Practice Run

1. Explain why each of the following arguments is flawed.

    a. You cannot give me 60%, I am a 90% student.

    b. There is no problem with the rule. If everyone followed the rule there wouldn't be a problem.

    c. The coin showed heads the last four flips, so it is more likely to show tails on the next flip.

    d. We need to stop the tax hike. If we allow 1% this year, they will ask for 2% next year, and 5% the year after that until we are paying all our money to taxes.

2. Consider the following paradox.
    *   A man has built a time machine and travels back in time. There, he prevents his father from meeting his mother.

    a. Describe why this leads to a paradoxical situation.

    b. What might this lead you to conclude about the scenario?

Compare your answers.

1. Explain why each of the following arguments is flawed.

   a. You cannot give me 60%, I am a 90% student.

   The student's argument that he is a 90% student is undermined by the score of 60% he received. This is evidence that he is a 60% student, whereas there is no evidence that he is a 90% student.

   b. There is no problem with the rule. If everyone followed the rule there wouldn't be a problem.

   This is circular reasoning. If not everyone is following the rule, there may be a problem with the rule, but the person states that there is no problem with the rule.

   c. The coin showed heads the last four flips, so it is more likely to show tails on the next flip.

   This statement is based on the assumption that probabilities will 'even out' in the short term. If a fair coin is used, there will be a 50% chance of tails, regardless of what previously happened.

   d. We need to stop the tax hike. If we allow 1% this year, they will ask for 2% next year, and 5% the year after that until we are paying all our money to taxes.

   This is a slippery slope argument. A 1% raise in taxes will not necessarily lead to future tax increases.

2. Consider the following paradox.
   • A man has built a time machine and travels back in time. There, he prevents his father from meeting his mother.

   a. Describe why this leads to a paradoxical situation.

   This is a paradox because if the man's parents never meet, he will never be born. However, if he is never born, he will not be able to travel back in time to prevent his parents meeting, so he will be born.

b.   What might this lead you to conclude about the scenario?

You could conclude that either the situation or the result has not been interpreted correctly. There is no consensus on the correct interpretation of this problem. However, the most straightforward conclusion is that time travel, in this sense, must not be possible.

Sometimes reasoning will lead you to an unexpected or surprising result. This does not mean your reasoning is incorrect, but you should be careful in this type of situation.

Example 2

Suppose a 100 g orange is made of 99% water. It is allowed to sit in the sun to dry until it is 98% water. What do you expect the weight of the orange to be now?

Here is the original scenario. There is 1 g of solid for every 99 g of water.

$$\frac{99\ g_{water}}{99\ g_{water} + 1\ g_{solid}} = \frac{99}{100} = 99\,\%$$

If you adjust the equation to reflect 98% water, you will need to reduce its mass to 49 g, as shown below.

$$\frac{49\ g_{water}}{49\ g_{water} + 1\ g_{solid}} = \frac{49}{50} = 98\,\%$$

This shows that the orange is 1 g solid and 49 g water, or a total of 50 g, when it is 98% water.

In Example 2, you may have been surprised to find that going from 99% water to 98% water meant the orange's mass was reduced by a half. Although the result is unexpected, you should not dismiss it. Careful reasoning has shown that the conclusion is true.