**LOGIC**

**EO 4:** Students will differentiate valid logical arguments from logical fallacies

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**Guiding Questions**:

Why is logic important to philosophy?

How can I tell the difference between a strong and a weak argument?

What are the different types of logical arguments?

Are there arguments that seem logical, but are in fact not?

**Curricular Components:**

Diagnostic self-test

Distinguish between opinion and argument

Investigate the difference between inductive and deductive logic/argument

Explain the various aspects of faulty and fallacious reasoning and provide methods for evaluating arguments and determining validity

Examine logical fallacies

Explore causality with Mill’s Method

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**Name**

**Habits of Mind:**

1. How do emotions affect your ability to think logically?
2. If someone could take one of your cherished beliefs and show how it is based on faulty reasoning, would you readily abandon it?
3. Should people who are uninformed and reason illogically be allowed to vote on issues and candidates that determine the course of the country?
4. Why do some people appear smarter than others?
5. Why can some people maintain concentration better than others?
6. Is it possible to raise a person’s intelligence or is intelligence something with which a person is born?
7. Can you train your mind to think? Explain.

**Insight Thinking:**

**Insight Thinking**: the steps leading up to the solution are not always apparent. The solution seems to come about by virtue of a sudden jump in thinking. It is more a matter of finding the right approach than of care in pursuing an approach.

**Problem 1**

Place three cups upright on a table or on the floor. Position them so that each bottle forms the corner point of a triangle of equal sides. The distance between the bases of any two bottles should be slightly more than the length of the plastic knife. Using only the four knives, construct a platform on top of the cups. No part of any knife may touch the ground. The platform must be strong enough to support a full glass of water.

1. Why is this problem so hard to solve?
2. How did you go about trying to solve the problem? (How would someone describe your group’s behaviors: talked, tried holding the items in different ways, imagined, argued, drew pictures etc…)

**Problem 2**

To discover whether it is possible to construct a platform on top of four cups, using only the four knives. Each cup is placed upright at the corner of a square. Each side of the square is slightly longer than a knife, so that a knife fits easily between the bases of any two adjacent cups. All four cups must be used, and the platform must rest equally on all four. The platform must be strong enough to support a full glass of water between the cups. Only the four knives may be used and no part of these may touch the ground.

**Problem 3**

This time use only two cups. Place these upright, their bases separated by the length of a knife handle added to the length of a knife. The two cups are thus father apart than on the two previous occasions. Using only the four knives, create between the two cups a bridge which will support at its center the weight of a full glass of water. The ends of the bridge rest on the tops of the cups. No part of any knife may touch the ground.

3. Was it easier to do problems 2 and 3 in comparison to problem 1? Why or why not? **LOGIC:**

 Philosophy is based on analysis and the construction of arguments. The study of these arguments is called logic. The practical value of logic is found in developing reasoning skills and in providing a process to evaluate arguments. Logic identifies the difference between good and bad arguments.

 One useful way to analyze arguments would be to use deductive logic. In the deductive arguments, the validity of and argument is found by correctly deducing a statement from a number of other statements. The best-known deductive arguments are referred to as syllogisms.

 The study of syllogisms can be traced back to the ancient Greeks; to be more exact, the beginnings of formal logic are found with the great philosopher, Aristotle. Aristotle recognized the philosophical value of logical thinking….

 The power of logic originates with the use of reason but logical reasoning is only useful when verbalized. Speaking, writing, and even silent thinking involves the use of language. The precise use of language is imperative to the study of logical thinking. Being the most talented logician in the world is meaningless if that person is unable to accurately express him- or herself linguistically.

-*Kasmarek, James E. Philosophy Book 2 Curriculum Unit, The Center for Learning, 2004.*

**Logic Defined:**

Read Pages 139 – 142 in Textbook and take notes on the following:

1. Define Opinions:
2. Are all opinions of the same value? Explain:
3. Define Grounds:
4. Define Argument:
5. Define Factual Statement:
6. Define Value Judgment:

**Instructions:** The following are either factual reflections of what is true or false, or they are value judgments requiring rational justification. Place an “F” next to factual statements and a “V” next to value judgments.

\_\_\_\_\_ 1. It is good to do what is in your rational self-interest.

\_\_\_\_\_ 2. Marcus Aurelius was an existentialist.

\_\_\_\_\_ 3. Karl Marx was banished from several countries during his lifetime.

\_\_\_\_\_ 4. Martin Luther King professed a philosophy of nonviolence.

\_\_\_\_\_ 5. The Oracle at Delphi declared that Socrates was the wisest man in Athens.

\_\_\_\_\_ 6. Trying to avoid anxiety by following fads or fitting in with the group is wrong.

\_\_\_\_\_ 7. You shouldn’t worry about the future.

\_\_\_\_\_ 8. Jean-Paul Sartre is a philosopher.

\_\_\_\_\_ 9. Hedonism is a morally corrupt philosophy of life.

\_\_\_\_\_ 10. People ought to seek philosophical enlightenment.

###

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**Inductive and Deductive Reasoning:**

According to traditional logic, arguments can be either inductive or deductive. Sometimes, it is difficult to determine which category an argument might be in. However, there are some key concepts that give clues as to which type the argument is. Generally speaking, deductive arguments are ones wherein the conclusion validly follows from the premises. The most important form of a deductive argument is that of the syllogism.

**Deductive Reasoning:**

In deductive argumentation, the conclusion is a proposition that follows from other propositions. This means that the conclusion is supported by the other propositions, called premises. It is incorrect to suggest, however, that this support is weak. Rather, the conclusion must be affirmed if the premises are true; it is impossible for the premises to be true and for the conclusion to be false. The purpose of the premises is to establish the truth of the conclusion.

For example:

All humans are mortal.

John Smith is human.

Therefore, John Smith is mortal.

This example is a simple valid deductive argument because the conclusion is necessarily drawn from the premises. If the truth of the premises is admitted, then the conclusion must also be admitted as true. Some statements that look like the above example are not necessarily valid deductive arguments. Valid ones follow certain rules of reasoning.

For example:

Some dogs are ill-behaved.

All dogs are animals.

Therefore, all animals are ill-behaved.

This is an invalid deductive argument. It might appear the same as the one previously written, however it breaks certain logical rules. (Experience tells us that there are animals that **are not** ill-behaved.)

Deductive reasoning does not grant new knowledge, but instead clarifies concepts that we may already know something about. Even though deduction aims at producing true, valid conclusions, it does so only based on prior knowledge of the truth of its premises. If one of the premises is false, the conclusion will be false.

**Inductive Reasoning:**

Inductive reasoning does not aim at producing true, valid conclusions. In fact, “valid” and “invalid” are not terms that can be accurately applied to inductive reasoning. Inductive reasoning enables us to infer probable and likely conclusions. Inductive reasoning is useful for gaining new knowledge by understanding statistical patterns and also for identifying causes and effects. However, unlike deductive argument, inductive arguments cannot guarantee true conclusions even if their premises are true.

Two of the most common types of inductive argument are the analogy and the statistical.

It is important to understand that inductive reasoning attempts to predict or suggest its conclusion based on inferences on the premises, but there is no necessity for the conclusion to follow from the premises. In other words, there is no guarantee that the future will be like the past or that the conclusion will definitely be true.

**Fill Ins:**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ arguments are ones wherein the conclusion validly follows from the premises.

2. The most important form of deductive argument is that of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

3. Two of the most common types of inductive argument are the \_\_\_\_\_\_\_\_\_\_ and the

\_\_\_\_\_\_\_\_\_\_\_\_\_.

**True or False:**

\_\_\_\_ 4. Conclusions based on inductive reasoning will always be true.

\_\_\_\_ 5. Deductive reasoning does not grant new knowledge, but instead clarifies concepts that we may already know something about.

\_\_\_\_ 6. If one of the premises is false, the conclusion will be false.

**Do the following use inductive or deductive reasoning? Write “D” for deductive and “I” for inductive.**

\_\_\_\_ 7. All cats have fur.

Xena is a cat.

Therefore, Xena has fur.

\_\_\_\_ 8. Some horses are big.

All horses have tails.

Therefore, anything with a tail is big.

\_\_\_\_ 9. All humans have a nose.

Bobby is human.

Therefore, Bobby has a nose.

**Introduction to Deduction: The Syllogism:**

### One form for deductive reasoning is called the categorical syllogism. A syllogism is made up of three lines. The first two lines are called premises. The Last line is the conclusion. Syllogisms follow a specific form. The first example is a categorical syllogism because is starts with a rule or fact about an entire category. Notice the example of a syllogism below. It follows a specific pattern:

### All people have DNA.

### Mike is a person.

**Therefore, Mike has DNA.**

### All X have Y.

### Z is X.

**Therefore, Z has Y.**

### There are different types of syllogisms. The one above is a categorical syllogism. Another type is a conditional syllogism. It starts with a *conditional phrase*. Notice the example below.

If you are late, you will miss the bus.

You were late.

Therefore, you missed the bus.

If p, then q.

p.

Therefore, q.

### You can also use the conditional syllogism form to argue in the negative:

If you are late, you will miss the bus.

You did not miss the bus.

Therefore, you were not late.

If p, then q.

Not q.

Therefore, not p.

**The important thing to note about a syllogism is that if you follow the correct form, and the premises are true, then the conclusion must also be true. An argument that is valid with true premises is called sound.Inductive and Deductive Reasoning Practice:**

### Directions: For each argument below, put an I in the blank if it is an inductive argument, or put a D in the blank if it is a deductive argument.

### Each year my family goes to Grandma’s for Thanksgiving. I’ve noticed that she always makes my favorite pecan pie. This Thanksgiving, I expect she will make another pecan pie.

### If the golfers come near my fence, then my dogs will bark at them. One of the golfers came near the fence. Therefore my dogs must have barked at them.

### All of my friends liked the class that Mr. Smith teaches, so I am sure I will like his class too.

### If she has the chicken pox, then there will be spots breaking out all over her body. She doesn’t have any spots, so she must not have the chicken pox.

**Directions:** For each of the following, put the syllogism into argument form and create the conclusion that makes the syllogism valid.

1. All theories that are not good theories will be abandoned.

Some ethical theories are theories that are not good.

Therefore,

2. No nonhuman animals are moral creatures.

All furry creatures are nonhuman animals.

Therefore,

3. Some sports enthusiasts are people who love football.

All sports enthusiasts are conscious creatures.

Therefore,

4. All dillies are bobbers.

No thingamajigs are bobbers.

Therefore,

### Validity, Truth, and Soundness:

The first rule in evaluating any argument is **never bother to disagree with a conclusion**, because if you find nothing wrong with its **form** (or how the argument is made) and nothing wrong with its **content** (or the assumptions on which the argument is based), then you **must** accept its conclusion. As a result, to challenge an argument, you must challenge either its form or its content, not its conclusion directly. Because we can **always** evaluate the form of an argument, but not always its content, the process of analyzing an argument usually begins with its form.

**Validity**. When the form of an argument is acceptable, that is, when its premises and conclusion are in the proper relationship, we say that the argument is **valid**. A valid argument, then, is one that is in an acceptable form; and invalid argument is one in an unacceptable form. Rules for determining the validity of an argument are given in the sections on [inductive and deductive reasoning](http://www.sjsu.edu/depts/itl/graphics/induc/ind-ded.html). If an argument is found to be **invalid**, all judgment of its must be suspended because, to be acceptable, an argument **must** be valid. The conclusion of an invalid argument is not necessarily wrong; because of the invalidity, there is simply no way to evaluate that argument.

**Checking validity**

One way to know if argument forms of syllogisms are invalid is to construct a counter example. The counter example shows the problem in an invalid argument. Another way is by the Venn diagram. It is restrictive and can only be used for simple arguments.

**Valid:** refers to the logical form of an argument whereas “truth” refers to the relationship of a statement to the object is describes in the world. So an argument can be valid with false premises.

**Invalid:** has some problem with its logical form, such as an ambiguous key term. It is possible for an invalid argument to have all true premises.

**Truth**. If, however, the form of an argument is found to be **valid**, then the content of its premises must be evaluated, to determine if they are **true** or **false**. A true premise is one that you believe **has or can be verified, or is self-evident**, in the case of a [verifiable statement](http://www.sjsu.edu/depts/itl/graphics/claims/claims.html#intro-fact), or **has or can be justified, or is self-evident**, in the case of an [evaluative or advocatory statement](http://www.sjsu.edu/depts/itl/graphics/claims/claims.html#intro-fact). The verification or justification usually comes in the form of [support](http://www.sjsu.edu/depts/itl/graphics/claims/premise.html#support), such as evidence, expert opinion, and supporting arguments.

**Soundness**. Finally, if an argument is valid and its premises are true, it is termed a **sound** argument, and its conclusion **must** be accepted. In many cases, however, there is insufficient reason to find the premises of a valid argument totally true; the more complex the argument, the less likely that it will be considered undeniably sound. In such cases, we often talk of the "relative soundness" of an argument by describing it as **strong** or **weak**. A strong argument is valid in form, and with premises and support that make a compelling case for its acceptance. A weak argument is also valid in form, but its premises and support do not compel their acceptance.

### In a valid argument . . .

### the conclusion must be accepted.

### the premises are true.

### the form is acceptable.

### the burden of proof is carried.

### "Strong" and "weak" are terms that measure what about an argument?

### validity

### truth

### soundness

### burden of proof

### The best way to begin evaluating an argument is usually on its . . .

### validity

### truth

### soundness

### burden of proof

### How controversial an argument is can affect its

### validity

### truth

### soundness

### burden of proof

**Faulty Reasoning:**

**Read Page 153 - 155 (Faulty and Fallacious Reasoning) Text Notes**

The text indicates that arguments are either \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Factual statements may be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Table 3.2 compares what two types of arguments

1.

2.

The conclusion of Table 3.2 is what? Hint: What's the difference between the two forms of argument?

Can an unsound argument be valid in form?

What does the text mean by "universalizability"?

What does the text mean by higher-order principle?

### Informal Fallacies:

### Definition of Informal Logical Fallacy:

### Use this space to sketch out your ideas

### for your assigned informal fallacy cartoon strip.

### Informal Fallacies:

 (This handout uses information from these sources : *Philosophy 2, Center for Learning*, Kasmarek *Experiencing Philosophy*, Falikowski; <http://dictionary.reference.com/search?q=reductio%20ad%20absurdum>; <http://www.datanation.com/fallacies/index.htm> )

**Ad Hominem Attack**

"You shouldn't shake babies; it hurts them and you could end up in jail."

Response: "You're just a leftist baby loving lunatic! I'll shake all the babies I want!"

Definition:

**Straw Man**

Senator Kennedy: “We should spend less on money on defense.”

Response: "Senator Kennedy is also against the draft; that is a dangerous position for the Senator to take."

Definition:

**Circular Reasoning**

No spitting on the sidewalk.

Why?

Because Congress passed a law prohibiting spiting on sidewalks.

Why did they do that?

Because they didn't want anyone spitting on the sidewalk."

Definition:

**Two Wrongs**

"My parents drank alcohol when they were young, so It is ok for me to drink now even though I'm not 21."

Definition:

**Argument from Ignorance**

"Since you cannot prove ghosts do not exist, they must."

"Since scientists cannot prove that global warming will occur, it probably won't."

Definition:

**Slippery Slope**

"If we are forced to register handguns, next it will be all guns, and then the government will take all guns away. We will not have a way to protect ourselves and we'll be a step away from a police state."

Definition:

**Appealing to Unqualified Authority**

"Carl Sagan, the eminent Astronomer believes that if we don't reduce pollution, we will have global warming by the year 2010."

Definition:

**Red Herring**

"The death penalty is not effective for preventing criminals from committing crimes.”

Response: “What about the victims of crime? If we house murderers at the tax payers' expense, how do you think surviving family members feel? They are actually paying to keep the murderer alive."

Definition:

**Guilt by Association**

"Bob here was a witness to the crime, he saw everything.”

Response: “Bob's an x-con; I don't believe anything criminals say."

Definition:

**False Dilemma**

"America, love it or leave it."

Definition:

**Taking the argument to the absurd**

"If that's true, then I'm a monkey's uncle."

"Sure, we can build more nuclear power plants, but if one leaks, it will mean the end of life on Earth as we know it."

Definition:

### Defining Mill’s Methods:

### Method of Difference

### Method of Agreement

### Joint Method of Agreement and Difference

### Method of Concomitant Variance

### Method of Residuals

### Mill’s Method Exercises:

### Analyze each of the inductive arguments below. Identify the purported caused, the purported effect, as well as the method used to support the conclusion: agreement, different, joint method, method of concomitant variations, or residuals.

### 1. Research shows that the A-1 Security Gadget increases safety levels at airports. We tested the device at four major airports, and in each case the number of concealed weapons detected increased over past months.

### Cause:

### Effect:

### Method:

### 2. I think this wool sweater is giving me a rash, because I haven’t changed body soap or detergent, and nothing else could be causing me this problem.

### Cause:

### Effect:

### Method:

### 3. Last fall’s class was a perfect indicator of the effect of studying on one’s class performance: the students who studied very little got D’s, those who studied a bit more got C’s, and those who studied regularly got B’s and A’s.

### Cause:

### Effect:

### Method:

### 4. In some cases, all a movie needs is stellar special effects to be a box-office hit. *The Red Mission* had good casting but a horrible plot, while *The Star Destroyer* had poor casting but an intricate plot. But both had great special effects and were smash hits.

### Cause:

### Effect:

### Method:

### Three Laws of Thought & Paradox:

### The only reason that logic “works” is because of a few laws of thought that we operate under. Curiously, these laws of thought cannot be proven themselves, but common sense tells us they are real.

|  |
| --- |
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### A Paradox is what happens when something seems to break one of these laws.

The next three paradoxes are taken from *101 Philosophy Problems, by Martin Cohen*

"Suppose you wish to turn this page. You will first of all need to half turn the page. And to do that, you will need to quarter turn the page. And so on. In fact, before you can turn the page you must make an infinite number of ever-decreasing fractional turns of the page. And you can't even leave the room to get help turning it, because in order to leave the room you will need to get halfway to the door, and before you can do that, you will need to get halfway to halfway to the door, and so on. As Zeno pointed out all that time ago, you simply can't go through an infinite series of stages in a sadly all too finite amount of time. You cannot count to infinity in a finite amount of time - no matter how fast you can count. It is, in fact, impossible to do anything -- logically speaking. Now try and turn the page."

Zeno 5th Century BC

"We all know about the Earth being a planet in Space. In fact, we know a bit more about where it is in Space: It is in the Solar System, which in turn is on one of the outer arms of the swirl of the Milky Way Galaxy (the band of light that we can see across the night sky, if we don't live in cities, anyway). And the Milky Way is one of a huge number of galaxies in the Universe.

But what is the Universe itself 'in'?"

This is also known as the infinite set paradox. Can you have a set that contains all sets? Answer, the last set would be outside and not contained by any other set. In layman's terms, can you have a box that contains all boxes?

**Something that is definite: The statement at the top of the next page is true.**

**The claim at the bottom of the previous page is false.**

This is known as the "Liar Paradox." A more common form is the statement, "I always lie." If, "I always lie" then when I say I always lie, I must be telling the truth -- a paradox!

Time Travel & The Grandfather Paradox - Get in a time machine and go back and stop your grandparents from getting married and having children. This would cause you to never be born. How did you get into the time machine if you were never born?

* “He goes back in time.
* He kills his ancestor?
* Therefore he does not exist.
* Therefore he doesn’t go back in time.
* Therefore he does not kill his ancestor.
* Therefore he exists.
* Therefore he goes back in time.
* Therefore he kills his ancestor.
* Therefore he does not exist.
* Therefore he doesn’t go back in time.
* Therefore he does not kill his ancestor.
* Therefore he exists... "

 http://www.chez.com/remuemeninges/tten.htm

**CROSSWORD REVIEW:**

### 48428xaogtCROSSWORD REVIEW

**Across**

4. This term describes an argument that is true in nature

6. Conclusion flows from a set of premises

8. A persuasive, but irrational rhetorical device used to argue

10. Whose method does the following explain: A man puts substance A, B, C, and D into a pot and the pot disappears before his eyes? The man then puts substance A, C, and D into a new pot and nothing happens; the pot remains. The man concludes that B caused the pot to disappear

12. Anything that can be used to show something is true or correct

13. This term describes an argument that follows the proper form, it is not concerned with the argument’s accuracy

14. A common form of deductive argument consisting of two premises and a conclusion

18. This term describes an argument that is false in nature

19. These forms of arguments can not be judged on validity or soundness, only on if they are strong or weak

20. Series of related statements leading to a conclusion

21. Personal judgment or belief without evidence

**Down**

1. What informal logical fallacy is used in the following argument: A father speaking to his sons says, "As I see it, you can either go to college or be a loser the rest of your life and never be able to support your family"

2. What logical fallacy is present in the following argument? "My father smoked cigarettes and never got lung cancer Therefore I should be able to smoke cigarettes and never get lung cancer too."

3. What informal logical fallacy is used in the following scenario: Mary states, "God exists." Paul asks, "How do you know God exist?" Mary responds, "Because it says so in the bible" Paul responds, "How can you believe what it says in the bible?" and Mary responds, "Because it is the word of God"

4. What informal logical fallacy is used in the following argument: You must go to school today because if you don't you will fail biology class, never graduate, never get a job, and die poor.

5. This idea has led philosophers to believe that it is impossible to travel back in time to change a historical event

7. The act of using the mind to reason

9. What informal logical fallacy is present in the following argument? The first person says, "Global warming is definitely occurring because of our burning of fossil fuels" and the second person states, "You are an idiot."

11. Fallacy used when a person misrepresents and then attacks an opponent's argument

15. Identify the informal logical fallacy used: "Prove to me that Bigfoot doesn't exist; if you can't then it does exist."

16. This term reflects an argument that does not follow the proper form of a deductive argument

### 17. The informal logical fallacy that is the introduction of irrelevant information into any argument

### E.O. Exam Review:

### 1. Define Argument:

### 2. Define Proof:

### 3. Define Opinion:

### 4. Define Thinking:

### 5. Define Deductive:

### 6. Define Inductive:

### 7. Define Syllogism:

### 8. Define Valid:

### 9. Define True:

### 10. Define Sound:

### 11. Define Informal Logical Fallacy:

### 12. Define Two Wrongs:

### 13. Define Circular Reasoning:

### 14. Define Red Herring:

### 15. Define Slippery Slope:

### 16. Define False Dilemma:

### 17. Define Ad Hominem:

### 18. Define Straw Man:

### 19. Define Mill’s Methods:

### 20. Define Grandfather Paradox:

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