

# Discrete Maths



Discrete Maths

↳ Unique

↳ Importance

Everything (maths) related to  
computers.

OAA-1, 2

B2OA

CC

TAFL

ML

+ Gate

OS

Turing  
Award

# Modeling computation

Write a program (A)  
which takes program (B) as  
input and judges that  
will program ever stop?

(checking of presence  
of infinite loop)



Logic in  $P_A$

if (  $P_B$  stops )  
    ~~print~~ ( "Infinite loop  
            not present"  
            in  $P_B$  )

else

    print ( "Infinite loop  
            present in  $P_B$ " )

Observation 4

How long will you wait for completion of  
    ( $P_A$ )  $P_B$ ?

Observation 2

$P_B$  is all the time  
occupying CPU.

Observation # 3

$P_A$  itself is given as  
input

In other words  
Who will detect  
that  $P_A$  is not giving  
into infinite loop.

You can NOT  
write any program  
to detect  
infinite loop  
presence.

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Set

Defining set

Way # 1:

Mention / List out all elements.  $\therefore$  Infinite

We may not be able to list all.

Way # 2

Mention of

characteristics elements.

$$S = \{x \mid x \text{ is even}\}$$

$$S = \{x \mid x \in \mathbb{Z}\}$$

$$S = \{ x \mid x \in x \} \quad ?$$

$\searrow$  element  
 $\swarrow$  set  
 single

$\{ \{ \} , \{ \{ \} \} ,$   
 $\{ \{ \{ \} \} \}$



While modeling computation  
( writing algorithm )  
( solving problem )

we may overlook  
our assumptions

~~because~~ of which  
we might think solution  
exist but actually

culprit is " ~~our assumptions~~ NOT <sup>NOT</sup> " 

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# Russell's Paradox

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" ~~A barber~~ will shave only  
all those who  
does NOT shave  
himself "  
do - - themselves

"I don't lie"

Russell's paradox  
is NOT a paradox.

It is an

~~OBSERVATION~~

Can there be a set  
whose if it's  
also a member  
of itself?

NO

$S' \rightarrow \{ \{ S' \} \}$   
 $S'' \rightarrow \{ \{ S' \}, \{ S \} \}, \dots$   
⋮

There is pit-fall (limitation)  
in defining set ways.

~~Better way of defining~~  
Solution



Grammar

&  
Languages



Heterological

"An adjective is said to be heterological if it does not possess the property it describes"