ANALYSIS OF CBSE QUESTION PAPERS AT THE HIGHER SECONDARY STAGE FOR THE YEARS 2012 TO 2014 (MATHEMATICS)

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Introduction

It has been realised that education is the primary vehicle of upward economic mobility. This can be seen from the fact that, due to the pioneering entrepreneurial efforts of a few, India today is uniquely poised to become an intellectual powerhouse in the new 'knowledge' era. The areas of pharmaceuticals and biotech research, consulting and software development, promise hundreds of thousands of high-paying and fulfilling jobs—if, however, the Indian education system can produce students with the required skill-sets and attitudes. This is an immense challenge that the Indian education system faces, and needs to be tackled with fresh thinking. The conservative mentality that apparently seems to be progressive but has actually been colonial, needs to be discarded. The education system has the potential to create problem-solvers and rigorous thinkers. A lot of solutions for India's complex social problems will need to come from creative visionaries working singly and collectively.

The imperatives of the new knowledge society extend well beyond the world of software engineers and BPO professionals. The search and sifting of raw data and its step-wise conversion into useful knowledge—is now at the heart of several traditional professions. It is not limited to elite professionals, such as managers, business consultants, doctors, researchers, economists and journalists. Pharmaceutical and used-car salespersons, real-estate agents, travel agents, advocates, couriers, retailers, and of course, personal secretaries—all require these skills to a substantial degree. These professions may have nothing in common other than the commonality of this process of 'information-sifting and evaluation'. Whether one calls this analytical thinking, critical thinking, lateral thinking, or problem-solving does not matter (indeed the skills needed are a composite of these). The point is that most of these types of thinking are required in most occupations today. Yet we are hard-pressed to find a single one of these activities that is expected from candidates who are appearing for examinations in Indian schools today, let alone the combination of these. The negative impact of this is already being felt—in a scarcity of skilled personnel.

Are our education and exam systems working to create such 'problem-solving' citizens?

A move has been made in this direction to improve the learning environments in different subject areas, particularly in mathematics, at school level. These concerns find a place in

the position paper of National Focus Group on Teaching of Mathematics which asserts that the main goal of mathematics education in schools is the mathematisation of the child's thinking. While learning mathematics, the learner should acquire the ability to think clearly and be able to pursue assumptions to logical conclusions. The learner develops an ability to handle abstractions and approach to problem-solving while learning mathematics.

Central Board of Secondary Education (CBSE) conducts examination for Class XII every year. Learning assessment of students especially, Board Examinations play an important role in shaping the transactional strategies in the classrooms.

In this paper, an attempt has been made to see whether the concerns of NCF–2005 have been reflected in the question papers of CBSE by analysing the CBSE question papers from 2012 to 2014.

Discussion

The learner at the higher secondary stage is expected to have acquired sufficient familiarity with the processes in mathematics, i.e.

- Formal problem-solving
- Use of heuristics
- Estimation and approximation
- Optimisation
- Use of patterns
- Visualisation
- Representation
- Reasoning and proof
- Making connections
- Mathematical communication

The reflection of the concerns of NCF–2005 can only be seen if the questions in the paper are based on these processes. For this purpose, CBSE question papers of the years 2012–2014 were analysed. Tables 1, 2 and 3 show the status of the types of questions asked based on different mental processes, in the question papers of the years 2012, 2013 and 2014 respectively. The different mental processes considered are: Recall, Application-based, Reasoning, Justification and Analysis and Value-based.

The information about these mental processes is presented in a consolidated form in Table 4. It also shows the weightage given to these processes.

Table 5 gives information about the weightage given to different types of questions like Long Answer (LA), Short Answer (SA) and Very Short Answer (VSA), in the question papers from 2012 to 2014.

Comments

From the tables, it can be seen that –

- The number of Recall type of questions along with the corresponding weightage of marks given to it, is seen to decrease from 2012 to 2014 (Table 4).
- An increase in the number of questions and the corresponding weightage of marks for Reasoning type questions can be seen through the years 2013–2014 (Table 4).
- As compared to the year 2012, Application-based questions find an increase in the year 2013 and then decreased in 2014.
- Very less weightage has been given on questions based on Justification and Analysis. However, an increase has been observed in such questions in 2013.

- There are no questions that require giving counter example for a given situation.
- There is a decrease in the weightage for the Recall type of questions with a corresponding increase in weightage in Reasoning, Application-based, Justification & Analysis and Value-based questions, from 2012 to 2014 papers.
- More emphasis on Short Answer type and Very Short Answer type questions can be seen, whereas no space has been provided for MCQ type questions (Table 5). It may be noted that NCF–2005 recommends designing of MCQ type questions that test the real understanding.
- Questions drawing knowledge of concepts from more than two areas need to be given space.

Conclusion

These points suggest that the questions based on the processes of Formal Problem Solving, Optimisation, Reasoning and Proof, Mathematical Communication and Values find a gradual increase in the weightage by the year 2014. This shows a growing tendency of framing questions that reflect the above-mentioned processes in the CBSE examinations. However, there is still scope left for the remaining processes.

Thus, it can be said that attempts are being made to move away from rote memorisation and produce thinking minds in mathematics, the prime concern of NCF–2005.

Table 1

Class XII **Subject: Mathematics** **Year 2012** **Maximum Marks: 100**

Q. No.	Unit	Mental Process	Type of Question (LA/SA/VSA)	Marks
1.	11	Recall	VSA	1
2.	10	Recall	VSA	1
3.	10	Recall	VSA	1
4.	7	Recall	VSA	1
5.	7	Recall	VSA	1
6.	4	Recall	VSA	1
7.	3	Recall	VSA	1
8.	3	Recall	VSA	1
9.	2	Recall	VSA	1
10.	1	Recall	VSA	1
11.	6	Recall	SA	4
12.	13	Reasoning	SA	4

13.	11	Reasoning	SA	4
14.	10	Recall	SA	4
15.	9	Recall	SA	4
16.	9	Recall	SA	4
17.	7	Recall	SA	4
18.	6	Reasoning	SA	4
19.	5	Recall	SA	4
20.	4	Reasoning	SA	4
21.	2	Reasoning	SA	4
22.	1	Reasoning	SA	4
23.	11	Recall	LA	6
24.	13	Reasoning	LA	6
25.	12	Recall	LA	6
26.	7	Recall	LA	6
27.	8	Application-based	LA	6
28.	6	Application-based	LA	6
29.	3	Reasoning	LA	6

LA – Long Answer, SA – Short Answer, VSA – Very Short Answer

Table 2

Class XII **Subject: Mathematics** **Year 2013** **Maximum Marks: 100**

Q. No.	Unit	Mental Process	Type of Question (LA/SA/VSA)	Marks
1.	2	Recall	VSA	1
2.	2	Recall	VSA	1
3.	3	Application-based	VSA	1
4.	4	Application-based	VSA	1
5.	4	Recall	VSA	1
6.	5	Reasoning	VSA	1
7.	9	Recall	VSA	1
8.	10	Reasoning	VSA	1
9.	10	Recall	VSA	1

10.	11	Recall	VSA	1
11.	1	Justification & Analysis	SA	4
12.	2	Application-based	SA	4
13.	3	Value-based	SA	4
14.	5	Recall	SA	4
15.	5	Application-based	SA	4
16.	5	Reasoning	SA	4
17.	7	Recall	SA	4
18.	7	Recall	SA	4
19.	7	Recall	SA	4
20.	10	Application-based	SA	4
21.	11	Recall	SA	4
22.	13	Application-based	SA	4
23.	5	Recall	LA	6
24.	6	Reasoning	LA	6
25.	8	Recall	LA	6
26.	9	Recall	LA	6
27.	11	Application-based	LA	6
28.	12	Reasoning	LA	6
29.	13	Reasoning	LA	6

LA – Long Answer, SA – Short Answer, VSA – Very Short Answer

Table 3

Class XII **Subject: Mathematics** **Year 2014** **Maximum Marks: 100**

Q.No.	Unit	Mental Process	Type of Question (LA/SA/VSA)	Marks
1.	1	Reasoning	VSA	1
2.	2	Recall	VSA	1
3.	3	Recall	VSA	1
4.	3	Recall	VSA	1

5.	4	Recall	VSA	1
6.	7	Reasoning	VSA	1
7.	7	Recall	VSA	1
8.	10	Recall	VSA	1
9.	11	Reasoning	VSA	1
10.	11	Reasoning	VSA	1
11.	1	Reasoning	SA	4
12.	2	Reasoning	SA	4
13.	4	Reasoning	SA	4
14.	5	Recall	SA	4
15.	5	Recall	SA	4
16.	6	Reasoning	SA	4
17.	7	Recall	SA	4
18.	9	Recall	SA	4
19.	9	Recall	SA	4
20.	11	Application-based	SA	4
21.	11	Recall	SA	4
22.	13	Reasoning	SA	4
23.	3	Value-based	LA	6
24.	6	Application-based	LA	6
25.	7	Reasoning	LA	6
26.	8	Recall	LA	6
27.	11	Reasoning	LA	6
28.	12	Application-based	LA	6
29.	13	Recall	LA	6

LA – Long Answer, SA – Short Answer, VSA – Very Short Answer

Table 4

Abstracts of Analysis of Each Question Paper

(Based on Tables 1, 2 & 3)

Total Marks: 100

Class: XII

Subject: Mathematics

Weightage to Mental Processes

S. No.	Mental Processes	No. of Questions			Marks allotted as per analysis		
		2012	2013	2014	2012	2013	2014
1.	Recall	19	14	14	52	44	42
2.	Reasoning	08	06	11	36	24	36
3.	Application-based	02	07	03	12	24	16
4.	Justification and Analysis	0	01	0	0	04	0
5.	Value-based	0	01	01	0	04	06

Table 5

Weightage to Different Types of Questions (2012–2014)

S. No.	Types of Questions	No. of Questions			Marks allotted as per analysis		
		2012	2013	2014	2012	2013	2014
1.	Long Answer (LA)	07	07	07	7x6 = 42	7x6 = 42	7x6 = 42
2.	Short Answer (SA)	12	12	12	12x4 = 48	12x4 = 48	12x4 = 48
3.	Very Short Answer (VSA)	10	10	10	10x1= 10	10x1=10	10x1 = 10