.d.).

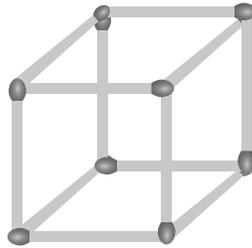


Figure 6: Twelve matches solution.

## Pyramid Flip

### *Problem*

Ten coins are arranged into a pyramid, as shown in figure 7. How can the pyramid be turned upside down by moving just three of the coins?



Figure 7: Pyramid flip puzzle.

## Solution

See figure 8 (PuzzlesAndRiddles.com, n.d.b).

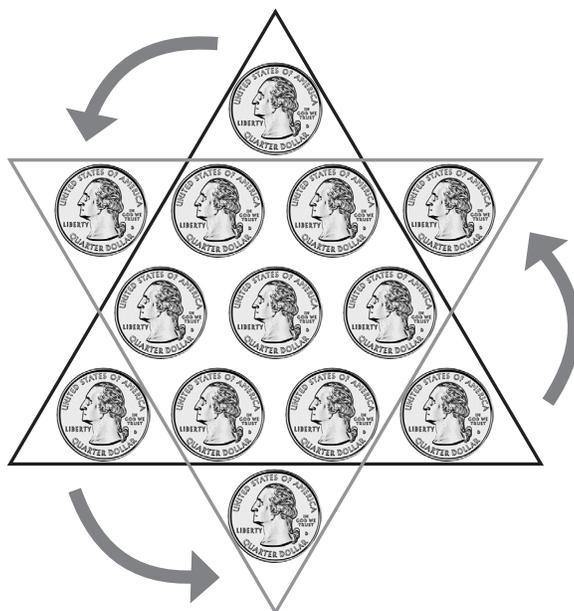


Figure 8: Pyramid flip solution.

## Marbles and Bags

### Problem

Given twelve marbles and three identical bags, a person could place four marbles in each bag to make sure that each bag contains the same number of marbles. Can you think of two other ways to make sure that each bag contains the same amount of marbles?

### Solution

To put twelve marbles in each bag, place all the marbles in one bag, then place the bag containing all the marbles inside the second bag, and deposit this bag inside the third bag. To put six marbles in each, place six marbles in one bag and six marbles in another bag. Put one of these bags inside the third bag (PuzzlesAndRiddles.com, n.d.a).

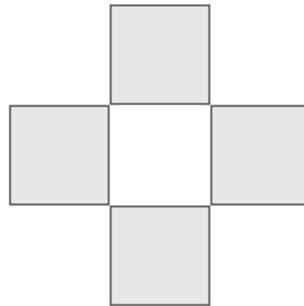
## Four Squares

### Problem

Arrange four identical squares (without interlocking or overlapping the squares) to create five squares of the same size.

### *Solution*

See figure 9 (Harris & Christin, 2007).



**Figure 9: Four squares solution.**

## **Half a Barrel**

### *Problem*

Two workers in a factory are trying to settle an argument over how much liquid is inside a barrel. After opening the barrel up, the two see it is around halfway full. One worker thinks the barrel is more than half full, while the other thinks the barrel is less than half full. How can the two workers settle their argument without using any measuring tools?

### *Solution*

The workers should tip the barrel until the liquid is level with the lowest part of the barrel's top—that is, just before the liquid would begin to spill out. If they can see the bottom of the barrel, then it must be less than half full, whereas if they cannot see the bottom, the barrel must be more than half full (PuzzlesAndRiddles.com, n.d.a).

## **Six Glasses**

### *Problem*

There are six glasses in a row. The first three are full of water and the last three are empty. By picking up only one glass, how can it be moved so that full and empty glasses alternate?

### *Solution*

Pour the contents of the second glass into the fifth glass (Livingstone & Thomson, 2009).

## Hide the Hole

### Problem

A person needs to cover a nine-by-two-foot hole, though, as shown in figure 10, only a six-by-three-foot board is available. How can the person cut the board into two pieces to completely cover the hole without overlapping or extending beyond the edge of the hole?

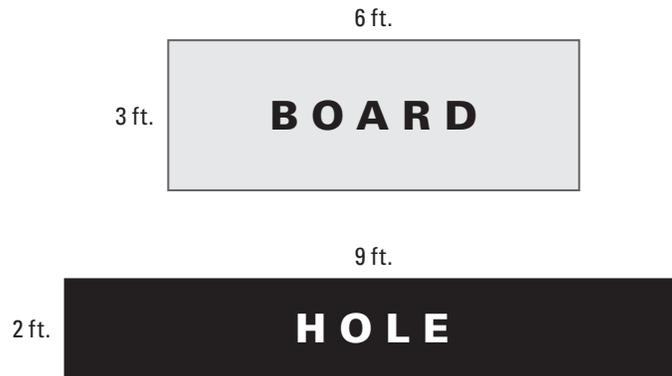


Figure 10: Hide the hole puzzle.

### Solution

See figure 11 (PuzzlesAndRiddles.com, n.d.b).

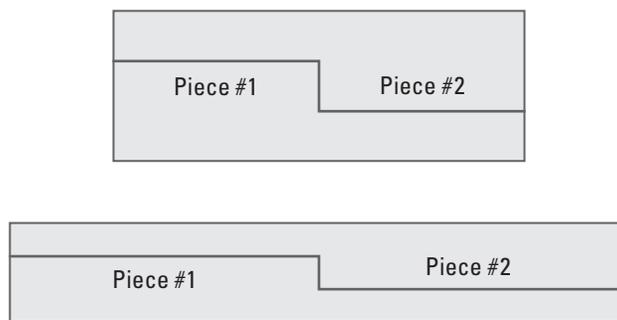


Figure 11: Hide the hole solution.

## Special Deal

### Problem

While dealing out cards for a game with three other players, a dealer is interrupted by a telephone call. When she returns, no one can remember who was dealt the last card. Without counting how many cards each player has or how many cards are remaining, how can she deal out the remaining cards in the deck so that each player is dealt exactly thirteen cards?

### *Solution*

Because the dealer is always supposed to receive the last card, she should deal the rest of the cards from the bottom of the deck, starting with herself and going in the opposite direction she was going before (PuzzlesAndRiddles.com, n.d.a).

## **Boxes of Fruit**

### *Problem*

The labels for three boxes of fruit have gotten mixed up. One box contains just apples, one box contains just oranges, and one box contains a mixture of both types of fruit. The farmer knows that none of the boxes is labeled correctly. How can she correctly relabel the boxes of fruit by only taking out one piece of fruit from one of the boxes?

### *Solution*

The farmer should take a piece of fruit from the box labeled “Apples and Oranges.”

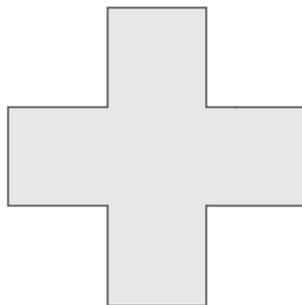
If the farmer takes out an apple, then she knows that the box she picked the fruit from must contain only apples. Thus, she can determine that the box labeled “Oranges” must contain a mixture of apples and oranges—it can’t contain just oranges because of its current label, and it can’t contain just apples because that box has already been identified. The remaining box labeled “Apples,” by process of elimination, must contain just oranges.

If the farmer takes out an orange, similar logic can be used. The box labeled “Apples and Oranges” contains just oranges, the box labeled “Apples” contains a mixture of apples and oranges, and the box labeled “Oranges” contains just apples (Rinkworks, n.d.).

## **Cross Cut**

### *Problem*

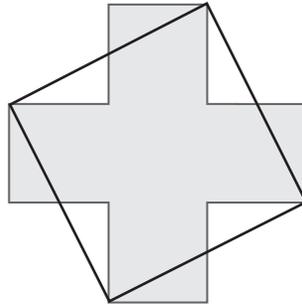
Using only four straight cuts, how can the cross shown in figure 12 be divided into five pieces that can be rearranged into a square?



**Figure 12: Cross cut puzzle.**

### *Solution*

As shown in figure 13, use a diagonal cut to cut off a corner from each arm of the cross. The triangles cut from each arm of the cross will fit into the gaps in between the arms to form a square (Livingstone & Thomson, 2009).



**Figure 13: Cross cut solution.**

## **Which Switch**

### *Problem*

After moving into a new house, the owner is trying to determine which lights the three light switches on the main floor control, as the lights controlled by these three switches are not visible from where the man is standing. Specifically, the new owner wants to figure out which of these three light switches controls the light in the basement. How can the man determine which light switch is wired to the basement light using the three light switches and without having to make more than one trip downstairs?

### *Solution*

The man should switch the first light switch on, leave it on for several minutes, and then turn it off. After turning off the first light switch, he should immediately flip on the second light and then go to the basement. If the basement light is on, the second switch operates this light. If the light is off, the man should touch the light bulb. The man will know that the first switch operates the basement light if the bulb is warm, as the light bulb would have warmed up while it was left on for a few minutes. If the bulb is cool, the man will know that the third switch operates the basement light (PuzzlesAndRiddles.com, n.d.a).

## **Six–Seven**

### *Problem*

Is there a way to use three sixes to make a seven?

### *Solution*

$6 + 6/6 = 7$  (Moscovich, 2006).

## Cut the Cake

### Problem

How can a round cake be cut into eight equal pieces using only three cuts?

### Solution

The cake can be cut two different ways.

1. Divide the cake into four equal quarters using two cuts. Cut the cake in half horizontally for the third cut.
2. *Divide the cake into four equal quarters using two cuts. Stack the four quarters on top of one another, and use the third cut to divide all these pieces in half (PuzzlesAndRiddles.com, n.d.a).*

## Growing Younger

### Problem

Two days ago, Suzy was eight years old. Next year, she'll be eleven years old. How is this possible?

### Solution

Suzy's birthday must be on December 31, and today's date must be January 1 (Rinkworks, n.d.).

## Equal Parts

### Problem

How can four matchsticks be used to divide the square shown in figure 14 into two equal parts?

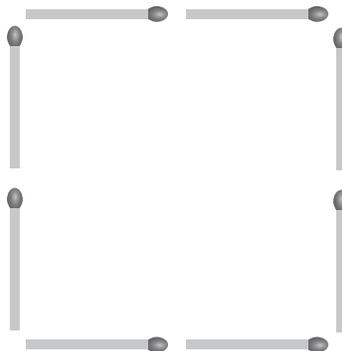
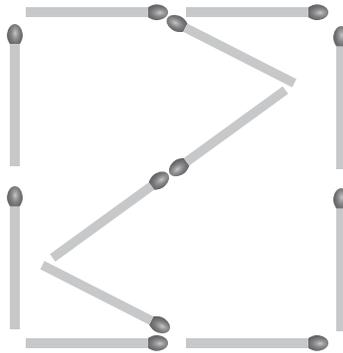


Figure 14: Equal parts puzzle.

### *Solution*

See figure 15 (Genius Puzzles, n.d.).

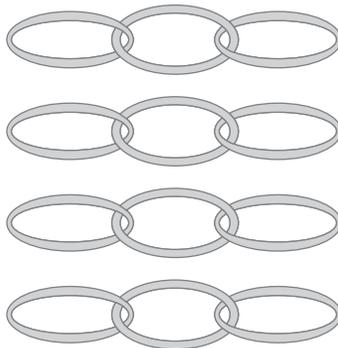


**Figure 15: Equal parts solution.**

## **Cutting Links**

### *Problem*

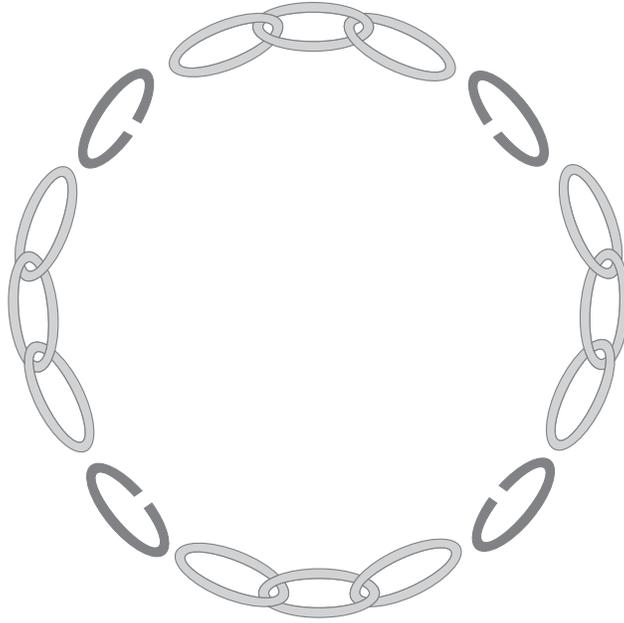
A jeweler is asked to join four three-link chains, as shown in figure 16, into a larger circular twelve-link chain. In order to join two closed links, one of the links must be cut, placed onto another link, and then closed. The clever jeweler finds a creative way to make the circular chain while cutting as few links as possible. How many links does he cut, and what does he do?



**Figure 16: Cutting links problem.**

### *Solution*

The jeweler need only cut three links, all from the same three-link chain. He can then take the three links he cut and use them to join the three remaining small chains together, as shown in figure 17 (PuzzlesAndRiddles.com, n.d.a).



**Figure 17: Cutting links solution.**

## Prison Break

### *Problem*

The warden at a prison gathers a group of twenty prisoners and offers to release them if they can solve his puzzle. Each of the twenty prisoner will be placed in solitary confinement. The warden will choose one of the prisoners randomly to be brought into an empty room with a light switch that does nothing. Once in the empty room, the prisoner can flip the switch up or down or choose to do nothing to the switch, after which he or she will be escorted back to solitary confinement. The warden will then choose another prisoner randomly to be brought to this room to flip the switch up or down or do nothing before being returned to isolation. The warden notes that he can choose the same prisoners more than once if he wants and that the light switch will start in the down position. The warden will continue to choose prisoners randomly to go to this room until one of the prisoners tells the warden that all the prisoners in this group have been to the empty room. If the prisoner is right about all the prisoners visiting the room, everyone will be released. If the prisoner is wrong, the group must remain in jail.

The prisoners are given an hour to come up with a strategy before being taken to solitary confinement. What switch-flipping strategy should they use to guarantee their success?

### *Solution*

The prisoners should choose one prisoner to be the counter. Prisoners who are not the counter will flip the switch to the up position if it is down and they have not previously flipped the switch up—that is, each prisoner who is not the counter will flip the switch up only once from the down position. Otherwise, they will do nothing when they are brought to the room. The counter never flips the switch to the up position. Instead,

whenever the counter enters the room, if the switch is in the up position, he or she will flip it down and add one to an ongoing “prisoner count” he or she is keeping. If the switch is down already, he or she does nothing.

This way, each of the prisoners besides the counter flips the switch up only once, and the counter flips the switch down once for each of the other nineteen prisoners. Once the counter flips the switch down nineteen times, he or she will know that every prisoner in the group has been to the empty room at least once and can signal that to the warden (PuzzlesAndRiddles.com, n.d.a).

## Riddles

### Fragile Name

#### *Riddle*

What is so fragile that when you say its name you break it?

#### *Solution*

The answer is silence (Harris & Christin, 2007).

### Crossing the River

#### *Riddle*

A child was standing on one side of a river and calling to her dog on the other side. Hearing her calls, the dog crossed the river quickly and got a treat for being a good dog. Amazingly, the dog did not get wet. How is this possible?

#### *Solution*

Either the river was frozen or the dog crossed the river using a bridge (Discovery Education, 2015).

### Six Eggs

#### *Riddle*

There are six eggs in a basket. If six people each take one egg, how can it be that one egg is left in the basket?

#### *Solution*

The last person took the basket with the last egg (Lateral Thinking Puzzles, n.d.).

## Escape Room

### *Riddle*

There is a man in a room that has no windows or doors and has walls, a floor, and a ceiling made of six-inch-thick concrete. Despite this, the man manages to leave the room with ease in just a few seconds. What are a few explanations as to how this might be possible?

### *Solution*

Here are a few possible explanations.

- ▶ There are only three walls.
- ▶ He is in a basement and climbs up the stairs.
- ▶ There is no door, so he walks through the doorway.
- ▶ There is no window, so he goes through the window frame. (PuzzlesAndRiddles.com, n.d.a)

## Chicken or Egg?

### *Riddle*

Which came first, the chicken or the egg?

### *Solution*

The riddle does not specify whether the eggs in question are chicken eggs; according to paleontologists, reptiles and dinosaurs produced eggs long before the existence of birds. For example, fossilized eggs that are more than one hundred million years old have been discovered, thus showing that eggs came before chickens (Moscovich, 2006).

## Riddle of the Sphinx

### *Riddle*

In Greek mythology, the sphinx was a mythical creature that had the head of a human and the body of a lion. It guarded the entrance to the Greek city of Thebes by asking all travelers the following riddle: What goes on four legs in the morning, two legs at noon, and three legs at dusk?

### *Solution*

The answer to the sphinx's riddle, which was solved by the Greek hero Oedipus, is a human being. A human crawls on all fours as a baby, walks on two feet as an adult, and uses a cane as a third leg as he or she gets older (Moscovich, 2006).

## The Horse, the Rope, and the Hay

### *Riddle*

A bale of hay is twenty-five feet away from a horse, which is tied to a fifteen-foot rope. Despite this, the horse is still able to eat from the bale of hay. How is this possible?

### *Solution*

The horse's rope is not secured to anything (iRiddler.com, n.d.).

## One-Way Street

### *Riddle*

A girl who is just learning how to drive goes down a one-way street the wrong way but doesn't break the law. How is this possible?

### *Solution*

The girl is walking on foot (Discovery Education, 2015).

## Hunting

### *Riddle*

Two fathers and two sons went hunting for rabbits. They caught three in total, but they each took one home for supper. How is this possible?

### *Solution*

There were three hunters: a grandfather, a father, and the father's son (Livingstone & Thomson, 2009).

## Photograph

### *Riddle*

A man is looking at a photograph when a friend asks him to identify the subject of the photo. The man replies, "Brothers and sisters, I have none, but that man's father is my father's son." Who is in the photograph?

### *Solution*

The man's son is in the photo (Rinkworks, n.d.).

## Longer Word

### *Riddle*

What seven-letter word becomes longer when the third letter is removed?

### *Solution*

The word is *lounger* (Harris & Christin, 2007).

## Catch

### *Riddle*

How can a person throw a ball and have it return to him or her, even if the ball does not have anything attached to it, hit anything else, or have anyone else catch or throw it?

### *Solution*

The person must throw the ball straight up in the air (Discovery Education, 2015).

## Avoiding the Train

### *Riddle*

A man was walking along a railway track when he spotted an express train speeding toward him. To avoid it, he ran ten feet toward the train before jumping off the track. Why?

### *Solution*

The man was walking through a train tunnel or on a bridge when he spotted the train coming toward him. In order to avoid the train, he had to move forward to get out of the tunnel or off the bridge so that he could get out of the train's path (Expand Your Mind, n.d.a).

## Home

### *Riddle*

A girl left home one afternoon. She started out by turning to the right and running straight ahead, eventually turning left, and running straight ahead again. She turned to her left, then ran straight two more times, each time running even faster. She saw a boy in a mask waiting for her as she turned toward home. Who was he?

### *Solution*

The girl is playing on a baseball team, and the masked boy was the catcher (Discovery Education, 2015).

## Consecutive Days

### *Riddle*

Name three consecutive days in English without using the words *Tuesday*, *Thursday*, or *Saturday*.

### *Solution*

Yesterday, today, tomorrow (University of Kent Careers and Employability Service, n.d.).

## Horse Race

### *Riddle*

A wealthy old man must determine which of his two children will inherit his fortune. He proposes that his two sons ride their horses in a race across the desert, and whichever horse crosses the finish line last will win the fortune. The brothers wander aimlessly across the desert for days, as neither is willing to cross the finish line first. During their wanderings, they run into a wise man, who gives them some advice. After hearing his advice, the brothers leap onto the horses and charge toward the finish line. What advice did the wise man give?

### *Solution*

The wise man told them to switch horses. The rules of the race state that the owner of the horse, not the rider of the horse, that crosses the finish line last will inherit the fortune (Rinkworks, n.d.).

## Coin in a Bottle

### *Riddle*

A man has placed a coin in an empty wine bottle and a cork in the neck of the bottle. Without using any extra tools, taking out the cork, or breaking the bottle, how can he get the coin out?

### *Solution*

The man can push the cork into the bottle and shake out the coin (PuzzlesAndRiddles.com, n.d.a).

## Window Cleaner

### *Riddle*

A window cleaner is cleaning the windows on the topmost floor of a skyscraper when he slips and falls. He is not wearing a safety harness and nothing slows his fall, yet he picks himself up and walks away unharmed. How is this possible?

### *Solution*

The window cleaner is cleaning the interior of the windows from the inside (University of Kent Careers and Employability Service, n.d.).

## **Driving**

### *Riddle*

If you drive a car leaving City A with thirty-five passengers, drop off six and pick up two passengers at City B, pick up nine more at City C, drop off three at City D, and then arrive at City E after forty minutes, what color are the driver's eyes?

### *Solution*

The answer is the color of your eyes (University of Kent Careers and Employability Service, n.d.).

## **Pacific Ocean**

### *Riddle*

What was the biggest ocean in the world before the discovery of the Pacific Ocean?

### *Solution*

The answer is the Pacific Ocean. The ocean still existed before it was formally discovered by explorers (Harris & Christin, 2007).

## **Digging Dirt**

### *Riddle*

How much dirt does a hole that is nine feet deep and three feet wide contain?

### *Solution*

None, as a hole in the ground is created by the absence of dirt (Discovery Education, 2015).

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