

# IMPROVING YOUR TESTING SKILLS & DEVELOPING YOUR SCIENTIFIC MIND

**(With Games Testers Play)**

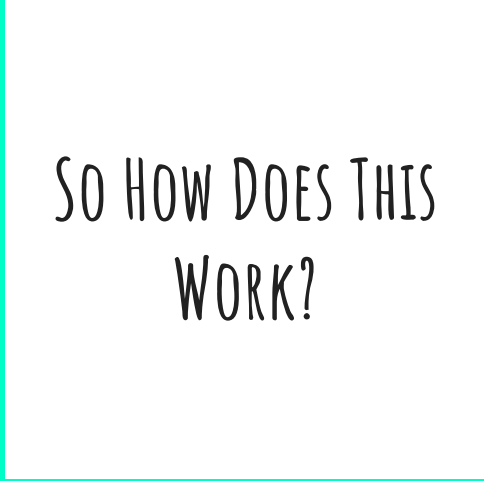
## WHY DO WE DO THIS? (TEACH CRITICAL THINKING W/ GAMES)

Over the years, one thing I continuously observe is that whenever we encounter a problem, we tend to always approach it the same way.

We are biased internally to the tools and techniques that we have learned and often times, it's difficult to break out of this pattern. In effect, we're predisposed to stay in a rut.

Remember to pick your rut carefully. Odds are that you will be stuck in it for a long time!





SO HOW DOES THIS  
WORK?

## WAYS WE CAN DEVELOP OUR SCIENTIFIC MIND

- Pose useful questions (ALWAYS ask questions!)
- Observe, Describe and Record everything we see
- Think critically about what we know\*
- Recognize and manage bias
- Design hypotheses and craft experiments to validate or refute
- Engage someone else and analyze their thinking
- Reason about cause and effect

\* Remember: when we use the word “facts”, we are simply referring to what we think we know

## SOME TECHNIQUES...

- **Focus then defocus**. Sometimes we need to target a specific detail. Other times, we need to step back and think less narrow.
- **Forward then backward**. Search for evidence to backup a theory. Then search for a theory based on evidence you have determined.
- **Dumb questions can lead to interesting answers**. Don't be afraid to ask as many questions as you can, even if they are seemingly stupid questions.
- **Flat lining**. If you are getting nowhere with a technique, it's time to stop. Try a different type of testing.
- **Visualize the data!**
- **Break the rules!**
- **Create your own data sets!**

## FOCUS

The technique of using “Focus” helps us when we are confused or too many variables are in play at any given moment. So we need to:

- Simplify the test
- Conserve states
- Repeat actions
- Return to a known state
- Investigate OFAT (One Factor At a Time)
- Make precise observations



# DEFOCUS

We can instead try to “Defocus” in an effort to find more elusive bugs

- Look over recent tests (or observations) to find patterns
  - This is huge in working with Big Data, Machine Learning and Data Science!
- Attempt to violate these patterns with new tests
- Use an MFAT approach (test Multiple Factors At a Time)
- Broaden and vary our observations

# FORWARD THEN BACKWARD

- Based on patterns you identify, try to create a rule or algorithm that satisfies that condition
- Ask yourself: what other data do I need to prove that theory?
- Then... for this set of data, try to determine are there any other possibilities that could be the cause?

What would happen if I hired two private investigators to follow each other?



# SILLY QUESTIONS THAT CAN AID CRITICAL THINKING



- Huh? What?
  - Make sure you develop understanding
- Really? Are You Sure?
  - Know that what you understand might be incorrect
- So what? Who cares?
  - What you may know might not matter

## FLAT-LINING

Sometimes, we simply need to just pull the plug and walk away. That's OK! Don't be afraid to do that (or use an alternative testing technique)



## BONUS ~~GAME~~ LEARNING SIMULATION: COMBINATORIAL LOGIC PUZZLE

Three boys (Jake, Anthony and Carlos) and two girls (Abigail and Paige) went on a trip to the zoo.

All five kids have five different favorite animals that they want to see: monkeys, alligators, bears, lions, and giraffes.

Each of the five children ate one of the five different things as a snack: popcorn, chips, pretzels, nachos with cheese, or crackers.

Each child bought one souvenir: a stuffed rabbit, a lion t-shirt, a key-chain, a plastic snake, or a stuffed monkey.

Figure out from the clues that follow which child likes which animal, who ate what for snack, and who bought what for a souvenir.

## BONUS ~~GAME~~ LEARNING SIMULATION: COMBINATORIAL LOGIC PUZZLE

- One of the kids got so excited to see their favorite animal, the alligators, that they spilled their popcorn all over the place.
- Paige really didn't want to see the alligator exhibit because she doesn't like reptiles or anything that has scales.
- The stuffed monkey got a little bit of nacho cheese on its face from its owner's kisses.
- All day after visiting the zoo, Jake kept making lion noises, even in his sleep!
- Abigail and Carlos both got a snack that involved chips.
- The kid who bought the t-shirt loved it so much that he slept in it despite pretzel crumbs getting into his bed.
- The nacho lovers' favorite animal is the monkey.
- None of the boys bought a stuffed animal.
- The kid with the keychain picked one with their favorite animal, a gator, on it.
- One of the girls just loved the new bear exhibit. It was her favorite part of the day.

THANKS!

ANY Q'S?

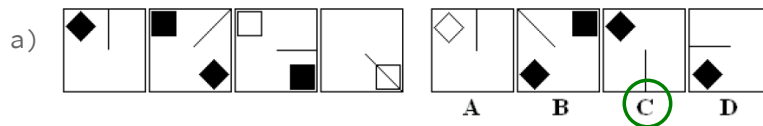
PUTTING IT ALL  
TOGETHER

## Abstract Thinking Puzzles

1. What number comes next?

a) 8, 27, 64, 125, 216, 343

2. Which figure completes the sequence?



## Art Dealer Game

- Eric and Bob are art dealers and you're an artist with art to sell
- Your art theme happens to be playing cards
- We have specific types of your art which I want
- Your mission is to figure out which types
- How?
  - You're to show us 4 of your art pieces at a time
  - We'll select the ones we want, leave the ones we don't
  - You must figure out which types I want before you run out of the types of art I want





## Hints

- Think value of card (as in Blackjack)
- That Ace can be 1 or 11
- Think color over suit
- Use a table!



## Condition Table

	Hearts	Diamonds	Spades	Clubs
Deuce	XX			
Three		XX		
Four		XX		
Five	XX			
Six				
Seven				
Eight				
Nine				
Ten				XX
Jack			XX	
Queen			XX	
King			XX	
Ace	XX		XX	

# Condition Table

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Ten			X	X
Jack			X	X
Queen			X	X
King			X	X
Ace	X	X	X	X