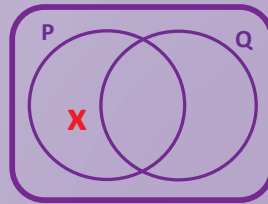
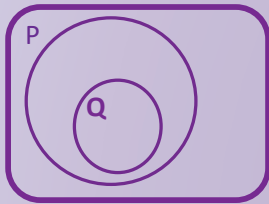




Math 1030 #2c

Venn Diagrams and Testing Validity



Use Venn Diagrams to Analyze Deductive Arguments

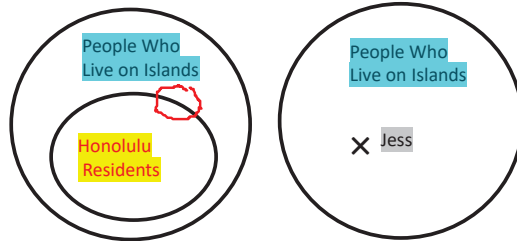
Basic Process

(Variation on Process in the Math 1030 Videos and Textbook)

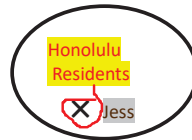
- ⇒ 1. Represent the premises AND the conclusion with Venn Diagrams.
- ⇒ 2. Compare the Venn Diagrams to determine validity
 - The Venn Diagrams agree → valid.
 - The Venn Diagrams do not agree → invalid.
- ⇒ 3. Determine soundness
 - If an argument is valid, consider whether the premises are true (don't need the Venn Diagram for this.)
 - Yes → the argument is sound
 - No → the argument is not sound
 - If an argument is invalid, it is automatically not sound.

EX 1: Represent the information in the premises and in the conclusion with separate Venn Diagrams. Then determine the validity and soundness of the argument and explain your reasoning.

- a) Premise: Residents of Honolulu live on an island.
 Premise: Jess lives on an island.



Conclusion: Jess lives in Honolulu.



Analysis and Explanation:

Invalid

We can't tell from the premises whether Jess is a Honolulu resident or not.

Not sound because it is not valid.

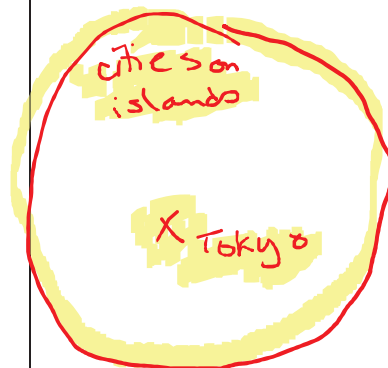
EX 1 (Continued):

- b) Premise: All Japanese cities are on islands.] True
 Premise: Tokyo is a city in Japan.] True
 Conclusion: Tokyo is on an island.

VD for Premises



VD for Conclusion



Analysis and Explanation

Valid, because both V.D. show Tokyo is a city on an island.

Sound, because both premises are true.

EX 1 (Continued):

c) Premise: Everything in space is a star.] **False**

Premise: Pluto is in space.

Conclusion: Pluto is a star.

✓ VD for Premises



✓ VD for Conclusion



✓ Analysis and Explanation

Valid because the premises show that Pluto is a star

but
Not sound, because there are many things in space that are not stars

EX 2: Statements with negation

Represent the information with Venn Diagrams. Then determine the validity and soundness of the argument and explain your reasoning.

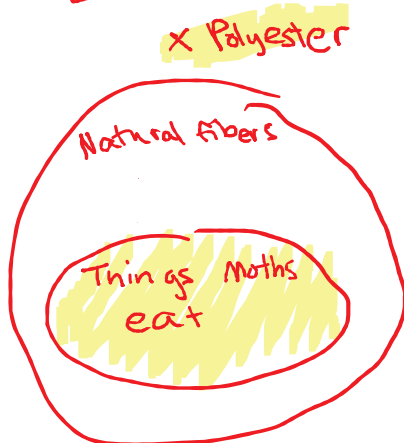
a) Premise: Moths only eat textiles made of natural fibers.

Premise: Polyester is not a natural fiber.] **True**

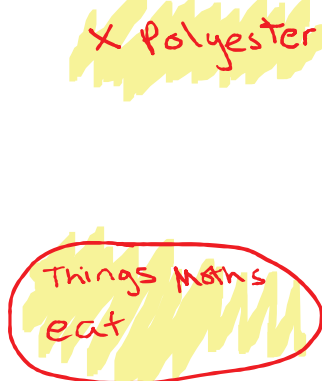
Conclusion: Moths will not eat polyester.

True
False
moth larvae eat natural fibers

✓ VD for Premises



✓ VD for Conclusion



✓ Analysis and Explanation

Valid because both V.D.s show that polyester is not eaten by moths.

Sound if we conclude the premises are true
or not sound if we argue that larvae, not moths, eat the fibers.

EX 2: Statements with negation

b) (Example also shown in Video 2B)

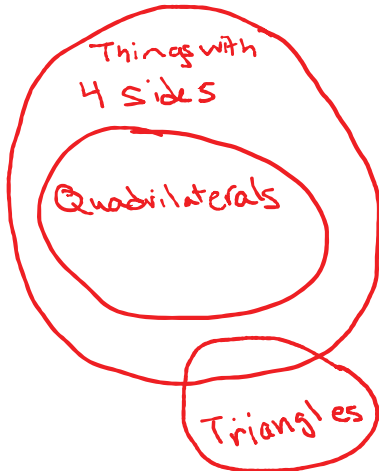
Premise: If a figure is a quadrilateral, it has four sides.] True

Premise: Triangles are not quadrilaterals.] True

Conclusion: Triangles do not have four sides.] True.



VD for Premises



VD for Conclusion



Analysis and Explanation

Invalid, because the VD do not agree.

Not sound because it is invalid.