## Analysis of IJSO questions

P K Joshi

**HBCSE-TIFR** 

MUMBAI

## Traditional way of calculating DI

- Discrimination Index; for any given MCQ
- How well does a question filter out "good" performing students from rest
- Does the question help us in selecting good students from the lot?
- List out the answers of each student: "correct" or "not-correct"
- Sort the answers on the basis of "total marks"; decreasing order of total marks obtained

Sort in decreasing order on total marks column CD Number of students in top 27% list, who answered question 5 correctly ;  $N_t$ Number of students in bottom 27% list, who answered question 5 correctly;  $N_b$ 

1	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	СС	CD	CE
1	1	2	3	4	5	6	7	8	9	10	11	12	13			
2								164								
3																
4	1	1	1	1	1	1	0	1	0	1	1	1	1		71.1	
5	1	0	1	1	0	1	1	0	0	1	1	1	1		67.75	
6	1	0	1	1	1	1	1	1	0	1	1	1	1		62.25	
7	0	0	1	1	1	1	0	1	0	1	1	1	1		60.75	
8	1	0	1	1	0	1	0	0	0	1	0	1	0		59.75	
9	1	1	1	1	1	1	0	1	0	1	0	0	0		59.55	
10	1	0	1	1	1	1	0	1	0	1	0	1	0		59.4	
11	0	0	1	1	1	1	0	1	0	1	1	1	1		58.5	
12	1	0	1	1	1	1	1	1	1	0	1	0	1		58.45	
13	1	1	0	1	1	1	0	0	0	0	0	1	0		57.5	
14	1	0	1	1	1	1	0	1	0	0	0	0	1		56.25	
15	1	0	0	1	1	1	0	0	0	1	1	1	0		56.05	
16	0	0	1	1	1	1	1	1	0	1	0	1	1		55.85	
17	0	0	0	1	0	1	1	1	0	0	1	1	1		55.6	
18	1	0	1	1	1	1	1	1	1	1	1	1	0		55.25	
19	1	0	0	0	0	1	0	1	0	1	0	1	1		54.95	
20	1	0	0	1	0	0	0	0	0	0	0	1	0		54	
21	1	1	0	1	1	1	0	0	0	1	1	1	1		53.7	
6	Sheet	1 Sheet2	Sheet3	$\oplus$				1	4				•	4		•
Ready	Ready												<b>=</b>	▣ ─		+ 100%

 $DI = \frac{N_t - N_b}{c}$ 

C= 0.27 x number of students

## Extension of the analysis

- Presented last year
- Handle negative numbers (negative marking)
- Handle long questions (theory & experiments)
- How to re-define "total" on which the sorting is carried out.
- Computer code to calculate in traditional style
- Computer code to calculate the extended version
- It can sort on all possible combinations of remaining questions to give DI as a number "range" rather than a single number.

IJSO – 2013

30 MCQs5 Theory questions5 practical/experiment questions

How easy is a question? Difficulty index Diff-I

Diff-I = Sum of all marks obtained in Question/(N x max marks)







IJSO-2018







DI 1.0 -0.8 -I Excellent 0.6 -D 0.4 good acceptable T. 1 0.2 poor 0.0 10 20 25 30 0 5 15 Q number

IJSO-2017

## Conclusions:

Data available for 3 years

The question-by-question analysis can be carried out by future hosts

Questions with high Diff-I (very easy) and low DI values can be identified

Future hosting countries can look at such questions to avoid framing such questions

The pattern of high DI value questions can also be identified

Some high Diff-I questions are desirable ?

Thank you