# Gaian Ocean

# Dionys

## Problem Set 04

## Tedious Dionysian Game Shows


*Χαῖρε*, friend. I'm stuck on a long layover in Ageleia, and I've only just now noticed that I forgot to pack chargers for my devices. *Now I am beholden to the fates of an airport bar TV wall.*

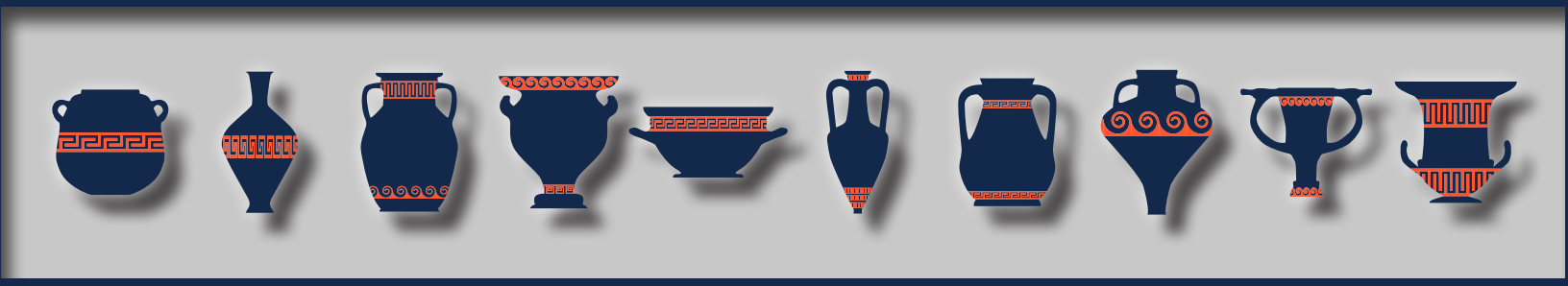
Naturally, they've got on shows from all over Olympia, but the biggest screen is reserved for the Anthios Broadcasting Company, which is based in Thebes, Dionys. Thanks to the libertine Dionysian spirit, ABC puts out hedonistic shows like *Keeping Up with the Maenids*, *CSI: Satyria*, and *Better Call Acetes*. And that other one you like!

But not all the shows are awesome: the Dionysians go *bonkers* for game shows of all sorts. And not just any game shows: truly torturous game shows with the most wickedly twisted sadistic hosts putting contestants through the absolute worst choices you've ever seen. Most of the time it works out, but sometimes the contestants seem to get really confused. That happened a few times while I was sitting at the airport! Maybe this will make more sense if we work on it together.

Socrates

# THE GAME OF ZONK!!!!

The show that got me the most confused was called **ZONK**.



At its core, **ZONK** is a game of urns: the contestant is presented with a series of urns by the evil game show host; the current host of **ZONK** is some idiot named Dendrites Entheos. Dendrites's only job seems to be second-guessing each decision that contestant makes, not to mention the occasional creepily-long hug for particularly-enthusiastic contestants.

Each urn contains several balls, and each ball is labeled with a prize (or anti-prize, as it were). The contestant knows how many of each kind of ball is in each urn, and the task is to make a series of decisions leading toward the final selection of a "good" urn—one containing many balls pointing toward incredible prizes and few balls pointing toward goat shit. Yes, goat shit. Hey, in a country based on wine-growing, you need your nitrogen. Once they've arrived at their Final Urn, they draw a ball out of it and see what they've won.

But here's the thing: the contestant's decisions over urns have to follow certain rules. If the decisions the contest makes along the way fail to abide the Four Rules of **ZONK**, then they're immediately disqualified, and they're not allowed to pull a ball from any urn. What's more, some idiot stangehand Pentheus comes out dressed like a pirate and shouts **ZONK ZONK ZONK** to the sadistic crowd's delight. I don't know. It's all confusing, especially these four rules.

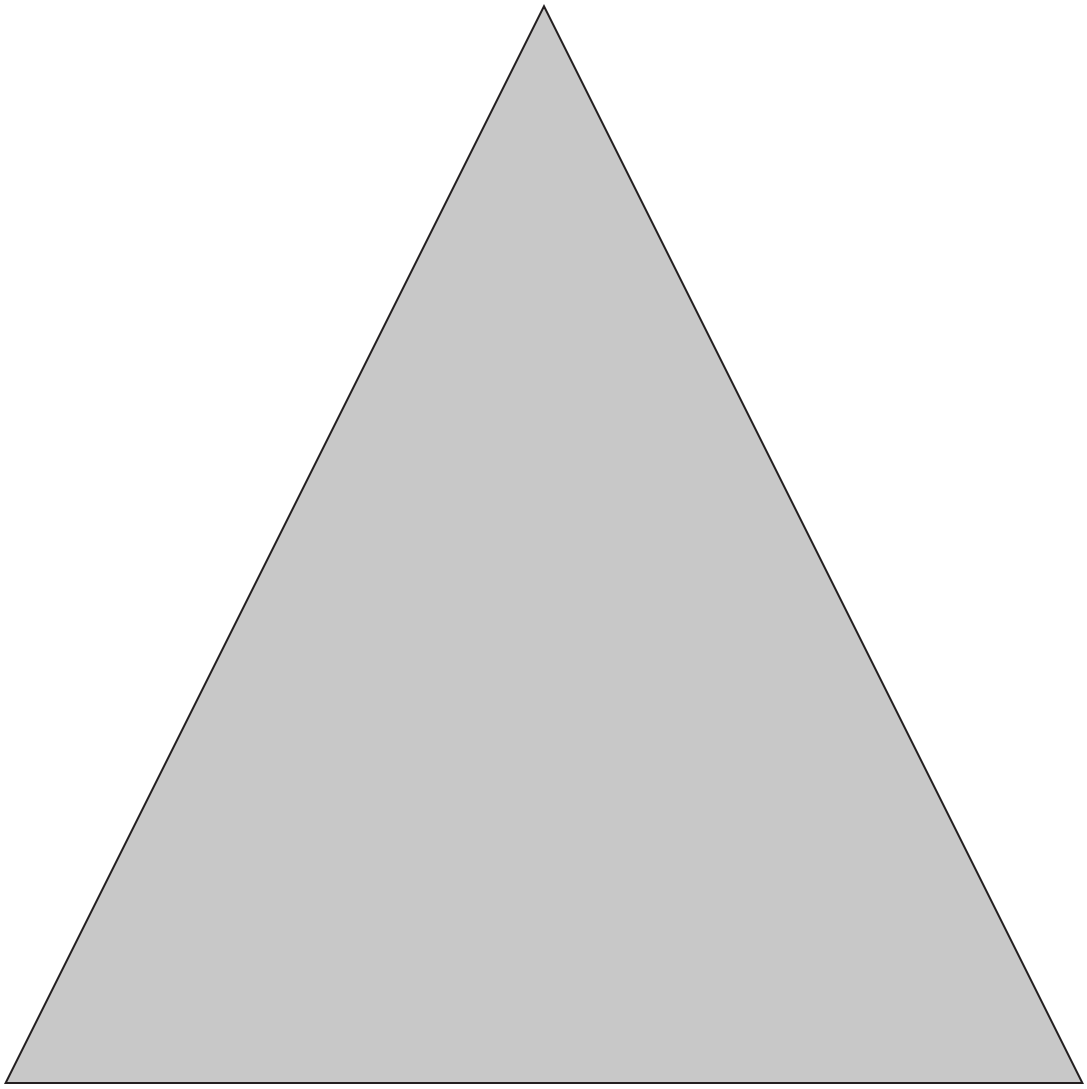
# PART 1 | ZONK!!!!

So I was watching this contestant Ino Thyllophorus play the game. The stakes were pretty high: each ball in her urn choices was labeled either "2.5M", "500K", or "nothing." The first of these meant Ino would receive 2.5 million Dionysian Maenids; the second meant she'd receive 500 thousand Dionysian Maenids; and the third, of course, meant she'd win nothing.

Her first decision was between these two urns:


And, her second was between these two urns:


*Before moving on to the next page, why don't you think about which urns you'd choose if these were American dollars instead of Dionysian Maenids? What kind of thoughts are you thinking as you think that through?*




Let's think this through:

1. Write out the three relevant degenerate lotteries as probability vectors, and place them into a space like the one above. (In terms of order, write the 2.5M probability first, then the 500K, and then nothing.)
2. Assuming Ino prefers more money to less, write out her preferences over these degenerate lotteries.
3. Using those same preferences, draw the associated arrows over the lotteries in the space you've drawn.
4. Place the four urns in the space you've created (making sure you've labeled which one is which!) (Need not be to scale.)
5. Ino chose Urn 1A in the first decision and Urn 2B in the second. Write out her preferences over the urns.
6. Using those same preferences, draw the associated arrows over the urns in the space you've drawn.
7. What is the expected value of the four urns? Can we explain Ino's choices using expected value?
8. Just as soon as Ino said "2B", that jerk Pentheus ran out and shouted **ZONK ZONK ZONK**. But I have no idea why! Can you tell me?

necessary for **PASS**: get 5

sufficient for one **ALMA**: get 8

sufficient for another **ALMA**: what does any of this have to do with risk, or the St. Petersburg paradox, or concavity? A good answer should take 250-1000 words.

# PART 2 | MACHINE OF DISAPPOINTMENT

The next show I watched was a **ZONK** spin-off called Machine of Disappointment. This is an even crueller game.

The first thing they do on Machine of Disappointment is offer the contestant three hypothetical scenarios. In this case, the contestant—a wise-seeming fellow named Tacitus—could either take a lovely trip to Ortygia, Artemissia (known for its rugged natural beauty), or he could win a special edition of *The Ortygian Huntress* (the greatest movie in Artemissian cinema, which is underrated!), or he could get nothing. They asked him what he wanted, and like any regular person, Tacitus said he preferred the trip to the movie and the movie to nothing.

This was an especially evil show. The host then gave Tacitus two urns: in Urn 1, 999 out of 1000 balls were labeled "TRIP", while 1 ball was labaed "MOVIE". In Urn 2, 999 out of 1000 balls were labeled "TRIP" while 1 ball was labeled "NOTHING." The host asked Tacitus which urn he preferred. Tacitus paused for a moment, and then, in a moment of weakness, he admitted that it would stink to have to watch The Ortygian Huntress when feeling the disappointment of not taking a trip to Ortygia. In other words, Tacitus preferred Urn 2 to Urn 1.

Suddenly that idiot Pentheus ran out again and shouted **ZONK ZONK ZONK**. What is *wrong* with these people?!

1. Write out the three degenerate probability vectors described in Tacitus's first choice (ranking the three alternatives), and write out his stated preferences.
2. Write out the two urn lotteries as probability vectors, and write out his stated preference.
3. Place all five of these lotteries into a simplex like the one above, with TRIP at the top, MOVIE at the bottom-left, and NOTHING at the bottom-right.
4. Using utility numbers $u_{\text{Trip}}$, $u_{\text{Movie}}$, and $u_{\text{Nothing}}$, write out Tacitus's expected utilities for the five lotteries described. Is there a problem there?
5. Why did Tacitus get **ZONK**ed?!

necessary for **PASS**: get 3

sufficient for one **ALMA**: get 5

sufficient for another **ALMA**: describe a decision problem where your preferences might change depending on what all is on the menu. Make sure to make precise use of the term "independent" while discussing why this decision problem might not be a good fit for the von Neumann and Morgenstern approach to decisionmaking under uncertainty.