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Introduction

This document will teach you basic logic and reasoning skills that can improve the argumentative force of your writing. By looking at formal arguments and integrating them into your writing, your writing will improve.

A lot of writing can make use of formal logic. From emails to job applications, to instructional material, persuasive letters, and proposals and grants, many of these contain *arguments*. Whenever you want to persuade your boss of that promotion, persuade the National Sciences and Research Council of Canada to give you that research grant, propose a new project to your boss or group, or make a case for change to your local politician, these will require an *argument* or arguments.

I should get this job, because all people with my credentials are apt to succeed in this role, and your company needs successful people.

Dear Councilperson, if you impose this bill, then it will have effect x. Effect x harms certain minorities. This means that this bill will harm minorities.



We don't want unpersuasive writing. Writing without formal arguments is unpersuasive. All writing should have formal arguments.

These examples all take the form of a logical argument. In fact, each encompasses a different basic argument form, all of which we will see.

What is an Argument?

An argument is, most simply, a set of statements in a certain *form* to persuade someone of something, or a conclusion supported by evidence with a specific relation between the conclusion and evidence. More formally defined, it is a set of *statements*, one of them a *conclusion*, and that conclusion is supported by other statements called *premises*.

A statement is a sentence. The conclusion is a statement dictating what you want to persuade the reader of. The premises are statements that make the case for the conclusion.

For instance, in our first example above

Conclusion: “I should get this job”

Premises: “your company needs successful people” and “all people with my credentials are apt to succeed in this role.”

All are sentences, or in this case, independent clauses, but their role and how they logically relate are different.

Why Add Formal Arguments to Your Writing?

Why should we add formal logical arguments to our writing?

- It can make your writing sound intelligent.
- It can make you seem reasonable.
- It shows you put thought into your proposal or argument.
- Those who know of formal argumentation, like lawyers, can see your arguments clearly.

All these reasons together make a sufficient case.

It's clear to see that you should add formal argument to your writing.

What I just did was try to persuade you of why you should add formal arguments to your own writing by giving a formal argument. How did it sound? Are you persuaded? If so,



read on so you can also learn how to do this yourself. (Exercise for practice: Which form was it? Try to figure this out then write it out as a formal argument.)¹

Formal Arguments

Again, a formal argument is a set of statements, or sentences, some of them premises, and those premises logically support a conclusion. Your conclusion is what you want to get your reader to believe.

However, we can't just have any set of sentences. These sentences need to be in a proper *logical form*, an order with a specific relation between premises and conclusion to give a *valid* logical relation. We will look at three valid forms: modus ponens, modus tollens, and hypothetical syllogism. Big words but let's just call them Form A, Form B, and Form C for now.

Each of the examples in the introduction takes one of these forms, and by the end of this document, you should understand which argument takes which form.

Here are the three forms:

Form A (*modus ponens*):

If x, then y.

x.

Therefore, y.

Form B (*modus tollens*):

If x, then y,

Not y.

Therefore, not x.

Form C (hypothetical syllogism):

If x, then y.

If y, then z.

Therefore, if x, then z.

¹ Hint: Form A

The sentence with “Therefore” is the concluding statement. The other two statements give reasons why the conclusion should be accepted. The form means that the argument is logically *valid*. Valid just means that the argument will be logically true in all cases if the premises are true. So, if we can get the reader to accept the premises, then they have no logical reason to deny the conclusion.

All we do here is replace the x’s, y’s, and z’s with a phrase. Think of the letters as variables, kind of like math. By replacing the variables, the truth value of the mathematical solution remains the same. What comes after the ‘=’ sign will always be true if the variables are correct. Here’s an example using Form A:

x = greenhouse gas emissions are increasing.

y = we should do something about it.

Which becomes:

If greenhouse gas emissions are increasing, then we should do something about it.

Greenhouse gas emissions are increasing.

Therefore, we should do something about it.

This argument is logically valid, and if the first two statements are true, then the conclusion is always true. That’s how logic works. It works through what’s called *logical entailment*, produced by some brilliant minds like Aristotle, Chrysippus, and Gottlob Frege (1848-1925). Just avoid Frege’s 1879 seminal work, *Begriffsschrift*, unless you like mental torture. (Obviously a joke. Read his work if you want to understand the origin of modern quantifier and predicate logic).

Form A is your cornerstone argument. If you were to learn only one argument, the argument of Form A can be made to work in almost all cases, since it’s so diverse and adaptable. Form C is another good one to remember, too, since it is easily understood: If we have x, then we always have y, if we have y, then we always have z, so if we have x, then we always have z. ($x \rightarrow y \rightarrow z$)

We’ll see in the next section how to make arguments flow easily within prose without disrupting their logical validity.



Incorporating Formal Arguments into Your Writing

We've seen what formal arguments look like. However, we would rarely add them into writing in their standard form. Unless your reader is a logician or philosopher, they would not care about or understand these arguments.

So, what we want to do is to add them into prose in natural language, but in a way that still flows logically. How can we do this?

First, we want to integrate them into natural sounding sentences. Something like,

If greenhouse gas emissions are increasing, then we should do something about it. Greenhouse gas emissions are increasing. So, we should do something about it.

This is better than the form, but still clunky and unappetizing. We can rewrite this to sound more natural and pleasing to the reader while remaining completely logical.

We shouldn't ignore greenhouse gas emissions if they are increasing. Greenhouse gas emissions are unfortunately rising exponentially. We should act now!

That's better. Are you persuaded yet? The form remains the same, but we've just translated it into more natural language.

I also mentioned that Form C is another good form to remember. This is because it's fairly logically intuitive. See this simple portrayal of this logic in simple prose:

If all cats are mammals and if all mammals are animals, then all cats are animals.

Is this pretty easy to reason out? I think most people understand the logic here.

Finer Integration

We can integrate arguments into writing even more naturally. The statements and conclusion don't have to be juxtaposed, or right beside each other; however, the closer they are the easier it is to see the argument. We might also place the statements a bit apart but structure them so they are more easily seen.

For instance, we might first make the case for each premise in turn, then give the conclusion at the end, keeping the order of the statements (premises and conclusion) the same.



We could have one paragraph, or a few sentences on the first statement, “We shouldn’t ignore greenhouse gas emissions if they are increasing.” Then another paragraph on “Greenhouse gas emissions are unfortunately rising exponentially.” Finally, remind the reader that because of these two things, “We should act now!”

Here’s how we might go about it:

We shouldn’t ignore greenhouse gas emissions (GGE) if they are increasing. GGE are linked to ozone layer destruction and ozone layer destruction increases UV radiation. Further, this increases global temperatures, leading to global warming. Finally, weather is affected. Global warming affects melting ice caps, sea levels, and weather. (Optionally you would add citations here, too)

Are greenhouse gas emissions rising? Many scientists argue that they are. [insert some quotes from relevant scientific authorities]. Here are some statistics supporting my claim [insert statistics here]. These statistics show that GGE are unfortunately rising exponentially. Exponential increase means that the situation will just keep getting worse, and faster at that. There is no time to delay.

What does this all mean? Statistics show that GGE are rising, and exponentially at that. We also know that if they are rising, this is bad, and we should do something about it. We should act now to curb GGE!

We’ve seamlessly integrated a formal argument into some natural-sounding prose, giving the argument a strong logical consistency. How does it sound to you? Is it persuasive? Does it sound smart, logical, or credible? There is a reason that I used this example, because this is a contentious example. If you were persuaded, then the logic (sprinkled with *pathos*, of course) had an effect.

Another thing I’ve done here is to give a case for why the premises should be accepted as true. In essence, I’ve given evidence for why the premises are true. Again, if you use a form that is logically valid and if the premises are accepted, then the reader must also accept the conclusion, since the premises always *logically entail* the conclusion. So, once you identify your argument form and write it out, the task then becomes to show why those premises should be accepted as true. One premise can be one paragraph, as your topic sentence, with your sub-points being evidence to show why that premise should be accepted. Order your premises in turn in subsequent paragraphs, then add a paragraph for the conclusion of the argument. This makes for a nice logical flow and great argumentation and reasoning, increasing your writing’s *logos*.



You can start with a formal argument and then this argument basically structures the writing, since the body paragraphs will follow the order of the premises and conclusion.

Introduction

Premise 1

Support for premise 1

Support for premise 1

Premise 2

Support for premise 2

Support for premise 2

Argument's conclusion

Essay conclusion

Another method to layer in a logical argument would be to state your conclusion first, and then show why it should be accepted, giving each premise in turn.

Introduction

Argument's conclusion

Premise 1

Support for premise 1

Support for premise 1

Premise 2

Support for premise 2

Support for premise 2

Essay conclusion

Rhetoric and Audience

The three pillars of rhetoric are ethos, pathos, and logos; or ethics, emotion, and logic. Logic thus makes up only one portion of good rhetoric in writing. Good writing usually has elements of all three, but the recipe of how much of each to use depends on who your main audience, or reader, will be.



This means that a completely logical argument with perfect logic will not always be the best approach. If you reader gets bored or doesn't understand the logic, then the writing will have little effect on them, since they will stop reading or just glaze over.

It's important to balance the three pillars of rhetoric in a ratio that works best for who you want to target, your reader. If you have too much pathos, or emotional flair, prose can be evocative, but it can also make prose seem too biased or unreasonable. Having too much logic can make writing seem cold or calculating.

Then there is ethos, or the authoritative flair. Too much of ethos can make some piece of prose seem authoritative or lie it is trying to hard to be credible and may lack reason or flair. You can instill ethos by stating your credentials. For instance, if I stated that I have a master's degree in philosophy and experience teaching critical thinking, this would make me seem more credible and authoritative, more ethos, than if someone who only studied fine arts.

However, ethos is also about your approach and consideration. Someone who shows that they've considered both sides of some issue shows more ethos than someone who is very logical, and maybe even uses the right about of pathos, but biased towards using evidence from only one side of the issue.

Fallacies

While logic so far might seem straightforward at this point, there are a few nuances in argument that can break logical entailment. For instance, some arguments sound almost exactly like the arguments we gave but aren't logically valid (the reasoning is bad). The form of an argument needs to be exact. If we alter the relation of x's and y's, we can get what we call a *fallacy*, which just means "bad argument." Fallacies don't have logical consistency and aren't valid arguments. This means the conclusion of the argument aren't always true if the premises are true.

Consider the following argument:

If people need more benches in the city square, then we should fund those benches.

We should fund those benches.

Therefore, people need more benches in the city square.

This looks eerily similar to Form A. However, you might feel like something is off. If so, your intuition is correct. Can you see the issue?



The issue here is that just because we fund city square benches, doesn't necessarily mean people need those benches.

Here is another, with a less obvious logical issue:

If a student writes well, then they get an A grade.

A particular student got an A grade.

Therefore, that student wrote well.

Here are the two fallacious argument forms:

Fallacy A (affirming the antecedent):

If x, then y.

y.

Therefore, x.

Fallacy B (denying the consequent):

If x, then y,

Not x.

Therefore, not y.

These arguments sound almost exactly like Forms A and B. Without careful consideration, we can easily give bad arguments that don't have logical consistency. We never want to give bad arguments, even if they might sound persuasive. That's just sophistry and trickery. If a reader notices a bad argument, they will perceive you as less credible in your reasoning.

Practice Makes Perfect

Logic and good reasoning aren't easy. It often goes against what we believe and how we think, since the human mind is prone to many biases. I can profess this from my own experience learning logic and critical thinking, as well as my time teaching critical thinking to university students. It's important to note that everyone can learn logic, since we already have all the mental tools to do it. The trick is learning to properly use the tools we have. Logic becomes more intuitive and easier with practice. You can see some resources for learning basic critical thinking and logic at the end of this document.



Conclusion

You should have understood three basic formal arguments, which we called forms A, B, and C, and understood how to integrate these arguments into writing. Again, integrating formal logical arguments into your writing can make it seem more reasonable, intelligent, and appeal to more reason-minded readers. Knowing argument forms can also give a clearer show of your reasoning within your writing. If you integrate formal arguments into your writing, nobody can call you out for having an unreasonable writing!

Just note that arguments aren't suitable for all types of writing. It mainly suits writing with the purpose of persuading. For instance, fictional novels don't need arguments unless you have a reasonable or logical character who uses reason. Or writing a friend an email just to catch up doesn't need an argument because the purpose of the email is not to persuade them of something (unless you want to ask them for money of course. Trying to coerce or blackmail them is morally dubious, but logic is morally neutral).

Be creative! Where can you implement logic in your life to increase certainty in your beliefs and claims? How can you use it to properly persuade others?

To learn more about logical deduction, see Wilcox Writing's document "Understanding Logical Deduction" in their Writing Center at www.wilcoxwriting.ca.

For more writing documents and to get help with your writing, visit www.wilcoxwriting.ca. By subscribing to our newsletter, you get access to our Writing Center and free writing documents.



Appendix A: Table of Argument Forms

Valid Forms		
Form A (Modus ponens)	<ol style="list-style-type: none"> 1. If x, then y. 2. x. 3. y. 	<ol style="list-style-type: none"> 1. If we put water in the freezer, then it freezes. 2. We put water in the freezer. 3. The water freezes.
Form B (modus tollens)	<ol style="list-style-type: none"> 1. If x, then y. 2. Not y. 3. Not x. 	<ol style="list-style-type: none"> 1. If we put water in the freezer, then it freezes. 2. The water didn't freeze. 3. We didn't put the water in the freezer.
Form C (Hypothetical syllogism)	<ol style="list-style-type: none"> 1. If x, then y. 2. If y, then z. 3. If y, then z. 	<ol style="list-style-type: none"> 1. If we put water in the freezer, then it freezes. 2. If it freezes, then we can make ice cubes. 3. If we put water in the freezer, then we can make ice cubes.
Invalid Forms		
Fallacy A (Denying the antecedent)	<ol style="list-style-type: none"> 1. If x, then y. 2. Not x. 3. Not y. 	<ol style="list-style-type: none"> 1. If we put water in the freezer, then it freezes. 2. We didn't put water in the freezer. 3. The water didn't freeze. (Can you think of an example where water freezes when not in a freezer?)
Fallacy B (Affirming the consequent)	<ol style="list-style-type: none"> 1. If x, then y. 2. y. 3. x. 	<ol style="list-style-type: none"> 1. If we put water in the freezer, then it freezes. 2. The water froze. 3. We put the water in the freezer. (What about outside on a winter's day? Does that defeat the argument?)

