

Truth-Tellers and Liars

250H

Truth-tellers and Liars Logic Puzzles

- Most Common Setup:
 - You're on an island where each inhabitant is a truth-teller (knight) or a liar (knave).
 - We use knights and knaves since they are one syllabus

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 - You're given some information about some people
 - You need to determine whether each person is a knight or a knave.

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 - In some cases, it may be impossible to determine what everyone is, or the situation may be impossible.

Truth-tellers and Liars Logic Puzzles

- Most Common Setup:
 - You're on an island where each inhabitant is a **truth-teller (knight)** or a **liar (knave)**.
 - We use **knights** and **knaves** since they are one syllabus
 - **Knights** always tell the **truth**
 - **Knaves** always **lie**
 - You're given some information about some people
 - You need to determine whether each person is a **knight** or a **knave**.
 - In some cases, it may be impossible to determine what everyone is, or the situation may be impossible.
- In some problems, you will also have **normals/randoms**
 - These are people that can tell both **truths and lies**

Puzzle #1

- Alice and Bob are residents of the island of **knives** and **knights**
- Bob says: “We are both **knives**”
- Who is a **knave** and who is a **knight**?

Puzzle #1

- Alice and Bob are residents of the island of **knaves** and **knights**
- Bob says: “We are both **knaves**”
- Who is a **knave** and who is a **knight**?
- Ans: **Alice is a knight**
Bob is a knave

Puzzle #1

- Alice and Bob are residents of the island of **knaves** and **knights**
- Bob says: “We are both **knaves**”
- Who is a **knave** and who is a **knight**?
- Ans: **Alice is a knight**
 - **Bob is a knave**
 - **Bob’s** statement cannot be true
 - A **knave** admitting to being a **knave** would be the same as a liar telling the truth that "I am a liar"
- This is known as the liar paradox

Puzzle #2

- Charlie and Dean are residents of the island of **knaves** and **knights**
- Charlie says: “We are of different kinds”
- Dean says: “We are the same kind”
- Who is a **knave** and who is a **knight**?

Puzzle #2

- Charlie and Dean are residents of the island of **knaves** and **knights**
- Charlie says: “We are of different kinds”
- Dean says: “We are the same kind”
- Who is a **knave** and who is a **knight**?
 - Ans: **Charlie is a knight**
Dean is a knave

Puzzle #2

- Charlie and Dean are residents of the island of **knaves** and **knights**
- Charlie says: “We are of different kinds”
- Dean says: “We are the same kind”
- Who is a **knave** and who is a **knight**?
 - Ans: **Charlie is a knight**
Dean is a knave
 - The two statements are contradictory
 - One has to be a **knight** and the other a **knave**
 - Since that is exactly what **Charlie** said, **Charlie** must be the **knight**

Puzzle #3

- You meet a single person named Ethan
- You want to know if they are a **knave** or a **knight**
- You may ask them a single question
- What question do you ask them?

Puzzle #3

- You meet a single person named Ethan
- You want to know if they are a knave or a knight
- You may ask them a single question
- What question do you ask them?
 - Ans: “Are you a teapot?”
 - If they respond yes : They are a knave
 - If they respond no: They are a knight

Puzzle #4- Most Famous Rendition

- Freya and Gabby are standing at a fork in the road
- Freya is standing in front of the left road
- Gabby is standing in front of the right road

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- Freya is standing in front of the left road
- Gabby is standing in front of the right road
- One of them is a **knight** and the other a **knave**, but you don't know which.
- You also know that one road leads to Death, and the other leads to Freedom.
- By asking one yes/no question, can you determine the road to Freedom?

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 - Ans: Ask each: “Would *the other person* tell me that *your* door leads to Freedom?”

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- You also know that one road leads to Death, and the other leads to Freedom.
- By asking one yes/no question, can you determine the road to Freedom?
 - Ans: Ask each: “Would *the other person* tell me that *your* door leads to Freedom?”
 - The **knave** will be forced to lie about the lie they would tell and would then answer with a double negative
 - Both **knight** and **knave** will give the correct answer.

Puzzle #5: Goodman's 1931 Variant

- Three inhabitants Hugo, Iris, James meet some day
- Hugo says either “I am a knight” or “I am a knave”, we don't which
- Iris says “Hugo said, ‘I am a knave’”
- Iris says “James is a knave”
- James says “Hugo is knight”
- Who is a knave and who is a knight?

Puzzle #5: Goodman's 1931 Variant

- Three inhabitants Hugo, Iris, James meet some day
- Hugo says either “I am a knight” or “I am a knave”, we don't which
- Iris says “Hugo said, ‘I am a knave’”
- Iris says “James is a knave”
- James says “Hugo is knight”
- Who is a knave and who is a knight?
 - Ans: Hugo is a knight
Iris is a knave
James is a knight

Puzzle #5: Goodman's 1931 Variant

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- Hugo says either “I am a knight” or “I am a knave”, we don't which
- Iris says “Hugo said, ‘I am a knave’”
- Iris says “James is a knave”
- James says “Hugo is knight”
- Who is a knave and who is a knight?
 - Ans: Hugo is a knight
Iris is a knave
James is a knight
 - Since a knave always lies, they cannot admit their own identity, so Hugo could not have admitted to being a knave
 - This means that Iris must be a knave
 - Iris's allegation directed at James must be false, so Hugo and James must be knights

Puzzle #6

- You meet Kenny, Lily, and Max who are all different classes
- Kenny, Lily, and Max are either a **knight**, a **knave**, or a **normal** (Remember: normals can tell lies or truths)
- Kenny, Lily, and Max know who each of the other two people are

Puzzle #6

- You meet Kenny, Lily, and Max who are all different classes
- Kenny, Lily, and Max are either a **knight**, a **knave**, or a **normal** (Remember: normals can tell lies or truths)
- Kenny, Lily, and Max know who each of the other two people are
- Kenny says “I am the **knight**,”
- Lily says “I am the **knave**,”
- Max says “Lily is the **knight**.”
- Who is the **knight**, the **knave**, and the **normal**?

Puzzle #6

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- Kenny, Lily, and Max are either a **knight**, a **knave**, or a **normal** (Remember: normals can tell lies or truths)
- Kenny, Lily, and Max know who each of the other two people are
- Kenny says “I am the **knight**,”
- Lily says “I am the **knave**,”
- Max says “Lily is the **knight**.”
- Who is the **knight**, the **knave**, and the **normal**?
- Ans: **Kenny is a knight**
 Lily is the normal
 Max is the knave

Puzzle #7

- Kenny says “I am the knight,”
- Lily says “Kenny is telling the truth,”
- Max says “I am the normal”
- Who is the knight, the knave, and the normal?

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- Kenny says “I am the knight,”
- Lily says “Kenny is telling the truth,”
- Max says “I am the normal”
- Who is the knight, the knave, and the normal?
- Ans: Kenny is a knight
Lily is the normal
Max is the knave

Puzzle #8

- Kenny says “I am the knight,”
- Lily says “I am the knight,”
- Max says “I am the knight”
- Who is the knight, the knave, and the normal?

Puzzle #8

- Kenny says “I am the knight,”
- Lily says “I am the knight,”
- Max says “I am the knight”
- Who is the knight, the knave, and the normal?
- Ans: Any of the three can be the knight, knave, and normal

Puzzle #8

- Kenny says “I am not the normal,”
- Lily says “I am not the normal,”
- Max says “I am not the normal”
- Who is the knight, the knave, and the normal?

Puzzle #8

- Kenny says “I am not the **normal**,”
- Lily says “I am not the **normal**,”
- Max says “I am not the **normal**”
- Who is the **knight**, the **knave**, and the **normal**?
- Ans: No solutions