UNIT 8: ENUMERATIVE INDUCTION

UNIT STRUCTURE

8.1: Learning objectives
8.2: Introduction
8.3: Enumerative Induction
8.4: Components of Enumerative Induction
8.5: Basic Characteristics of Enumerative Induction
8.6: Enumerative Induction is a form of Proper Induction
8.7: The Value of Enumerative Induction or Induction per Simple Enumeration
8.8: Enumerative Induction is an imperfect form of induction
8.9: Enumerative Induction: Complete Enumeration and Simple Enumeration
8.10: Let Us Sum Up
8.11: Further Readings
8.12: Answers to Check Your Progress
8.13: Model Questions

8.1: LEARNING OBJECTIVES

After going through this unit, you will be able to:

- Explain Enumerative Induction;
- Describe what Enumerative Induction refers to;
- Identify the various components of Enumerative Induction;
- Discuss the key features of Enumerative Induction;
- Determine whether Enumerative Induction and Induction by Simple Enumeration are the same;
- Is Enumerative Induction a form of Induction proper;
- Discuss the value of Enumerative Induction;
- Assess how useful or valuable Enumerative Induction really is;
- Is Enumerative Induction an imperfect form of Induction;
- Distinguish between Complete Enumeration and Simple Enumeration;
- Is induction based merely on enumeration, whether complete or incomplete?
- Determine whether induction can achieve certainty through enumeration alone, and so on.

8.2 INTRODUCTION:

Induction can operate through two contrasting approaches: elimination and enumeration. Now, the question arises: What is Enumerative Induction? Enumerative Induction involves drawing broader conclusions about a group based on specific observations of its members, where the accumulation of confirming instances boosts the likelihood of future occurrences following the same pattern. This reasoning process works by counting and examining observed cases, then assuming the trend holds true for unobserved instances. Thus, it is a type of inductive reasoning that generalizes a conclusion about an entire group based on a sample, moving from specific cases to a universal claim. For instance, observing numerous white swans might lead to the inference that all swans are white, illustrating how enumerative induction broadens the scope of a conclusion beyond observed instances. This type of reasoning is somewhat embedded in traditional syllogistic logic, typically following the "*Some As are B*, therefore, *All As are B*" structure, and exists partly due to its pervasive nature and the framework allowing its definition. This makes it clear that Enumerative Induction reasons from particular instances to all instances, making it an unrestricted generalization, where a sufficiently long sequence of confirming cases leads to a strong likelihood of subsequent instances being true.

This unit is primarily concerned with Enumerative Induction, its components, basic features, and so on. Let us explain each of these in turn.

8.3 ENUMERATIVE INDUCTION:

Enumerative Induction is a fundamental form of Inductive reasoning that involves inferring a general rule or law from a, usually finite, set of positive, observed instances. It involves taking a characteristic found in observed instances and applying it to the whole group, essentially moving from "*Some As are B*" to "*All As are B*". This process is non-monotonic and defeasible, meaning it doesn't ensure the truth of the conclusion, and additional evidence can change the outcome. At its heart, Enumerative Induction is about spotting a pattern in observed cases and extending it to unobserved ones or the entire class. It is important to note here that Enumerative Induction and Induction per Simple Enumeration are basically one and the same in classical logic. They are a simple way of making a general conclusion based on a few instances without discovering any causal connections. Thus, Enumerative Induction or Induction by Simple Enumeration is the establishment of a real proposition based on mere

uniform or uncontradicted experience without any attempt at explaining a causal connection.

Bacon defines *Enumerative Induction* as “an induction because we have never an instance to the contrary” (Roy, 1986: 29). Mill further elaborates, stating it involves ascribing generality to propositions true in all known instances, saying, “It consists in ascribing the character of general truths to all propositions which are true on every instance that we happen to know of” (Ibid.). This process relies on simple, unanalysed experience, following the formula: “such and such has always been found to be true, no instance to the contrary has been met with; therefore, such and such is true” (Ibid., 30). For instance, observing only black ravens and no ravens of other colours leads to the general proposition “*All ravens are black*” based on uniform experience. This induction involves a *leap* from known to unknown, applying the Uniformity of Nature principle loosely without establishing a causal link between characteristics like ‘blackness’ and ‘ravens’. Thus, unlike *Scientific Induction*, it doesn’t probe into causal connections, assuming unobserved cases resemble observed ones.

In his *Induction and Hypothesis*, S.F. Barker outlines two approaches to Induction: simple enumeration of instances and elimination. According to Barker, “Induction proceeds simply through the enumeration of instances – this would be induction by simple enumeration” (Barker, 1957: 49-50). This method supports generalizations based on the number of confirming instances. For example, observing 15 redheaded Irishmen and 17 irascible Irishmen (with no contradictory evidence) suggests the generalization about irascibility is more probable due to more supporting instances. According to its proponents, simple enumeration is the core non-demonstrative inference method for justifying beliefs about unobserved empirical statements – there is no other way to cogently confirm empirical hypotheses.

Now, the most pertinent question that needs to be addressed is: Why is simple enumeration key to justifying beliefs about things we haven’t observed? Or, why is simple enumeration considered the core non-demonstrative inference method for justifying beliefs about unobserved empirical statements? At this juncture, it can be said that simple enumeration is a fundamental approach in inductive reasoning, serving as a primary method for justifying beliefs about unobserved empirical statements. By examining observed instances, it enables us to make broader generalizations, assuming that patterns holding true in observed cases will extend to unobserved ones. This process involves identifying consistent trends or characteristics across multiple instances, which are then applied to predict outcomes or assert properties about unobserved cases. For instance, the consistent observation of the sun rising in the east

supports the prediction that it will do so tomorrow, illustrating how past patterns inform expectations about future events. Similarly, repeated observations of water boiling at 100°C at sea level support the broader claim that water exhibits this behaviour universally under similar conditions, encompassing both observed and unobserved instances. Through such generalizations, simple enumeration provides a foundational mechanism for reasoning about empirical phenomena beyond immediate observations, underlining its role as a core non-demonstrative inference method in empirical inquiry and everyday reasoning.

ACTIVITY- 8.1

- Why simple enumeration is considered the core non-demonstrative inference method for justifying beliefs about unobserved empirical statements?

  ……

  ……

  ……..…

CHECK YOUR PROGRESS

Q.1: Enumerative Induction reasons from particular instances to all instances. (True/False)

Q.2: Enumerative Induction and Induction by Simple Enumeration are basically one and the same. (True/False)

Q.3: Unlike Scientific Induction, Enumerative Induction doesn't probe into causal connections. (True/False)

Q.4: Who said Enumerative Induction is "an induction because we have never an instance to the contrary"?

Q.5: Who is the author of the book*, Induction and Hypothesis*?

8.4 COMPONENTS OF ENUMERATIVE INDUCTION:

Enumerative Induction involves making a general conclusion based on specific examples. If you observe many instances of something happening, you assume it will happen in general. It's a way of generalizing from experience. In view of the definition

of enumerative induction, we can count the following as the key components of enumerative induction:

(i) Target Population: The entire group being studied (e.g., all swans)

(ii) Sample: Observed members of the target population (e.g., 100 swans in a lake)

(iii) Relevant Property: The shared characteristic being observed (e.g., being white)

(iv) Generalization: The conclusion drawn about the entire group based on the sample (e.g., all swans are white)

(v) Sample Size: The number of observations, affecting the induction's strength

(vi) Representativeness: How well the sample represents the target population, impacting the conclusion's reliability.

The above example is: Target Population: All swans, Sample: 100 swans observed in a lake, Relevant Property: Being white, Premise: All 100 observed swans are white, Conclusion: Therefore, all swans are white. Interestingly, this example highlights a limitation of enumerative induction, as the conclusion is false due to the existence of black swans. Apart from limitations, enumerative induction has reliability. But one can ask: what determines the reliability of enumerative induction? The reliability of enumerative induction hinges on two crucial factors: sample size and representativeness. A larger, representative sample strengthens the induction, while a small or biased sample can lead to flawed conclusions, like jumping to conclusions based on limited data.

8.5 BASIC CHARACTERISTICS OF ENUMERATIVE INDUCTION:

In simple words, Enumerative induction is a way of making general conclusions based on many particular examples. If you see something happen many times, you assume it will keep happening. It is like learning a pattern and applying it broadly. This type of reasoning is pretty basic and has been around a long time. An analysis of the definition of Enumerative Induction reveals the following characteristics or marks of Enumerative Induction:

1. Structure (Part to Whole): Structure is an important feature of Enumerative Induction. The argument usually goes like this: "*All the As we have seen are B*", so "*All As are B*". Or, "*Most As we have observed are B*", so "*Most As are B*". It is about applying what is true for some to the whole group.

2. Inductive Leap: Inductive leap is a key feature of Enumerative Induction. Enumerative Induction involves making a jump in logic – the conclusion says more than what's actually observed. Unlike deductive reasoning, the premises don't guarantee the conclusion; it's possible for the premises to be true but the conclusion false. This makes the inference 'defeasible' or 'nonmonotonic' – new evidence can potentially overturn the conclusion.
3. Probabilistic Nature: Another important characteristic of Enumerative Induction is its probabilistic nature. The conclusion's strength in Enumerative Induction is based on probability rather than certainty. It is about how likely or probable the conclusion is, given the evidence. The outcome is considered 'probable', 'likely', or 'reasonable' based on the observations.
4. Sample-Based: Sample-based is a notable characteristic of Enumerative Induction as Enumerative Induction relies on a sample from the target population. For the inference to be strong, the sample needs to be big enough (to avoid hasty generalization) and representative of the whole population (to avoid bias).
5. Positive Instances (Confirming Cases): Positive instances are also a characteristic feature of Enumerative Induction. The underlying idea is that when we observe instances that fit a pattern (like seeing white swans), it boosts the likelihood that unobserved instances will follow the same pattern.
6. Vulnerability to Contradiction: One of the most important characteristics of Enumerative Induction is its vulnerability to contradiction. Since it is based on a limited set, the conclusion can be knocked down by a single counterexample – like the discovery of black swans, which overturned the idea that all swans are white.
7. Uniformity of Nature: One of the main characteristics of Enumerative Induction is the uniformity of nature. Enumerative Induction relies on the underlying assumption that patterns observed in the past will hold true in the future, and that unobserved cases will mirror observed ones. It is about expecting consistency in how things behave.
8. Often Non-formalizable: Enumerative Induction is often informal and intuitive – it is a common way of reasoning used in everyday life and science to identify patterns and establish "laws". However, this informal nature means it can sometimes lead to overgeneralization.

8.6 ENUMERATIVE INDUCTION IS A FORM OF PROPER INDUCTION:

Is Enumerative Induction or Induction per Simple Enumeration a form of Proper Induction?This form of induction is indeed a proper induction, characterized by the inherent "*inductive leap*" from known to unknown, which fundamentally defines induction. However, it is often regarded as *popular* or *rudimentary* due to the absence of any understood causal connection. It is called *Induction per Simple Enumeration* as its conclusion is derived merely from enumerating instances, lacking deeper analysis. It is also referred to as *Imperfect Enumeration*, distinguishing it from *Perfect Induction* or *Induction by Complete Enumeration*, where every instance within the general proposition's scope is accounted for, highlighting the difference in methodological rigour and scope.

8.7 THE VALUE OF ENUMERATIVE INDUCTION OR INDUCTION PER SIMPLE ENUMERATION:

Enumerative induction, also known as induction per simple enumeration, involves making general conclusions based on mere enumeration or counting of instances. It doesn't look for underlying causes, just patterns in what is observed. Because of this, its conclusions are probable, not definite or certain. This raises questions about how useful or valuable enumerative induction really is.

According to Bacon, Enumerative Induction or Induction per Simple Enumeration holds no importance whatsoever. Bacon says, "Induction which proceeds by merely citing instances, is res peurillis, a childish affair, and being without any principle of Inference, it may be overthrown by a contradictory instance" (Roy, 1986: 31). He criticizes this method for its simplicity and vulnerability. Logicians generally acknowledge Bacon's severe criticism is justified for many everyday generalizations. However, they also note that Enumerative Induction's conclusions are merely probable, unlike Scientific Induction's more certain outcomes. It is worth mentioning that probability varies greatly, from near zero to near certainty. While hasty generalizations are often worthless, consistent, widespread experience across history and geography can lend significant probability to a conclusion. Uncontradicted experiences shared across known periods and regions give a high degree of probability, suggesting Enumerative Inductionor Induction per Simple Enumeration isn't entirely without value.

Fowler emphasizes that the value of Enumerative Induction hinges on two key considerations. *Firstly*, the quantity of positive instances we have encountered plays a significant role - a larger number of instances typically strengthens the argument, whereas a smaller number weakens it. As Mill aptly puts it, “The precariousness of the method of Simple enumeration is an inverse ratio to the largeness of the generalisation” (Ibid., 32), implying that more instances render the generalization more reliable. *Secondly*, the probability of having encountered negative instances is crucial; if it is likely that we would have come across counterexamples if they existed, Enumerative Induction gains substantial probability. Aristotle seemed to share a similar view, suggesting that the onus is on those who question a generalization to produce counterexamples, given a strong conviction that no such instances exist. Thus, Enumerative Induction’s value lies in the robustness of its instances and the likelihood of encountering contradictory evidence, making it a more credible form of reasoning when these conditions are met.

From our analysis, it is clear that Enumerative Induction, despite its potential for high probability, falls short of the certainty offered by Scientific Induction. The key difference lies in the establishment of causal relationships - Enumerative Induction lacks this crucial aspect, whereas Scientific Induction hinges on it. In Enumerative Induction, the strength of the conclusion relies heavily on the number of observed instances and the breadth of experience, aiming to minimize encounters with contradictory evidence. In contrast, Scientific Induction is less concerned with the quantity of instances; a single, meticulously observed case can suffice to establish a general conclusion, provided a causal link is identified. This fundamental distinction highlights the differing degrees of reliability between these two forms of induction, with Scientific Induction yielding more definitive conclusions.

In view of the above, it can be said that Enumerative Induction, despite its limitations, retains value as a precursor to Scientific Induction. It cannot establish causal connections, but it suggests them, serving as a potential starting point for more rigorous investigation. As Grumley notes, “The chief value of the enumerative method lies in its power to suggest causal relation. The condition that two phenomena (subject and predicate) are always or very frequently connected seems sufficient ground for entertaining the hypothesis that they are causally related” (Ibid., 33). This indicates that Enumerative Induction plays a vital role in the initial stages of scientific inquiry, facilitating hypothesis formation and paving the way for Scientific Induction. It is a *stepping stone*, helping identify patterns and potential causal links that can be further explored and validated through more systematic methods. Thus, it can be said that by highlighting correlations and anomalies, Enumerative Induction provides a foundation

for Scientific Induction to build upon, ultimately contributing to the discovery of causal relationships.

8.8 ENUMERATIVE INDUCTION IS AN IMPERFECT FORM OF INDUCTION:

Enumerative Induction is considered an imperfect form of induction because it lacks a known causal connection between the observed instances and the generalized conclusion. This imperfection arises from uncertainty about the relationship between phenomena - we are unsure if a causal connection exists, not that we have established its absence. Our minds hover in suspense, vaguely believing in a necessary connection despite lacking concrete evidence. For instance, considering 'blackness' and 'ravens', we lack knowledge of a causal relation, yet we entertain the general proposition "*All ravens are black*" based on a hunch about an essential connection. As scientific understanding advances, this hunch either solidifies into a causal link, elevating Enumerative Induction to Scientific Induction, or gets discarded, reducing it to a particular statement. Thus, Enumerative Induction exists in an unstable state, poised to either mature into Scientific Induction or diminish into a mere collection of instances.

8.9 ENUMERATIVE INDUCTION: COMPLETE ENUMERATION AND SIMPLE ENUMERATION:

The concept of *Enumerative Induction* refers to a type of inductive reasoning that relies on generalizing from observed instances purely based on their enumeration, without establishing a causal link between the instances and the generalized conclusion. This approach differs significantly from Scientific Induction, where generalization is grounded in the strength of causal connections between phenomena. Enumerative Induction involves observing a pattern or characteristic among a set of instances and extrapolating that pattern to unobserved cases, essentially making an educated guess based on the count of instances rather than understanding the underlying causal mechanisms. This process is inherently probabilistic and lacks the robustness of Scientific Induction, making the generalizations drawn from it susceptible to exceptions and revisions as new evidence emerges. The distinction highlights the difference between generalization based on enumeration and generalization rooted in

causal understanding, with Enumerative Induction being a less secure foundation for drawing broad conclusions.

Enumeration may be *complete* or *incomplete*. When we talk about enumeration, there are two possibilities. Sometimes, we manage to count every single instance that fits a general statement. This is called *Perfect Induction* or *Complete Enumeration* - for example, if we check all the students in a class and find that all of them are under 25, we can conclude with certainty that all students in that class are under 25. On the other hand, there are times when we only look at a few instances and notice they share a common characteristic, so we assume that other instances, even ones we have not seen, will also have this characteristic. For example, if we observe that a few swans are white, we might conclude that all swans are white - but there is a chance we might encounter a black swan! This is called Induction by *Simple Enumeration* or *Imperfect Induction*. It is a bit of a leap, but it is how we often make sense of the world. The key difference is that Perfect Induction is exhaustive and certain, while Imperfect Induction is partial and uncertain, leaving room for surprises as we encounter more instances. Thus, when Scholastic philosophers categorize induction into Perfect and Imperfect, it can be said that they viewed Induction as based on mere enumeration or counting of instances, whether complete or incomplete.

Moreover, modern logicians argue that if induction relies solely on enumeration, it cannot achieve the certainty of Scientific Induction. In Imperfect Induction, the enumeration is incomplete, so it is clear that counting alone is not enough - the investigation ends with the counted cases. For instance, we cannot conclude that all apples in a barrel are ripe just because three-fourths of them are. Thus, Imperfect Enumeration clearly cannot provide certainty. Some, like Jevons, claim Perfect Induction yields certain conclusions, but most modern logicians disagree. They argue Scientific Induction's certainty comes from understanding causal connections, not just counting instances. Even complete enumeration only shows things happen a certain way, not that they must. Enumeration can provide assertory conclusions, but only Scientific Induction justifies certainty. For example, knowing all students in a class are under 25 is certain with Perfect Induction, but that is different from understanding why they are under 25. Thus, it can be said that Scientific Induction's strength lies in its grasp of causal connections, making its conclusions more robust.

ACTIVITY- 8.2

- How can Enumeration be complete or incomplete? Explain

  ……

  ……

  ……..…

CHECK YOUR PROGRESS

Q.6: The conclusion of Enumerative Induction is probable. (True/False)

Q.7: Inductive leap is a key feature of Enumerative Induction. (True/False)

Q.8: Enumerative Induction is not proper induction. (True/False)

Q.9: Enumerative Induction is considered an imperfect form of induction. (True/False)

8.10: LET US SUM UP

- Induction can operate through two contrasting approaches: elimination and enumeration.
- Enumerative Induction and Induction per Simple Enumeration are basically one and the same in classical logic. They are a simple way of making a general conclusion based on a few instances without discovering any causal connections.
- Enumerative Induction or Induction by Simple Enumeration is the establishment of a real proposition based on mere uniform or uncontradicted experience without any attempt at explaining a causal connection.
- Enumerative Induction typically follows this form:Particular instances are observed (e.g., A_1, A_2, A_3 are all B), ∴ All A's are B (generalization). It is a type of inductive reasoning where a general conclusion is drawn from specific instances.
- According to Barker, "Induction proceeds simply through the enumeration of instances – this would be induction by simple enumeration."
- The reliability of enumerative induction hinges on two crucial factors: sample size and representativeness. A larger, representative sample strengthens the induction, while a small or biased sample can lead to flawed conclusions, like jumping to conclusions based on limited data.
- Inductive leap is a key feature of Enumerative Induction. Enumerative Induction involves making a jump in logic – the conclusion says more than what's actually observed.
- Enumerative Induction is probabilistic nature. The conclusion's strength in Enumerative Induction is based on probability rather than certainty.

- Enumerative Induction is a proper induction, characterized by the inherent "*inductive leap*" from known to unknown, which fundamentally defines induction.
- Enumerative Induction plays a vital role in the initial stages of scientific inquiry, facilitating hypothesis formation and paving the way for Scientific Induction. It is a *stepping stone*, helping identify patterns and potential causal links that can be further explored and validated through more systematic methods.
- Enumerative Induction is considered an imperfect form of induction because it lacks a known causal connection between the observed instances and the generalized conclusion.
- Enumeration may be *complete* or *incomplete*.
- Modern logicians argue that if induction relies solely on enumeration, it cannot achieve the certainty of Scientific Induction.

8.11: FURTHER READINGS

Ballantine, W. G., *Inductive Logic,* Ginn& Company, London, 1896.

Barker, S. F., *Induction and Hypothesis*, Cornell University Press, London, 1969.

Popper, K., *The Logic of Scientific Discovery*, Routledge, London & New York, 1992.

Roy, B. N., *Inductive Logic,* S. C. sarkar& Sons, Calcutta, 1986.

8.12: ANSWERS TO CHECK YOUR PROGRESS

Answer to Q. No. 1: True

Answer to Q. No. 2: True

Answer to Q. No. 3: True

Answer to Q. No. 4: Bacon

Answer to Q. No. 5: S.F. Barker

Answer to Q. No. 6: True

Answer to Q. No. 7: True

Answer to Q. No. 8: False

Answer to Q. No. 9: True

Answer to Q. No. 10: True

⑦ 8.13: MODEL QUESTIONS

A. Very Short Questions

Q.1: Define Enumerative Induction.

Q.2: State the form of Enumerative Induction.

Q.3: Write Bacon's definition of Enumerative Induction.

Q.4: What are the two approaches of Induction according to S.F. Barker?

Q.5: Define Inductive leap.

B. Short Questions (Answer each question in about 100 – 150 words)

Q.1: What do you mean by Enumerative Induction? Give an example of Enumerative Induction.

Q.2: Why is simple enumeration key to justifying beliefs about things we haven't observed?

Q.3: What are the components of Enumerative Induction?

Q.4: Is Enumerative Induction a form of proper induction? Explain.

Q.5: Is Enumerative Induction an imperfect form of induction? Discuss briefly.

Q.6: Write a short note on the value of Enumerative Induction.

C. Long Questions (Answer each question in about 300 – 500 words)

Q.1: What is Enumerative Induction? Explain with suitable examples.

Q.2: Define Enumerative Induction. Explain the key components of Enumerative Induction.

Q.3: What does Enumerative Induction refer to? Explain the basic features of Enumerative Induction.

Q.4: Define Enumerative Induction. How useful or valuable is Enumerative Induction really? Explain and examine.

Q.5: What does Enumerative Induction mean? Is Enumerative Induction a Proper Induction? Justify your answer.

Q.6: Define Enumerative Induction. Is Enumerative Induction an Imperfect Induction? Explain and examine.

Q.7: What is Enumerative Induction? What do you mean by Complete Enumeration and Simple Enumeration? Explain with examples.

Q.8: Explain and examine the view that “Enumerative Induction reasons from particular instances to all instances.”

*** ***** ***