Truth-Tellers and Liars
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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- 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.
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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.
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  - Knights always tell the truth
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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.
  - 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 knaves and knights
- Bob says: “We are both knaves”
- Who is a knave and who is a knight?
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- 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
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
- 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?
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
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- 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?
  - Ans: Ask each: “Would *the other person* tell me that *your* door leads to Freedom?”
Puzzle #4- Most Famous Rendition

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- Freya is standing in front of the left road
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- 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?
  - 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

- 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?
- 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?
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**?
- 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