

1. (8 pts) Write the converse, inverse, and contrapositive of the following proposition:  
 "If gravity is a myth, then scientists should study fairy tales."  
 (Be sure to label which is which!)

Converse: "If scientists should study fairy tales, then gravity is a myth."

Inverse: "If gravity is not a myth, then scientists should not study fairy tales."

Contrapositive: "If scientists should not study fairy tales, then gravity is not a myth."

2. (12 pts) Assume that  $p$  and  $q$  represent propositions. Make a truth table for the following statements: " $p$  and  $q$ " and " $(not\ p)$  or  $(not\ q)$ ." (Note: If you wish, you may also include other columns in your truth table. You may either create one truth table that includes both propositions or create a separate truth table for each one.)

$P$	$q$	$p$ and $q$	$(not\ p)$	$(not\ q)$	$(not\ p)$ or $(not\ q)$
T	T	T	F	F	F
T	F	F	F	T	T
F	T	F	T	F	T
F	F	F	T	T	T

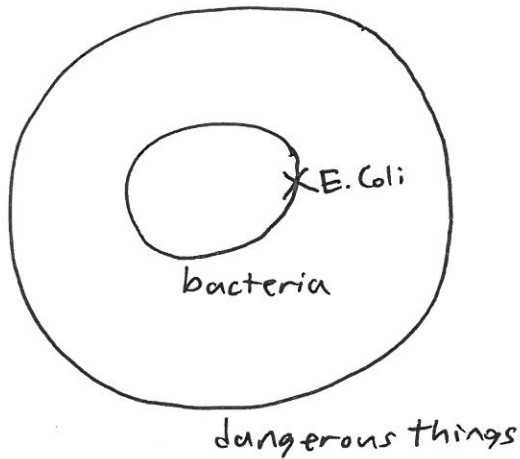
(optional)

3. (14 pts) Draw a Venn diagram to determine whether the following argument is valid. If it is valid, discuss the truth of the premises and state whether it is sound.

Premise: All types of bacteria are dangerous.

Premise: *E. Coli* is dangerous.

Conclusion: *E. Coli* is a type of bacteria.



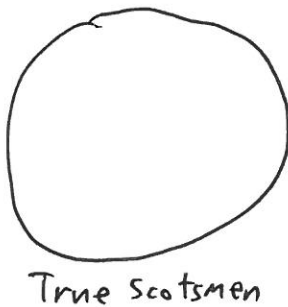
invalid

4. (14 pts) Draw a Venn diagram to determine whether the following argument is valid. If it is valid, discuss the truth of the premises and state whether it is sound.

Premise: No true Scotsman watches American football.

Premise: Your uncle watches American football.

Conclusion: Your uncle is not a true Scotsman.



Valid

If you think the premises are true, then the argument is sound otherwise, the argument is unsound

5. (14 pts) The orchestra pit in the University of Colorado's Macky Auditorium is 28 feet by 52 feet. What is the area of the pit in square meters?

$$28 \text{ ft} \times \frac{0.3048 \text{ m}}{1 \text{ ft}} = 8.5344 \text{ m}$$

$$52 \text{ ft} \times \frac{0.3048 \text{ m}}{1 \text{ ft}} = 15.8496 \text{ m}$$

$$\text{area} = 8.5344 \text{ m} \times 15.8496 \text{ m} = \boxed{135.27 \text{ m}^2}$$

OR

$$\text{area} = 28 \text{ ft} \times 52 \text{ ft} \times \frac{(0.3048)^2 \text{ m}^2}{1^2 \text{ ft}^2} = \boxed{135.27 \text{ m}^2}$$

6. (12 pts) Convert 50 decagrams to pounds.

$$50 \text{ decagrams} \times \frac{10 \text{ gram}}{1 \text{ decagram}} \times \frac{0.001 \text{ kg}}{1 \text{ g}} \times \frac{1 \text{ lb}}{0.4536 \text{ kg}} = \boxed{1.10 \text{ lb}}$$

7. (12 pts) Suppose that your utility company charges 9¢ per kilowatt-hour for electricity. How much does it cost to operate a 1200-watt microwave for six minutes?

$$1200 \text{ watt} = 1.2 \text{ kW.}$$

$$6 \text{ min} = \frac{6}{60} \text{ hr} = 0.1 \text{ hr}$$

$$1.2 \text{ kW} \times 0.1 \text{ hr} = 0.12 \text{ kWh.}$$

$$0.12 \text{ kWh} \times \frac{9¢}{1 \text{ kWh}} = \boxed{1.08¢}$$

8. (14 pts) Suppose that your car gets 28 miles per gallon of gasoline and that you are driving at a speed of 55 miles per hour. How many gallons of gasoline will you use in two hours?

$$\frac{55 \text{ mile}}{1 \text{ hour}} \times 2 \text{ hour} = 110 \text{ mile}$$

$$110 \text{ mile} \times \frac{1 \text{ gal}}{28 \text{ mile}} = \boxed{3.9 \text{ gal}}$$