Logic Problems

*Some notes:*

*These problems should be done in groups of 3-4. Students should always be reminded and encouraged to draw pictures to solve these problems. Most of these problems will take students 5-20 minutes.*

Counterfeit Coin Problem

You have eight coins. One of the coins is counterfeit, but you cannot tell by holding the coin, looking at the coin or manipulating the coin in any way. The only thing you have to use is a balance scale to weigh the coins. The counterfeit coin will be slightly lighter than the others. The catch is you can only use the scale twice. How will you find the counterfeit coin?

Put 1 through 9 into the boxes so no 2 consecutive numbers touch.

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Mastermind

This game of mastermind uses eight colors. The teacher selects three colors for their combination. The teacher is not picking any repeat colors. With this version of the game, the students should be able to have the answer in 6 guesses or less. If students have never played before, it is good to do an example on the board to show expectations. The very first time you play it will probably take 30 minutes to explain, demonstrate, and move through two rounds.

Eight Colors

Red Blue Yellow Green Magenta Orange Purple White

Game rules:

1. The teacher puts the students into groups of 3.
2. The teacher picks the secret code. (Three colors/no repeats.)
3. Explain to students they will be making their guess one set at a time (three colors)
4. Before allowing the students to start working in their groups, tell them that each guess they make is a clue to the secret code. Encourage the students to use the first letter of each color as they guess. This will get them into the routine of using symbols.
5. Teacher will call the students over for each round of guesses. By calling them by Round 1, Round 2, etc., you are ensuring the the teams are not rushing.
6. When students bring up their guess, tell them how many colors they have correct, then how many colors they have in the correct space. (For example, 1 correct, none in the right space)
7. Students will return to their groups to formulate their next guess. Give groups about 45 seconds between guesses.
8. Call students up for round two and repeat steps 6-7.
9. If students guess in 6 or less, then they win! If they do not complete their guesses in 6 or less then their game is over.
10. Have a winning and losing team place their guess process on the board. Have them explain their process and discuss logically why their guesses made or did not make sense. Explaining the process at the end will help make all groups more successful.

King and Poison

You are a prisoner sentenced to death. Luckily for you, the King is feeling generous. He provides you with an opportunity to live. You are given 24 identical glass vials, 12 filled with water and 12 filled with poison. You cannot tell by look, weight, color, odor, etc., which is water and which is poison. The King also provides you with two boxes. You must put all of the vials in to either of the two boxes and the king will pick on box randomly. (Each box must have at least one vial.) He will pick the box, shake it, and then give it back to you. You must pick a vial and drink it. If it is water you go free; if it is poison, you die. How can you give yourself the best chance of survival? (\*\*Please note, you cannot guarantee your survival, you just want to give yourself your best chance.\*\*)

Make this statement true, by adding one line segment. You cannot alter the = sign. For example you cannot make the = sign a not = sign by placing the line segment on top of it.

5 + 5 + 5 = 555

Using the digits 1, 2, 3, 4, 5, and 6, make a multiplication equation that uses each digit once.



X 





Move one coin to make two rows of four

O

O

O

O O O

Each letter in the equation below stands for a single digit 0-9. No two different letters can be the same. (For example, G cannot represent 2 and R cannot represent 2). On the other hand, letters that are the same must be the same number. (For example, if one G is a 1, then all Gs must be 1.) At the end of the problem, you will have no two different letters will have the same number and the numbers will add up to the letters in RIGHT. (Keep in mind there are multiple solutions.)

 WRONG

+ WRONG

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 RIGHT

As with the problem above, you are applying the same rules to this equation:

 SEND

 +MORE

\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MONEY

You are a postman and you are carrying four boxes. On top of each box is a label; the label is not attached, just resting on top of the box. You trip and fall; the boxes and the labels go flying. You do not know which label goes with each box, but you do not want to get in trouble so you put any random label on any box. What is the chance you will have exactly three labels on the correct box?

You have three switches in your kitchen, and they correspond with three light bulbs in your basement. You cannot see the light bulbs from the kitchen. You want to find out which switch goes to which bulb but you can only go down the steps once. How are you going to find out which switch goes to which bulb?

You have a 40 pound block of wood and a balance scale. What is the minimum amount of pieces you could cut the block of wood into to measure all whole number weights

 1 through 40 lbs?

Card Deck Algorithm Logic

**Scenario 1**

Pull the cards, A-10 out of a card deck. (It is preferable that they are the same suit). The goal is to devise an algorithm that when you deal the cards A, 2, 3...10 they are in order. Here is the catch: you are dealing the cards out one face up, then one to the bottom of the deck, one face up, one to the bottom of the deck…..and this will continue until all the cards are face up in order. The students need to work in groups to find/solve the pattern.

**Scenario 2**

Pull the cards, A-10 out of a card deck. (It is preferable that they are the same suit). The goal is to devise an algorithm that when you deal the cards A, 2, 3...10 they are in order. Here is the catch: you are dealing the cards out one face up, then two to the bottom of the deck, one face up, two to the bottom of the deck…..and this will continue until all the cards are face up in order. The students need to work in groups to find/solve the pattern.

**Scenario 3**

Pull the cards, A-10 out of a card deck. (It is preferable that they are the same suit). The goal is to devise an algorithm that when you deal the cards A, 2, 3...10 they are in order. Here is the catch: you are dealing the cards out one face up, then three to the bottom of the deck, one face up, three to the bottom of the deck…..and this will continue until all the cards are face up in order. The students need to work in groups to find/solve the pattern.

**Scenario 4**

Pull the cards, A-10 out of a card deck. (It is preferable that they are the same suit). The goal is to devise an algorithm that when you deal the cards A, 2, 3...10 they are in order. Here is the catch: you are dealing the cards out one face up, then **one** to the bottom of the deck, one face up, **two** to the bottom of the deck, one up, **three** to the bottom of the deck ( then 4 then 5...etc) and this will continue until all the cards are face up in order. The students need to work in groups to find/solve the pattern.

**Putting the cards in order**

Students should be placed in groups of three and given a deck of cards. Explain to students that they will be developing a strategy to place the cards in order A-K by suit. All the hearts should be in order, all the diamonds, all the spades and all the clubs. It does not matter which suit they place first in the deck, but all the cards in that suit must be in order. The goal is to complete this as quickly as possible with their group members.

1. All students should be given a shuffled deck and be told the goal.
2. Clarify any questions about suit, make sure the students see an example of what the cards look like in order.
3. Give students five minutes to practice and develop their strategy in their groups.
4. After five minutes, make sure each group shuffles a card deck for another group to ensure that the decks are shuffled
5. To be finished, the students must order their deck, place the deck in a neat pile face down on the table, and all members must place their hands above their heads to indicate they are finished and not touching their cards
6. Go around to each group in the order they finished to see if their cards are in order, if there is a mistake they are disqualified.
7. Allow students another three minutes to see if they can improve their algorithm and repeat steps 5-6