

Logic Homework Exercises #5 - Solutions

FALL 2022

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Name _____

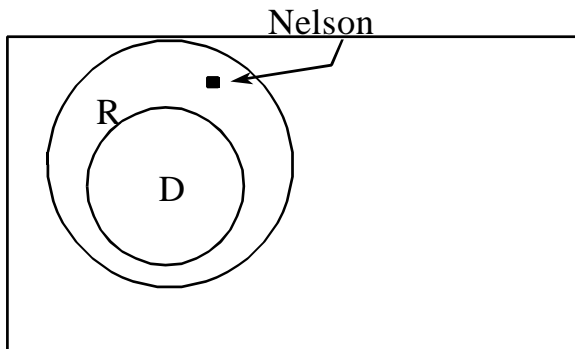
Instructions. Use Euler circles to determine the validity of the following arguments:

1. All doctors are rich. Nelson is rich. Therefore, Nelson is a doctor.

Answer: Making the following assignments:

D - doctors, **R** - rich people, **N** - Nelson

We have:



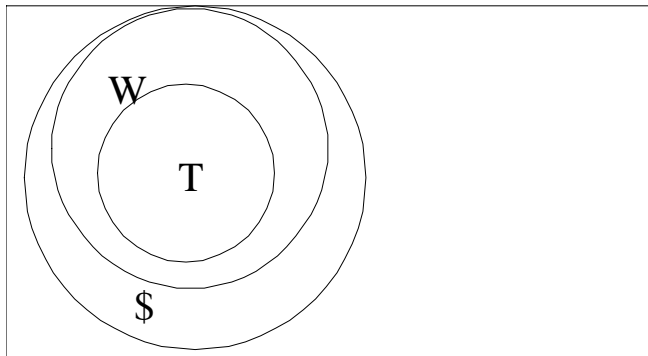
Since the circles can be drawn in such a way that the premises are true and the conclusion is false, the argument is **INVALID**.

2. All teachers are wise. All wise people are wealthy. Therefore, all teachers are wealthy.

Answer: Making the following assignments:

T - teachers, **W** - people who are wise, **\$** - wealthy people

We have:



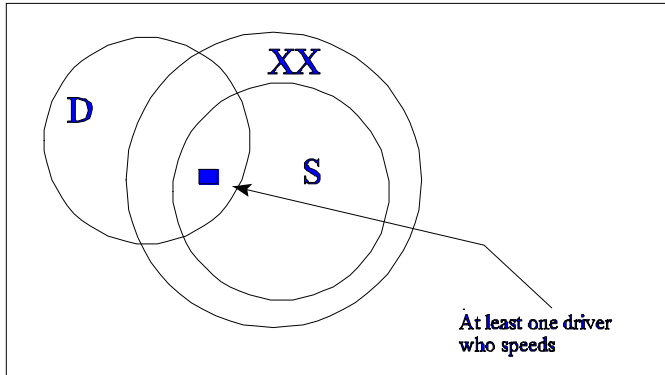
Since the circles can NOT be drawn in such a way that the premises are true and the conclusion is false, the argument is **VALID**.

3. Some drivers speed. All speeders are dangerous. Therefore, Some drivers are dangerous.

Answer: Making the following assignments:

D - drivers, **S** - people who speed, **XX** - dangerous drivers

We have:



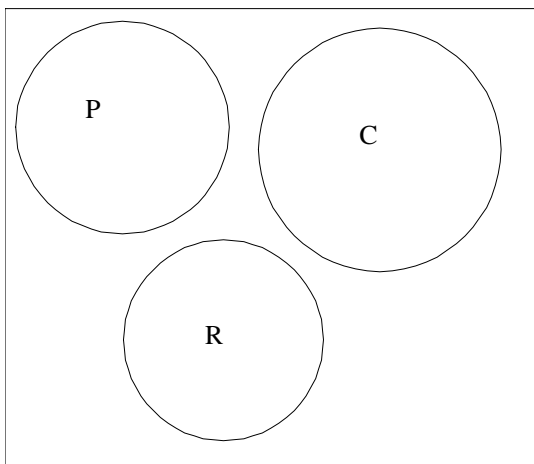
Since the circles can NOT be drawn in such a way that the premises are true and the conclusion is false, the argument is **VALID**.

4. No politicians curse. No Republicans curse. Therefore, All Republicans are politicians.

Answer: Making the following assignments:

P - politicians, **C** - people who curse, **R** - Republicans

We have:



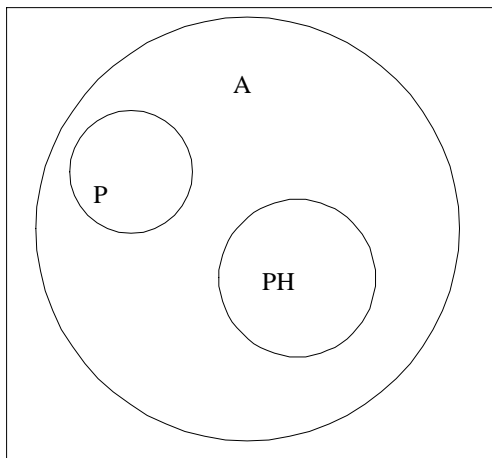
Since the circles can be drawn in such a way that the premises are true and the conclusion is false, the argument is **INVALID**.

5. All Pennsylvanians are Americans. All Philadelphians are Americans. Therefore, Some Philadelphians are Pennsylvanians.

Answer: Making the following assignments:

P - Pennsylvanians, **A** - Americans, **PH** - Philadelphians

We have:



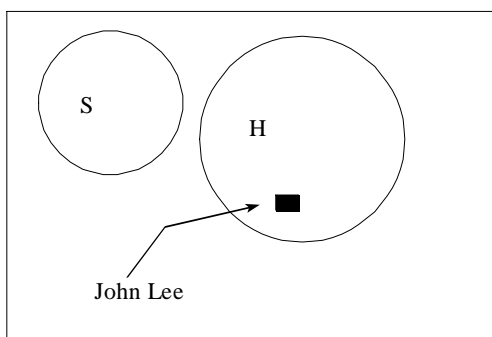
Since the circles can be drawn in such a way that the premises are true and the conclusion is false, the argument is **INVALID**.

6. No smokers are healthy. John Lee doesn't smoke. Therefore, John Lee is not healthy.

Answer: Making the following assignments:

S - smokers, **H** - healthy people

We have:



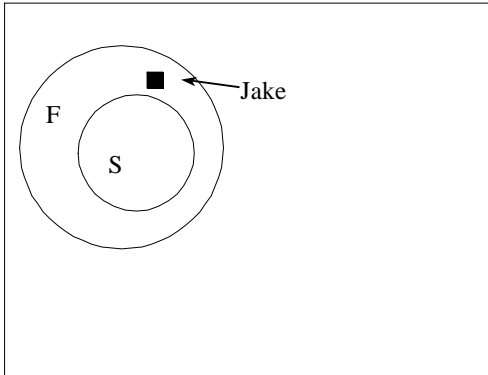
Since the circles can be drawn in such a way that the premises are true and the conclusion is false, the argument is **INVALID**.

7. Everyone who smiles is friendly. Jake does not smile. Therefore, Jake is not friendly.

Answer: Making the following assignments:

S - people who smile, **F** - friendly people

We have:



Since the circles can be drawn in such a way that the premises are true and the conclusion is false, the argument is **INVALID**.

(The following are taken from "Discrete Mathematics" by Richard Johnsonbaugh)

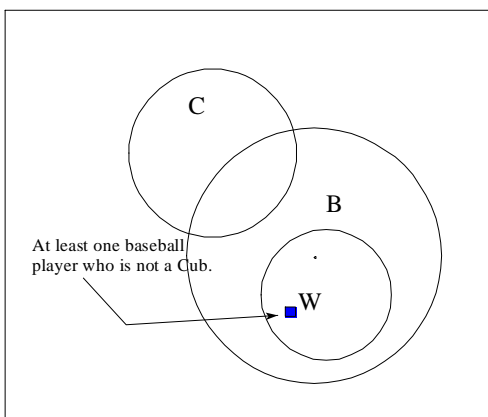
Use **Euler circles to Determine whether each argument is valid**.

8. No Cubs are White Sox. All White Sox are baseball players. Therefore, Some baseball players are not Cubs.

Answer: Making the following assignments:

C - Cubs, **W** - White Sox, **B** - baseball players

We have:



Since the circles can NOT be drawn in such a way that the premises are true and the conclusion is false, the argument is **VALID**.

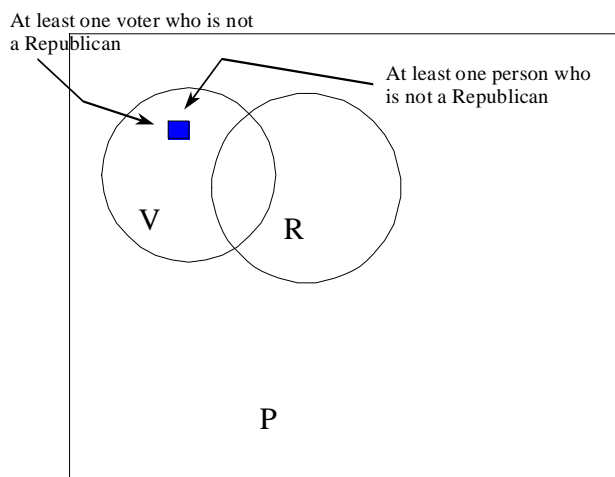
9. Some voters are not Republicans. Some people are not voters. Therefore, some people are not Republicans. Assume that:

- (a) All voters are people,
- (b) All Republicans are people
- (c) The universe is the set of all people

Answer: Making the following assignments:

V - voters, **R** - Republicans, **P** - people

We have:



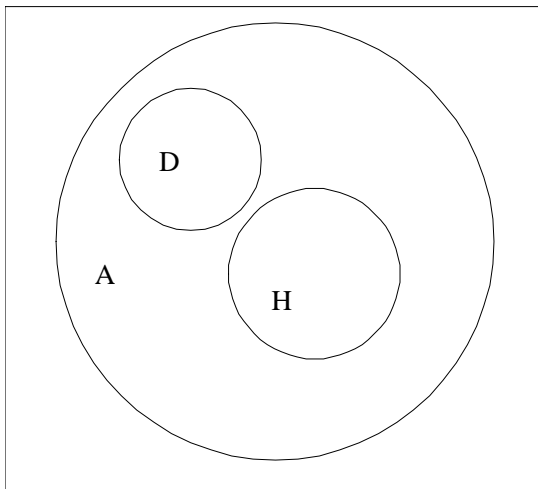
Since the circles can NOT be drawn in such a way that the premises are true and the conclusion is false, the argument is **VALID**.

10. All dogs are animals. No dogs are horses. Therefore, no horses are animals.

Answer: Making the following assignments:

D - dogs, **A** - animals, **H** - horses

We have:



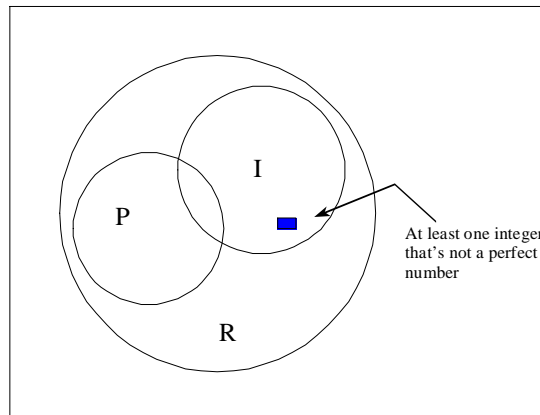
Since the circles can be drawn in such a way that the premises are true and the conclusion is false, the argument is **INVALID**.

11. Some integers are not perfect numbers. All integers are real numbers. Therefore, some perfect numbers are not real numbers. (Note: a perfect number is a natural number n which has the property that it is equal to the sum of its divisors (excluding n itself). e.g. $n = 28$ is a perfect number because $28 = 1 + 2 + 4 + 7 + 14$.)

Answer: Making the following assignments:

I - integers, **P** - perfect numbers, **R** - real numbers

We have:



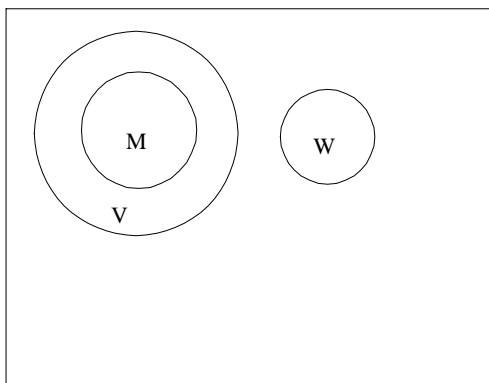
Since the circles can be drawn in such a way that the premises are true and the conclusion is false, the argument is **INVALID**.

12. All movies are violent epics. No violent epics are worth watching. Therefore, nothing worth watching is a movie.

Answer: Making the following assignments:

M - movies, **V** - violent epics, **W** - movies worth watching

We have:



Since the circles can NOT be drawn in such a way that the premises are true and the conclusion is false, the argument is **VALID**.