

# Exam 1

Math 105, Summer 2018

Name: \_\_\_\_\_

*Key*

Don't leave anything blank. If you don't know the entire answer, showing a formula or writing something illustrating that you understand any concept involved in the problem will allow me to give partial credit. I have to give you a 0 if you write nothing down.

Show your work. If you give me an answer without any kind of demonstration of how you got that answer, you will not receive credit for that part of the problem.

Check your answers. Take the time before you turn in your test to make sure you have read the directions correctly and in their entirety, that all your work shown is correct, and that you have clearly stated your answer (by boxing or circling it where appropriate).

Pace yourself. If you're stuck on a problem, move on and come back to it later. Don't risk forcing yourself to give partial answers if you run out of time near the end of the test. Do the easy ones first. There are 126 points on this exam. That means you should budget about 0.4 minute(s) for each point a problem is worth in order to complete the exam in time.

Reminder. There are to be no calculators or devices with internet access used in conjunction with this test. If you use any such material, you will receive a zero on this assessment.

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1. Are each of the following arguments deductive or inductive? Why? Use complete sentences.

- (a) 1. All men are mortal.  
2. Socrates is a man.

∴ Socrates is mortal.

The argument is deductive because it reasons ~~from~~ from general principles (e.g. "all men are mortal") to a specific case (that of Socrates).

- (b) 1. Some baseball teams are good.  
2. The Mariners are good.  
∴ The Mariners are a baseball team.

The argument is deductive because it reasons ~~the~~ from general principles (about the set of baseball teams) to a specific instance (that of the Mariners).

- (c) 1. I put mushrooms in spaghetti sauce.  
2. I put mushrooms in chili.  
∴ I put mushrooms in all of my food.

The argument is inductive because it reasons from specific cases (that of spaghetti sauce and chili) to a general principle (about the set of food).

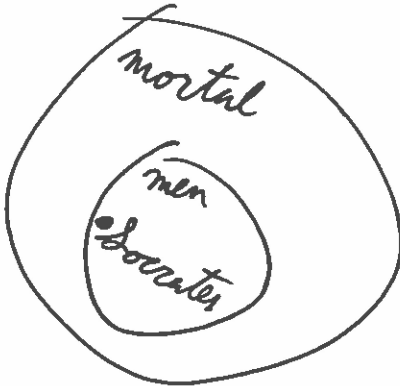
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2. Are each of the following arguments valid or invalid? Support your argument with a Venn diagram or complete sentence as appropriate.

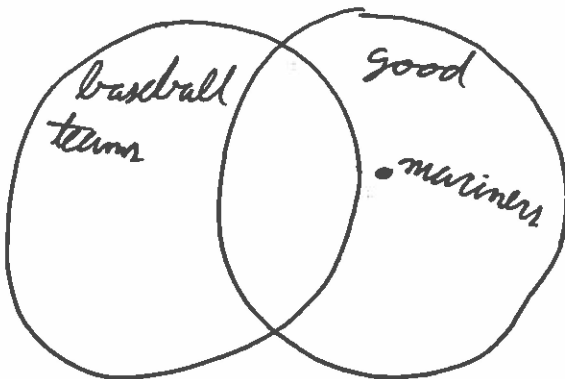
- (a) 1. All men are mortal.  
2. Socrates is a man.

$\therefore$  Socrates is mortal.



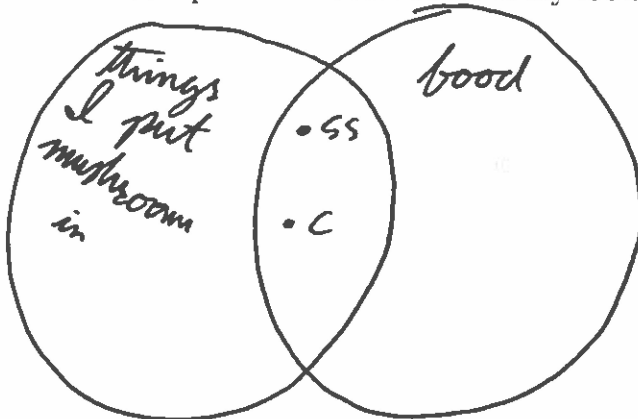
*the argument is valid*

- (b) 1. Some baseball teams are good.  
2. The Mariners are good.  
 $\therefore$  The Mariners are a baseball team.



*the argument is invalid*

- (c) 1. I put mushrooms in spaghetti sauce.  
2. I put mushrooms in chili.  
 $\therefore$  I put mushrooms in all of my food.



*the argument is invalid*

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3. Use the following symbolic representations for the remainder of the problem.

$t$ : You buy tomatoes.

$\ell$ : You buy lettuce.

$o$ : You buy onions.

Translate the following statements from symbolic logic into natural language.

(a)  $t \rightarrow \ell$

If you buy tomatoes, then you buy lettuce.

(b)  $\ell \wedge (\sim (o \vee t))$

You buy lettuce and you buy neither onions nor tomatoes

(c)  $(t \vee (\sim o)) \rightarrow \ell$

If you buy tomatoes or don't buy onions, then you buy lettuce

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4. Give the following natural language statements a symbolic representation. Make sure to state what your symbols mean (note: if you use the same symbols for all parts of the problem, you only need to state them once).

- (a) If something doesn't have a long tail, then it is not a cat.

$l$ : it has a long tail

$c$ : it is a cat

$$(\sim l) \rightarrow (\sim c)$$

- (b) All turkeys on the UO campus have long tails.

$t$ : it is a turkey on the UO campus

$$t \rightarrow l$$

- (c) Either something is a cat, or it is a turkey on the UO campus with a long tail.

$$c \vee (t \wedge l)$$

- (d) If something is a cat or if it does not have a long tail, then it is a turkey on the UO campus.

$$(c \vee (\sim l)) \rightarrow t$$

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5. Under what conditions is the following statement true? Make sure to show your work.

$$(p \vee q) \rightarrow (\sim p)$$

$p$	$q$	$p \vee q$	$\sim p$	$(p \vee q) \rightarrow (\sim p)$
T	T	T	F	F
T	F	T	F	F
F	T	T	T	T
F	F	F	T	T

The statement is true when  $p$  is false and  $q$  is true, or when both  $p$  and  $q$  are false

6. Are the following sentences equivalent?

$$(p \rightarrow q) \vee (\sim q)$$

$$\sim p$$

$p$	$q$	$\sim q$	$p \rightarrow q$	$(p \rightarrow q) \vee (\sim q)$	$\sim p$
T	T	F	T	T	F
T	F	T	F	T	F
F	T	F	T	T	T
F	F	T	T	T	T

the statements are not equivalent

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7. Express the contrapositive of the following statement: "All bunnies are cute."

*If something is ~~not~~ not cute, then it is not a bunny.*

8. Is the following argument valid or invalid? Make sure to show your work.

1.  $p \rightarrow q$

2.  $(\sim q) \vee r$

$\therefore p \rightarrow r$

			①		②	③		
$p$	$q$	$r$	$p \rightarrow q$	$(\sim q)$	$(\sim q) \vee r$	$p \rightarrow r$	$① \wedge ②$	$(① \wedge ②) \rightarrow ③$
T	T	T	T	F	T	T	T	T
T	T	F	T	F	F	F	F	T
T	F	T	F	T	T	T	F	T
T	F	F	F	T	T	F	F	T
F	T	T	T	F	T	T	T	T
F	T	F	T	F	F	F	F	T
F	F	T	T	T	T	T	T	T
F	F	F	T	T	T	T	T	T

*The argument is valid*