Composition and Division

I. Lesson

In this lesson, we will focus on two more fallacies. Both arise by confusing the part-whole relationship. The part-whole relationship is the relationship that holds between an object and any part from which it is composed. For example, my arm helps to make up the whole that is my body, so it is a part of my body. Specifically, these fallacies occur when there is a misunderstanding of how the properties possessed by a part relate to the properties possessed by a whole. This type of confusion can work in two ways:

- **Fallacy of Composition:** a fallacy in which the conclusion of an argument overgeneralizes the properties of a part onto a whole

- **Fallacy of Division:** a fallacy in which the conclusion of an argument mistakenly bestows the properties of a whole onto its parts.

  As should be clear from their characterization above, these are both informal fallacies, as they have to do with a relationship holding between terms in propositions, rather than the formal structure of the argument.

II. Examples

i. Fallacy of Composition

I could reason that since atoms are incredibly small, and since I am made of atoms, then I must also be incredibly small. This example is a use of the Fallacy of Composition, because it assumes that a property held by the part, my atoms, is also held by the whole, me.

In the example above, we err in making the jump from (1) knowing a fact about an individual part of my body, to (2) assuming that this fact applies to my body as a *whole*. Yet we haven't any basis for this assumption!

ii. Fallacy of Division

I could reason that since I am reasonable, and since I am composed of atoms, therefore atoms are reasonable. This would be the Fallacy of Division. This is fallacious as it was assumed that a property held by a whole, me, would be held by a part from which it is composed, my atoms.

In the example above, I went wrong in making the jump from knowing a fact about myself, to assuming that this fact would apply to a single atom, again, without any basis for this assumption besides the part-whole relationship itself.

Though both of the examples above involve the relationship between a simple object and one or more of its parts, it is not the only instance in which the part-whole fallacy appears. Each of these fallacies can also occur in reasoning related to a group and its members. For example, I attend my high school's basketball game. I am struck by how tall all of the players on my school's team are, and I conclude that the students at my school must be unusually tall. This is an example of the Fallacy of Composition, as I am taking a property of a small group of students at my school and overgeneralizing it to the whole of the school's population.

Equivalently, imagine that your principal has decided to try to find out more about the demographics of the school, so they pick ten students at random to represent the school and ask who their favorite basketball player is. These students end up choosing Lebron James. From this fact, your principal reasons that you, being a member of the school, must be a fan of Lebron James, so they give you a free ticket to a game in which he is playing. In actuality, you might have chosen Kevin Durant or Russell Westbrook as your favorite basketball player. In this example, your principal committed the Fallacy of Division. This time, their fallacious reasoning involved assuming that some fact about the average member of the whole of your class held true for each individual member of your class.

[Activity]: In the second of the examples immediately above, your principal attempted to utilize the experimental tool of representative sampling, but instead fell prey to the Fallacy of Division. In a group of two, discuss this example and try to understand why this was fallacious (i.e., why your principal was wrong to draw the conclusion he did).

III. Exercises

Exercise 1

Directions: Determine whether the following chains of reasoning are examples of the Fallacy of Composition or the Fallacy of Division

Ex. Trees are tall, trees have leaves, therefore leaves must be tall too.

Answer: Fallacy of Division

1.) I know that some people became rich after investing in a company, so I assume that anyone investing in that company will become rich.

2.) I know rent in New York City is almost always unaffordable anywhere, so when I'm shown any apartment listing in the city, I assume it will be unaffordable.

3.) I know that the pink paint on my house looks very good, so I assume that any house would look very good if it were painted pink.

4.) I know that one branch on a tree has dead leaves, so I reason that the tree as a whole is dead.

5.) I know that a car can reach 120 mph, so when I see an individual tire without any method of propulsion, I reason that this tire too can reach 120 mph.

6.) I know that my room itself is quite messy, so I reason that my house as a whole too must be quite messy.

Exercise 2

Directions: Give three examples of fallacious reasoning involving either the Fallacy of Composition or Division

Ex: Lions can roar, lions are cats, therefore I can expect my house cat to roar. (Fallacy of Composition)

1.)
2.)
3.)

Exercise 3 (Challenge Question)

Directions: Determine whether the following are examples of the Fallacy of Composition, the Fallacy of Division, or non-fallacious reasoning.

Ex. I know that I don't drive, because I think the activity is frightening, so I assume everyone who doesn't drive is also frightened by driving.

Answer: Fallacy of Composition

1.) I know that koalas are marsupials, and I know that marsupials have pouches, so I reason that koalas too have pouches.

2.) I know that a year on Earth is a little over three hundred and sixty five days. I know that Earth is also a planet, so I assume all planets have around three hundred and sixty five days to a year as well.

3.) I know that my body hurts after working out, I know my thumbs are a part of my body, so my thumbs must hurt after working out.

IV. Conclusion

In this lesson, we covered two more fallacies that are prevalent not only in the study of logic, but also in argumentation in general. The fallacies of Composition and Division both arose from a misunderstanding of the part-whole relationship and how this relationship interacts with the properties held by parts and wholes. An understanding of part-whole relationships is extremely important, as parts and wholes figure routinely in our reasoning practices. Thus, it is imperative that students understand how to avoid fallacious arguments involving them.

Lesson Goals:

Following this lesson, students will be able to:

- identify and avoid the use of the Fallacies of Composition and Division
- understand what a part-whole relationship is, and why this comes into play in the Fallacies of Composition and Division

Answer Key:

Exercise 1

1. Fallacy of Composition
2. Fallacy of Division
3. Fallacy of Composition
4. Fallacy of Composition
5. Fallacy of Division
6. Fallacy of Composition

Exercise 2

Answers may vary; however, each must involve some misunderstanding of the relationship of the properties of a part to those of a whole, which that part makes up.

Exercise 3 (Challenge Question)

1. Non-fallacious reasoning
2. Fallacy of Composition
3. Fallacy of Division