Name: VEN THON
ID: e20191250

Assignment 09

1.What is deductive approach and give 2 example of it?

- It is to understand something through reasoning using prior knowledge and observing results of experiments using your hypothesis.
- Example:
  - Example1:
    - Generalization: if you know that all the beans in my bag are white.
    - Specific case: you take a bean from my bag.
    - Result: then that bean must be white.
  - Example2:
    - Generalization: all students of ITC are Male.
    - Specific case: Vysing is a student at ITC.
    - Result: so that Vysing is Male.

2.what is inductive approach? Give 2 examples of it?

- It is to understand something through observation with no prior knowledge and concluding at the end of your observations.
- Example:
  - Example1:
    - Basic step: you take bean from my bag, and it is white.
    - Induction step: you take 2^{nd} then 3^{rd} until thousand of beans from my bag and they are all white.
    - Conclusion: then you conclude that all beans my bag are white.
  - Example2:
    - Basic step: we have mathematical 2n>0, n is positive integers.
    - Induction step: you take
      - n=1, =>2n=2*1=2>0
      - n=2, =>2n=2*2=4>0

        . .

        . .
      - n=N, =>2n=2*n>0
    - Conduction: so that all n is positive integers =>2n>0.

3. what is the concept of first principal Induction?

- If we have a propositional function P(n) and we want to prove that P(n) is true for any natural number n, we do the following
  - Basic step: show that P(0) is true.
  - Inductive step: show that if P(n) then P(n+1) for nay n∈N.
  - Conclusion: then P(n) must be true for any n∈N.

4. Show that "$n+1 \leq 2^n$" for all positive integers n?

- Basic step: show that P(1) is true.
  P(1) is true, $1+1 \leq 2 \Rightarrow 2 \leq 2$
- Inductive: show P(n) is true, then P(n+1) is true assume that $n+1 \leq 2^n$ is true
  We need to show P(n+1) is true
  $n+2 \leq 2^{n+1}$
  we start from $n+1 \leq 2^n$:
  $n+1+1 \leq 2^n + 1 \leq 2^n + 2^1 = 2^{n+1}$
  so that if $n+1 \leq 2^n$ then $n+1 \leq 2^{n+1}$
- Conclusion: the P(n) must be true for any positive integer $n+1 \leq 2^n$ is true for nay positive integers.

5. what is the concept of second principal induction?

- There is another proof technique that is very similar to the first principal mathematical induction.

6. Prove that this rule is true every natural number n ?

$1^3+2^3+3^3+....+n^3= n^2(n+1)^2/4$

- Basic step: for n=1, $1^3=1^1 2^2/4$
- Inductive step:

$S(k)=k^2(k+1)^2/4$ (1)

We must now show that the formula is also true for n=k+1; that

$S(k+1)=(k+1)^2(k+2)^2/4$ (2)

To do that, add the next cube to s(k), by (1)

$S(k+1)=s(k)+(k+1)^3$

$=K^2(k+1)^2/4 +(k+1)^3$

$=[k^2(k+1)^2+4(k+1)^3]/4$

$=[(k+1)^2(k^2+4(k+1))]/4$

On taking $(k+1)^2$ as a common factor;

$=(k+1)^2(k^2+4k+4)/4$

$=(k+1)^2(k+2)^2/4$

- Conclusion : Therefore $1^3+2^3+3^3+....+n^3= n^2(n+1)^2/4$