ALETHIC	$\Box\phi$	it is **necessary** that ϕ
	$\Diamond\phi$	it is **possible** that ϕ
DEONTIC	$\Box\phi$	it is **obligatory** that ϕ
	$\Diamond\phi$	it is **permitted** that ϕ
DOXASTIC	$\Box\phi$	it is **believed** that ϕ
LOCATIVE	$\Box\phi$	it **is the case** that ϕ
PROVABILITY	$\Box\phi$	it **can be proved** that ϕ
TEMPORAL	$F\phi$	it **will be** the case that ϕ
	$P\phi$	it **was** the case that ϕ

It helps to think of modality in terms of possible worlds (we make it precise later on):

$\Box\phi$ is true iff ϕ is true in all possible worlds

$\Diamond\phi$ is true iff ϕ is true in at least one possible world

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1. In EPISTEMIC modal logic $\Box\phi$ reads "it is **known** that ϕ". What is the meaning of $\Diamond\phi$?

2. Formalize the following sentences.

- Necessarily, if snow is white, then snow is white or grass is green.
- I'll go if I must.
- It is possible that Bush will lose the election.
- Snow might have been either green or blue.
- If snow could have been green, then grass could have been white.
- It is impossible for snow to be both white and not white.
- If grass cannot be clever then snow cannot be furry.
- God's being merciful is inconsistent with your imperfection being incompatible with your going to heaven.

- If Jones is a bachelor, then he must be unmarried.
- Snow is a necessary condition for skiing.
- Food and water are required for survival.
- Thunder implies lightning.

Examples for semantic flexibility of natural language modal words:

- I can come to the party, but I can't stay late. ("can" = "is not inconvenient")
- Humans can travel to the moon, but not Mars. ("can" = "is achievable with current technology")
- It's possible to move almost as fast as the speed of light, but not to travel faster than light. ("possible" = "is consistent with the laws of nature")
- Objects could have traveled faster than the speed of light (if the laws of nature had been different), but no matter what the laws had been, nothing could have traveled faster than itself. ("could" = "metaphysical possibility")
- You may borrow but you may not steal. ("may" = "morally acceptable")
- It might rain tomorrow ("might" = "epistemic possibility")