**(1) If it is your birthday, then you get some presents.**
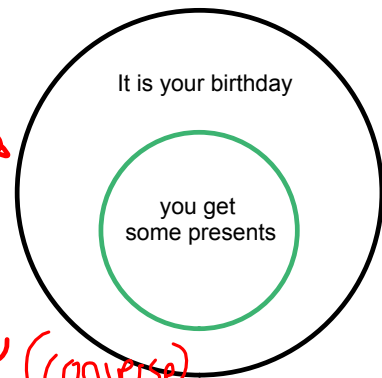
*presents / bday*     *If A, then B*

*B A*

**(2) Only if it is your birthday, do you get some presents.**

24. Is the first sentence true for you?

25. Is the second sentence true for you?

27. Which sentence does this Euler Diagram illustrate?

It is your birthday

you get
some presents

(3) *If you get some presents, then it is your birthday (converse)*

(4) *you get presents if and only if it is your birthday*

<u>**2.3 – Direct Proof**</u>

A <u>syllogism</u> is an argument of the form

a→b

b→c

Therefore, a→c.

A syllogism is an example of a <u>direct proof</u>.

The statements a→b and b→c are called the <u>premises</u> of the argument.

a→c is called the <u>conclusion</u> of the argument, and is often considered to be a theorem.

A <u>theorem</u> is a statement that is proved by reasoning deductively from already accepted statements.

Syllogisms were discussed by the Greek philosopher Aristotle in the fourth century BC. Write the syllogism illustrated by the following Euler diagram.
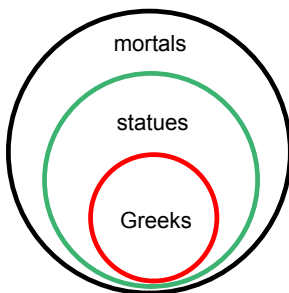
*If they are Greek, then they are a statue.*
*If they are a statue, then they are mortal.*
*Therefore, if they are Greek,*
*then they are mortal.*

6. If the premises of a syllogism are true, does it follow that its conclusion must be true?

*yes*

7. If the premises of a syllogism are false, does it follow that its conclusion must be false?

*no*

*"Admit one ridiculous premise and the rest follows." – Aristotle*

**1.** If you live at the South Pole, you live in the Antarctic.　　　$a \rightarrow b$

**2.** If you live in the Antarctic, you live where it is cold.　　　$b \rightarrow c$

**3.** If you live where it is cold, you see a lot of penguins.　　　$c \rightarrow d$

Therefore, if you live at the South Pole, you see a lot of penguins.　$a \rightarrow d$

What part of the second premise matches

8. the conclusion of the first premise?　*you live in the Antarctic*

9. the hypothesis of the third premise?　*you live where it is cold*

10. Starting with a→b to represent the first premise, represent the entire argument in symbols.

11. Which premise is ridiculous (false)?　# 3

12. What does the fact that one premise is false indicate about the conclusion of the argument?

　*conclusion is not necessarily true*

**If Captain Spaulding is in the jungle, there are too many cheetahs.**

**If there are too many cheetahs, Captain Spaulding can't play cards.**

13. What conclusion follows from these premises?

　*If Cpt. Spaulding is in the jungle, then he can't play cards.*

14. If the two premises are true, doe sit follow that the conclusion must be true?

　*yes*

Write in the missing statements for the following proofs.

20. *Theorem:* If two hungry vultures took an airplane, they would be told that there is a limit of two carrion per passenger.

*Proof:*

If two hungry vultures took an airplane, they would want to take along some food.

> If they would want to take along some food, then they would try to carry on six dead raccoons.

If they tried to carry on six dead raccoons, the flight attended would object.

> If the flight attendant would object, then they would be told there is a limit of two carrion per passenger.

Therefore, if two hungry vultures took an airplane, then they would be told there is a limit of two carrion per passenger.

21. *Theorem:* If a group of chess players checked into a hotel, the manager would say "I can't stand chess nuts ~~boating~~ in an open foyer."

**boasting**

*Proof:*

> If a group of chess players checks into a hotel then they would stand in the lobby bragging about their tournament victories

If they stood in the lobby bragging about their tournament victories, the manager would ask them to leave.

> If the manager asks them to leave, then they would ask why

If they asked why, the manager would say "I can't stand chess nuts boasting in an open foyer."

Therefore, If a group . . . , then the manager would . . . foyer.