

## Understanding Minimalistic Theatrical Structures Using Mathematical Induction

In each day, there are twenty four hours that continually repeat for a week, and then a month, and then a year... and so on. The common knowledge is that this will continue on for all eternity, no matter how many hours we tack on to the day, at 12 hours, a clock will have completed a cycle and wind up exactly where it started, signaling a 2-cycle day. This is a simple example of mathematical induction, where if one can prove a base case, and then prove induction, one can show the next instance in the pattern that holds true for all of the pattern's instances. Not only this, however, the consistent repetition is a common technique in minimalist artwork, which unlike a clock that cannot record the complexity of history, allows for a development in plot and complexity of themes. Using Arthur Miller's *The Crucible*, and Samuel Beckett's *Waiting For Godot*, I argue that through the application of induction, an understanding of minimalist theatrical structures can arise.

Mathematical induction is a simple proof concept, where one "suppose[s they] want to prove that every natural number has some property P" (Velleman 260). For example, if one wanted to prove that, for every natural number  $n$ ,  $2^0 + 2^1 + \dots + 2^n = 2^{n+1} - 1$ , then all that would need to be done is to prove a base case (say  $n = 0$ ).  $2^0 = 1 = 2^1 - 1$ ; which is true. Thus, mathematical induction can occur where  $n$  now stands for an arbitrary, natural number, and assume  $2^0 + 2^1 + \dots + 2^n$  is equal to  $2^{n+1} - 1$ . Then  $2^0 + 2^1 + \dots + 2^n + 2^{n+1} = (2^0 + 2^1 + \dots + 2^n) + 2^{n+1}$ . It should be noted that  $(2^0 + 2^1 + \dots + 2^n)$  can be replaced with  $(2^{n+1} - 1)$ , and thus would end up as  $(2^{n+1} - 1) + 2^{n+1}$ ; which equals  $2 \times 2^{n+1} - 1$ . This is equal to  $2^{n+2} - 1$ , which is the goal of this proof. Thus, the theorem has been proven true, and for all natural numbers,  $n$ ,  $2^0 + 2^1 + \dots + 2^n = 2^{n+1} - 1$ .

As defined by the Metropolitan Museum of Art, minimalism is an art form that “derives its name from the minimum of operating means. Minimalist painting is purely realistic – the subject being the painting itself” (MoMA Learning). However, to go further than just the idea of using minimal elements to express an idea, minimalism seeks to create patterns through this method of using minimal elements. Using this simplistic structure to tease out complex themes and elaborate patterns, minimalist artists exist to let a piece of art stand alone on its own merits, and really strike at the core necessities of the artwork. In most minimalist pieces, there is a repetition which allows for this growth in complexity. To view this in mathematical terms, every phrase of music has an element that was repeated in the first phrase. Looking at minimalistic theatre, one can apply this repetition to the act structure, in looking at which acts are written/directed with the same properties. Thus, mathematical induction is the perfect concept to show minimalist theatrical structures.

Ivo Van Hove’s adaptation of Arthur Miller’s *The Crucible* embodies this idea of stripping away any elements non-essential to its plot. Through using the text to express repetition throughout the four acts, Van Hove teased out a simple act narrative: a still start, a slow rise of action leading to the inciting incident, a rapid rise of action, and a chaotic end. To prove this through induction, first there must be a base case: Act One. Act One opens with Reverent Parris kneeling in silent prayer over his daughter, Betty Parris. The stage is quite still. Van Hove allows the act to unfold naturally, as written in the text, where most of the set up leads to the inciting incident of the act, which is the point where Hale asks Abigail, “Did you call the Devil last night” (Miller, 40). This places Abigail in a fight or flight situation, which rapidly escalates the scene by shifting blame over to Tituba. At this point in the play, Van Hove speeds up the text, as

the textual patterns are hurried and fear-driven, all leading to the chaotic ending where the witches list off names.

To show the induction step, Act One Plus One must have the same structure as Act One. Thus, in Act Two, the same structure can be seen. Van Hove starts off the scene with Proctor's wife, Elizabeth, stirring soup before Proctor enters. The slow rise of action occurs at several points, Marry Warren's entrance and gift, the appearance of Mr. Hale, the interrogation. However the inciting incident occurs when Cheever discovers the poppet, and the blame starts to get shifted around. There's a rapid rise in the action from here, while Elizabeth is taken away, and Proctor is left to engage Marry Warren in a wrestling match on stage, ending the scene in chaos. Thus, Act Two, or Act One Plus One, holds to the same theorem used in Act One, and thus it can be induced that all of the acts in *The Crucible* will be directed/have been written in this manner, or all acts have the same arc property. Thus, through this induction of theatrical structure, an example of minimalism is shown: using a minimum of techniques to produce complexity throughout a piece of art.

Similarly, Samuel Beckett's *Waiting For Godot* can be understood in the same way, looking more strictly at the text. Considered a minimalistic piece in its setting, props, and language, *Waiting For Godot* expresses absurdist, existential themes. The plot: two men sit around and wait for Godot to show up, which never happens, for the entirety of the play. To prove this pattern holds by induction, first there must be a basis from which to induct. Thus, in Act One, Vladimir and Estragon sit around waiting for Godot. They interact with Pozzo and Lucky, drawing an absurd relation between the two pairs, and in the end, are told that Godot "won't come this evening but surely tomorrow" (Beckett, 41). The scene ends with Estragon and Vladimir not moving.

To prove that rest of the play follows the same structure, Act One Plus One must now be proven to follow the same structure as Act One. Indeed, the scene starts out with Vladimir and Estragon sitting around waiting for Godot, having an absurd interaction with Pozzo and Lucky, and then being told by a boy that Godot will not be coming that day, but the next. The second act ends with Vladimir and Estragon not moving, just as the first act. Thus, through induction, it can be implied that all of *Waiting for Godot* follows this structure, however there are only two acts in the play, thus not only is it implied that the entire play is a practice of repetition, but it can be stated as fact, with limits. However, instead of hypothesizing about the play itself, as in *The Crucible*, *Waiting For Godot* asks its audience to imagine that the characters will continue to sit around and wait for Godot, day after day, with bizarre happenings along the way after the play ends. Through this, an example of using minimalist techniques allows for a logical mathematical induction, and offers the audience to think further than just the text itself, and draw its own conclusions to its meaning.

Thus, minimalism can come to be understood as a repetition, much like a 12-hour clock. However a clock cannot record history, and express the complexity of life. Thus, minimalism can come to be understood as not just repetitive style, but a form of repetitive measurement, like the circular pattern of a clock. Thus looking at minimalism through the lens of mathematical induction, one can see that it both measures, and seeks to build upon, itself through the reiteration of textual themes and patterns. Induction can be understood as a measurement of truth statements on a pattern that holds true for some theorem. Thus, minimalism can be seen to measure sameness and repetition, in order to understand the complexity of the world. As a style, it can help audiences understand more about the relationship of the text, and nature of the world

created within the minimalistic art piece. As long as there is a base from which minimalism can build off of, any form of complexity can arise.

Through looking at *The Crucible* and *Waiting for Godot*, through the eyes of minimalism and mathematical induction, it can be shown that all minimalistic theatrical pieces can be analyzed in similar form, and used as a measurement of sorts to understand complexity within literary works.

#### Works Cited

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