CATEGORICAL SYLLOGISMS: Arguments with:

(a) Exactly two premises and one conclusion;

(b) Only (A, E, I, O) categorical propositions;

(c) Exactly 1 premise with the predicate term, P;

(d) Exactly 1 premise with the subject term, S;

(e) Only the premises contain the middle term, M, and M occurs just once in each premise

Predicate (major) term: *The term in the conclusion's predicate position*

The premise containing the major term is called the *major premise*

Subject (minor) term: the term in the conclusion's subject position

The premise containing the minor term is called the *minor premise*

Though logically it doesn't matter, *traditionally* the major premise is put first in the syllogism; I will not always follow this pattern

Examples:

No giraffes are camels.
<u>Some camels are not spotted creatures.</u>
∴ Some giraffes are spotted creatures.

Major term?

Minor term?

Middle term?

Major premise?

Minor premise?

Traditional order?

Valid?

Example 2:

No heavy hitters are this year's players.
Some Canucks are heavy hitters.
∴ Some Canucks are not this year's players.

Major term?

Minor term?

Middle term?

Major premise?

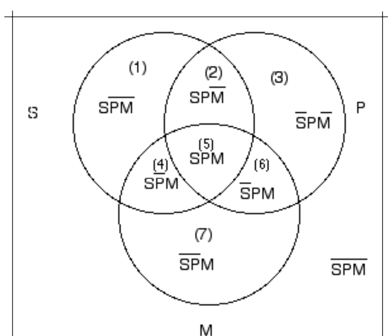
Minor premise?

Traditional order?

Valid?

VENN DIAGRAMS: Categorical syllogisms have three classes (categories), S, P and M; so to test these arguments for validity, we'll need three overlapping circles

A bar over a letter—e.g., $\overline{S}$—means that anything in that region is not in S



VENN DIAGRAMS AND VALIDITY: Once again, we diagram the information in the premises, and then see whether we've thereby diagrammed the information in the conclusion

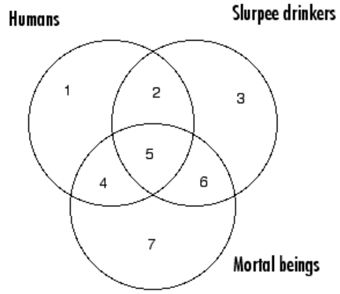
If so, the argument is valid; otherwise, it's invalid.

Why?

1. All humans are mortal beings.
2. <u>All mortal beings are Slurpee™ drinkers.</u>

∴ 3. All humans are Slurpee™ drinkers.

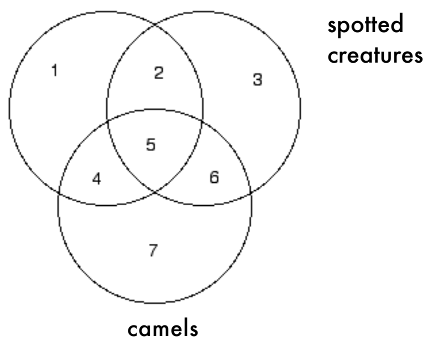
Is the conclusion, "All humans are Slurpee™ drinkers diagrammed?"



What about example 1 above:

1. Some camels are not spotted creatures.
2. <u>No giraffes are camels.</u>

∴ 3. Some giraffes are spotted creatures.



Hint: Diagram universal premises first, since that will restrict the areas into which you can place your particular premises' "X"s

Is the conclusion, "Some giraffes are spotted creatures," represented after we have diagrammed the premises?

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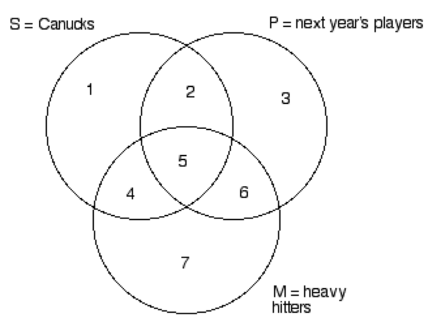
Ex. 2?

1. No heavy hitters are next year's players.
2. <u>Some Canucks are heavy hitters.</u>

∴ 3. Some Canucks are not next year's players.

P = ?
S = ?
M = ?
Major premise?

Is the conclusion, "Some Canucks are not next year's players," represented after we have diagrammed the premises?



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Ex. 3?

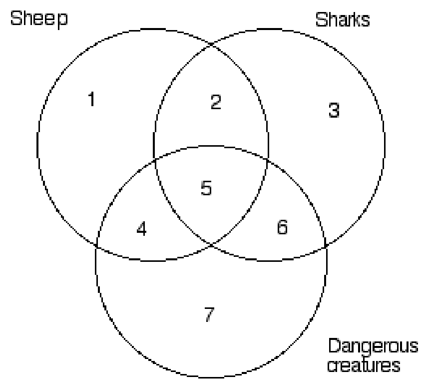
1. Some dangerous creatures are not sharks.
2. <u>Some sheep are dangerous creatures.</u>

∴ 3. Some sheep are not sharks.

P = ?
S = ?
M = ?
Major premise?

Hint: If the region into which you place an "X" is further subdivided, then you should put the "X" on the line which divides the region

Is the conclusion, "Some sheep are not sharks," represented after we have diagrammed the premises?



Summary of strategies for diagramming Categorical Syllogisms:

(1) **Diagram universal premises first** (this can rule out regions for "X"s for particular premises)

(2) *If the premise does not say into which subregion the "X" should go, put the "X" on the boundary of that region.*

That the "X" is on the boundary means that it could be in either region, but **you cannot assume** which region it is in.

Chapter 8: Arguments to and from Generalizations

A deductive argument is one that is *intended* to be valid, even if the argument actually fails to be valid.

A valid argument is one in which it is impossible for its conclusion to be false, if its premises are all true.

That is, there are both valid and invalid deductive arguments

Deductive fallacies are arguments that are intended to be valid, but actually fail

e.g., (a) denying the antecedent and

(b) affirming the consequent are common deductive fallacies

(a) 1. $P \supset Q$ **Denying the antecedent**

2. $\sim P$

$\therefore$ 3. $\sim Q$

(b) 1. $P \supset Q$ **Affirming the consequent**

2. Q

$\therefore$ 3. P

Inductive arguments: are not intended to be valid, but seek to provide strong reasons or support for accepting the conclusion

e.g. 1. All observed ravens are black

$\therefore$ 2. If there's a raven on a tree on the Queen Charlottes, it will be black.

All inductive arguments are invalid, since, even if their premises are all true, their conclusion can be false.

Definition: An argument is inductive if it seeks to provide strong, but not conclusive, reasons for its conclusion.

Two different sorts of standards:

(i) An argument is **deductive** if it is intended to be evaluated by the standard of **validity**.

(ii) An argument is **inductive** if it is intended to be evaluated by the standard of **strength**.

So, to critique an inductive argument for not being valid is to apply an inappropriate standard to the argument

More differences: (i) new information cannot alter the validity of an already valid argument

If the argument is valid, this means its premises guarantee the truth of the conclusion; so adding information will not alter this support

Example: 1. All men are mortal

2. Socrates is a man

$\therefore$ 3. Socrates is mortal

Add a premise:

1. All men are mortal.
2. Some people drink coffee.
3. Socrates is a man.

$\therefore$ 4. Socrates is mortal.

Add a contradictory premise:

1. All men are mortal.
2. Some men are not mortal.
3. Socrates is a man.

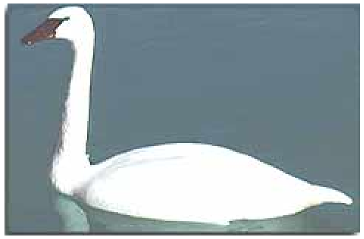
$\therefore$ 4. Socrates is mortal.

Is the argument still valid? Why?

What does the contradiction show?

(ii) new information CAN alter the strength of an inductive argument

Before Captain Cook reached Australia, all observed (by Europeans) swans were white



1. <u>All swans so far observed are white</u>

∴ 2. All swans are white

The premise provides strong support for the conclusion.

The British explorer, James Cook, discovered black swans in Australia.

Add a premise:

1. All swans so far observed are white
2. <u>(Cook) This Australian swan is black</u>

∴ 3. (Not) all swans are white

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Notice that in this case adding the new premise **completely** removes inductive support for the original conclusion; however, some information can merely **weaken** the support

Defeasibility: All inductive arguments are *defeasible*: new information can weaken the support of the original premises

Valid arguments are indefeasible

Degrees of support: (i) valid arguments provide full (100%) support for their conclusions, if their premises are all known to be true

(ii) strong inductive arguments provide partial (less than 100%, but more than 50%) support for their conclusions, if their premises are all (known to be) true.

(point of "known to be true": though inductive arguments provide only partial support for their conclusion, they still may be equal or superior to some deductive arguments, because we can be more confident about their premises)

Deductive.	**Inductive.**
1. All ravens are black. ∴2. If there's a raven at X in the Queen Charlotte Islands it is black.	1. All observed ravens are black. ∴ 2. If there's a raven at X in the Queen Charlotte Islands it is black.

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How would we know that the premise of the deductive argument is true?

How would we learn that the premise of the inductive argument is true?

Typically, deductive arguments provide no stronger support for their conclusions than do their inductive counterparts, because what they gain in the strength of the deductive inference, they often lose in certainty about the truth of the deductive argument's premises.

Statistical generalization: Reasoning from samples taken from a population to the whole population

Form of statistical generalizations:

1. Statistical facts about a sample taken from a population.
∴2. Statistical conclusion about the real world population

Example:

1. 42% of polled Canadian voters support the Federal Conservatives.
∴2. 42% of Canadian voters support the Federal Conservatives.

Evaluation of statistical generalizations:

Are the premises well-supported?

Is the source of information about the sample credible?

Were the data determined by correct methods?

1. **Is the sample large enough?** Mathematically, small samples have larger "margins of error"

   In other words, the result of a small sample can vary quite a bit from the true value, and so are prone to "runs of luck"

How much?[1]

TABLE 6.1
APPROXIMATE 95% CONFIDENCE INTERVALS FOR AN OBSERVED SAMPLE FREQUENCY OF .50 IN SAMPLES OF VARIOUS SIZES

SAMPLE SIZE	CONFIDENCE INTERVAL	MARGIN OF ERROR
10	.18 to .82	± .32
25	.30 to .70	± .20
50	.36 to .64	± .14
100	.40 to .60	± .10
250	.44 to .56	± .06
500	.46 to .54	± .04
1000	.47 to .53	± .03
2000	.48 to .52	± .02
10000	.49 to .51	± .01

Clearly, for very small samples (say, 10), the true answer can vary by e.g., 32%

Conversely, once the sample size reaches 1000, increasing sample size provides only small increases in accuracy

[1] From *Understanding Scientific Reasoning*, p150 (5th ed.)

This means that small samples are a very fuzzy guide to the actual world, and that a relatively big sample (e.g., 1000) can be nearly as reliable as a very large sample

The fallacy of "hasty generalization": People commonly assume that a single experience (or a few) can provide an accurate "snapshot" of the world

Well-known cognitive psychologists, Amos Tversky and Daniel Kahneman, found that people typically "expect any two samples drawn from a particular population to be more similar to one another and to the population than sampling theory predicts, at least for small samples" (p. 297)

We believe we can tell a person's personality, from a few visits, and explain away later discrepancies as due to a change of behaviour, or having an off day, etc. (confirmation bias)

http://en.wikipedia.org/wiki/List_of_cognitive_biases#Common_theoretical_causes_of_some_cognitive_biases

Sample bias: Even a reasonably large sample, may not provide an accurate representation of the real world population

Theoretically, for the sample to accurately picture the real world, each member of the RWP must have an equal chance of being selected into the sample population

The best way to achieve this is through random sampling

In actual practice, this is very hard to achieve

Literary Digest poll: During the 1936 US presidential election, the *Literary Digest* sent 10 million questionnaires asking whether recipients would vote for Franklin Roosevelt or Alf Landon.

2.5 million questionnaires were returned (the sample), and 56% said they would vote for Landon; the remaining 44% said they'd vote for Roosevelt

Actual result: 62% for Roosevelt vs. 38% for Landon

Why? Questionnaire recipients came from phone books, but only 11 million Americans owned phones, and these tended to be better off

The election occurred during the Great Depression, where more than 9 million people had no jobs

These people were very much more likely to vote for Roosevelt than Landon, yet they were also very unlikely to be included in the sample

Other worries: Questionnaire sampling accuracy depends on return rate, but it is also hampered by the fact that people who are motivated enough to return the questionnaires may not be representative of the larger population

Gallop poll: Gallop had correctly predicted Roosevelt's victory in 1936, failed to correctly predict Truman's victory in 1948

The *Chicago Tribune* (in)famously published their first edition with the banner headline: Dewey Defeats Truman

Explanation: While Gallop pollsters tried to include every neighbourhood in their surveys, within those neighbourhoods, workers tended to prefer areas within those areas that were "nicer," with "nicer" people

Other sources of bias:

(1) **Prejudice:** We tend to see our stereotypical beliefs as supported no matter what the evidence is (confirmation bias, again)

e.g., we "explain away" contrary evidence and add supporting data

(2) **Question phraseology:** How questions are asked can give a false picture of people's true views

Which do you favour: (a) allowing citizens to support their own charity, according their own best judgement, or (b) taking people's hard-earned money to provide misguided support for welfare cases and drug addicts?

vs.

Which do you favour: (a) using public funds to reduce the hardship of our less fortunate citizens, or (b) leaving these unhappy people to the whim of dubious charities?

In sum: We should critically evaluate statistical generalizations according to (i) accuracy of premises; (ii) appropriate sample size; (iii) sample bias; or (iv) other sources of bias

Statistical applications: Given knowledge about the statistical structure of some RWP, we draw conclusions about individual members of, or subgroups within, that population

General pattern:

1. X% of Reference Class F has property G
2. <u>a is a member (or subgroup) of F.</u>

∴3. a has property G

Example:

1. 90% of Americans are right handed.
2. <u>Babe Ruth is an American</u>

∴3. Babe Ruth is right-handed.

We will here only consider statistical applications to be strong when the percentages are close to 0% or 100% (say, less than 10% or greater than 90%)

Otherwise, they are weak

Relevance of premises to conclusion: Different reference classes often yield incompatible conclusions

Example:

1. 4% of great hot-dog eaters are right-handed.
2. Babe Ruth is a great hot-dog eater.

∴3. Babe Ruth is **not** right-handed.

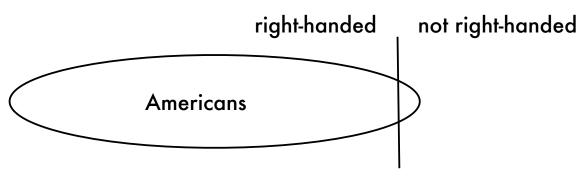
To know which statistical application argument we should trust we need to know which reference class is more relevant to drawing the correct conclusion

To know this, we need more background information

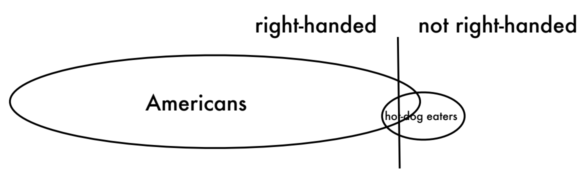
One method: Combine reference classes: "Americans" and "hot-dog eaters"

35% of American hot-dog eaters are right-handed

One way to represent the first statistical application is with an ellipse divided into right and non-right handed sub-groups: 92% lie to the left; 8% to the right



We can represent the statistical application involving combined reference classes by adding a second ellipse represent "hot-dog eaters": 35% of American hot-dog eaters are right-handed



Statistical applications are defeasible

Clearly, new information can undermine (or enhance) the support of statistical applications for their conclusions

- We can try to compensate by choosing more relevant reference classes
  - However, which reference classes are relevant can be hard to determine
  - Our theories of the world guide us in this task

Of course, these theories have themselves been established by induction

The Problem of Induction: Inductive reasoning presupposes that the world has discoverable, genuine patterns

- In other words, it is possible to correctly reason from a sample to the larger world
  - How would we *prove* this assumption?

Exercises: worksheet