**0)** Consider the set the following sets:

C = {Blue, Purple, Red, Brown, Orange, Green, Yellow}

S = {Red, Green, Blue}

T = {Blue, Purple, Brown, Yellow, Orange}

**a)** Assume the set C is your “universe”. Fill in the { }’s with the appropriate values.

S∩T **= { }**

**= { }**

**b)** a) For each of the following, state whether the statement is *true* or *false*:

Blue ∈ C

{Blue} ∈ C

{Blue} ⊂ C

|S∪T| = 8

Purple ∈ (S∩T)

Purple ∈ (S∪T)

{Purple} ⊂ (S∪T)

(S∪C) ⊆ C

c) Do the sets S and T form a partition of C? Why or why not?

**1)** Consider the following sets:

Let your Universe be the set of all US states

START = {all US states that begin with the letter A}

HINT: START = {Alabama, Alaska, Arizona, Arkansas}

END = {all US states that end with the letter "a" }

a) What is |START|?

b) How many subsets of START are there?

c) Give TWO of the subsets of START.

1:

2:

d)Fill in the { }’s with the appropriate values.

START ∩ END **= { }**

e) Give TWO partitions of START:

1:

2:

f) Prove or disprove each of the following:

START ⊆ END

END ⊆ START

**2)** Complete the following truth table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **q** | **¬p ∧ q** | **p ∨ ¬q** | **(¬p ∧ q) →(p ∨ ¬q)** |
| True | True |  |  |  |
| True | False |  |  |  |
| False | True |  |  |  |
| False | False |  |  |  |

**3)** Consider the proposition **¬p ∧ ¬q**

For each of the following, circle those that are logically equivalent and cross out those that are not.

|  |  |
| --- | --- |
| **¬p ∨ ¬q** | **¬q ∧ ¬p** |
| **¬(p ∨ q)** | **¬(q ∨ p)** |

**4)** **a)** What is *modus ponens*?

**b)** Assume the following is true:

If the cafeteria has brownies tonight, I will get at least two.

In what situation would *modus ponens* be relevant to this statement? Explain.

**c)** What is a *contrapositive*?

**d)** Proposition: If "Big Bang Theory" and "NCIS" do well this week, then CBS will win the ratings war.

State the *contrapositive* of this proposition in English.

**e)** Jane is watching the Aruba golf tournament on television. Cat Jones is putting on the last hole. The announcer says:

*"If Cat Jones makes this putt, she will win the tournament."*

Suddenly, the power goes out and Jane can't see the end. When the power comes back on, Jane finds out that Cat Jones did not win the tournament. Jane thus concludes that Cat Jones did not make the putt.

Is this a valid deduction? Why or why not?

**f)** Across town, Joe is watching the Biggest Loser. Chris Thompson is about to weigh in. The announcer says:

*“If Chris lost at least 10 pounds, the red team is the winner.”*

Chris weighs during the power outage. When the power comes back on, Joe finds out that the red team was the winner. Joe deduces that Chris lost at least 10 pounds.

Is this a valid deduction? Why or why not?

**g)** What is DeMorgan’s Law?

**h)** A movie prediction made in 1939:

*"Gone With The Wind" will be a box-office flop, and "Wizard Of Oz" will be a success.*

This prediction turned out to be false.Thus, state in English the logical negation of this statement. For full credit, you must use "or" and "not", but you may not use "and".