

Tamanna

An Aptitude Test for Senior School Students

TECHNICAL MANUAL

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FOREWORD

Individuals differ from each other in terms of their physical characteristics such as height, weight and so on as well as in their psychological dimensions such as ability, interest, aptitude, personality, motivation and emotions. Aptitude is one such psychological dimension which refers to the ability to acquire skill or knowledge in a particular area. The information related to aptitude can guide the student, parents and the school to take decisions regarding a student's educational and career-related choices. It may also motivate students to broaden their horizon about the world of work and undertake new explorations according to their ability profile.

To facilitate schools in helping students make informed career choices NCERT has developed *Tamanna: An Aptitude Test for Senior School Students* (classes IX and X). The test comprises Technical Manual which gives details of construction and standardisation of the test, technical information on the aptitude test, scoring and norms, and interpretation of scores. The Test Booklet contains items on the seven dimensions measured in the aptitude test, i.e. Language Aptitude (LA), Abstract Reasoning (AR), Verbal Reasoning (VR), Mechanical Reasoning (MR), Numerical Aptitude (NA), Spatial Aptitude (SA), and Perceptual Aptitude (PA). The Guide for Teachers and Parents consists of the features of the aptitude test, test administration and scoring, and understanding the meaning of test scores.

The efforts made by the Department of Educational Psychology and Foundations of Education in developing the aptitude test are acknowledged. Piloting of the aptitude test undertaken by CBSE in its affiliated schools is gratefully acknowledged. I place on record my appreciation to all members of the Test Development Team and Review Committee for their efforts in the development of the aptitude test.

I hope this endeavour would go a long way in helping students to make appropriate academic choices and other career-related decisions.

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INTRODUCTION

Aptitude is thought of as a natural tendency, special ability, or capacity or cluster of abilities. This natural tendency determines person's readiness to learn or acquire a skill or their suitability to pursue a particular career/vocation. Aptitude in one specific ability or a combination of specific abilities such as verbal reasoning, numerical aptitude, abstract reasoning, etc. which helps to make educational and vocational choices. It helps the person to decipher the career option that is best suited to one's capabilities. Knowledge of aptitude helps a person to make best fit choices about career related decisions. Students with the help of aptitude test can look forward for career guidance and counselling.

Aptitude is considered as an inborn tendency but environment also plays a significant role in the development of aptitude. An individual's performance on a task depends on intrinsic factors such as personality characteristics, motivation, ability, etc. and on extrinsic factors such as cultural exposures, environment stimulation, family environment, quality of education, etc. For example, a person has the ability to be an engineer but due to lack of support from the school and home environment he/she may not be able to explore this occupation and may not get appropriate training in the same field. As a result, despite having an aptitude a person may not get supportive environment/proper training in that area.

Use of Aptitude Test

The aptitude test result offers factual information about a student's specific abilities which facilitates the student, her/his parents and the school to take a joint decision regarding the students' educational and career/vocational choices.

Self-awareness of one's aptitude is essential. It facilitates students to get motivated and take appropriate steps in strengthening their specific abilities. When the aptitude test result of a student is seen vis-a-vis her/his achievement records in a discipline, it may help the student to seek curricular guidance. The aptitude test result also encourages students to explore career pathways and occupations. This helps to broaden their horizon about the world of work and also encourages students to open up to new avenues of occupation/vocations (which they and/or their family may not be aware about).

Aptitude test results help students to revalidate their choices and thus take suitable decision to continue or change their educational/discipline choice. A relook at their occupational aspirations/goals in relation to their specific aptitudes helps to review the efforts being made by them to achieve such goals.

Therefore, aptitude test result provides information which gives ample time to the students to indulge in self-exploration and self-preparation in academics as well as in exploring the world of work so that they are able to make well-informed career/vocational choices and undertake new exploration as suited to her/his present ability profile.

The development of Aptitude Test, namely **Tamanna: An Aptitude Test** is to help schools to use aptitude test data to facilitate students in career planning and choice.

DIMENSIONS MEASURED IN THE APTITUDE TEST

Aptitude test covers seven dimensions: Language Aptitude (LA), Abstract Reasoning (AR), Verbal Reasoning (VR), Mechanical Reasoning (MR), Numerical Aptitude (NA), Spatial Aptitude (SA) and Perceptual Aptitude (PA). Operational definition of these dimensions are given below:

1. Language Aptitude (LA)

Language aptitude is concerned with a person's ability to use and understand written language. This sub-test, assesses how well a student understands English words and their synonyms, spells words correctly and identifies the correct meaning of the given proverbs/idioms.

This aptitude is prominently useful for success in educational and vocational related performances. Language aptitude is more relevant for courses and occupations/vocations involving much reading and writing such as teaching, journalism and media studies, advertising, law, library science, stenography, business development, etc.

2. Abstract Reasoning (AR)

Abstract reasoning refers to a person's ability for logical and analytical thinking. This sub-test is non-verbal and it assesses how well students can reason and logically relate geometric shapes or designs. In this sub-test, set of figures are given in a certain sequence and students are required to infer the next figure in the series.

Abstract reasoning is important for courses and occupations/vocations concerned with mathematics, computer programming, architecture, law, medicine, economics, mechanics, forensic science, etc.

3. Verbal Reasoning (VR)

Verbal reasoning is the ability to understand and reason using concepts expressed in words. It evaluates a student's ability to think constructively with words. In this sub-test, verbal reasoning is assessed by the ability to understand concepts and relationships that are underlying a word pair and then finding the missing word in a pair with similar concepts and relationships.

Verbal reasoning has been found to be relevant for courses and occupations like psychology, speech therapist, auctioneering, advertising, linguistics, business, law, education, public relations, marketing, journalism, etc.

4. Mechanical Reasoning (MR)

Mechanical reasoning refers to a person's ability to understand and apply mechanical concepts and principles to solve problems. In this sub-test, mechanical reasoning is assessed by items covering the areas of acceleration, pressure, energy transformation, work and power, levers, pulleys, screws, springs, tools, etc.

Mechanical reasoning ability has been found to be important for success in courses and occupations/vocations concerned with machinery/electrical/civil/ automobile engineering, carpentry, electrician, machine operator, physics, chemistry, etc.

5. Numerical Aptitude (NA)

Numerical aptitude refers to understanding numerical relationships and applying the same to the issue/problem. It is related to a student's ability to do mathematical operations quickly and accurately. This sub-test assesses how well a student is able to solve problems covering four primary arithmetic operations like addition, subtraction, multiplication and division. At the same time, it also covers areas like ratio, percentage, square and square root, cube and cube root, number sequence, factorization, linear equation, work and speed, etc.

Numerical aptitude is relevant for success in courses and occupations related to all types of engineering, architecture, oceanography, geology, meteorology, biosciences, health sciences and of course statistics and natural sciences.

6. Spatial Aptitude (SA)

Spatial aptitude is related to the capacity to mentally manipulate actual materials through imagining. A student in this ability test is required to quickly judge how an object would look like when constructed in a given way. In this sub-test, spatial aptitude is assessed through items in which the need is to determine quickly how the figure will look like when seen through a mirror and how a figure will look like when folded in a particular way.

Spatial aptitude is needed in all such courses and occupations/vocations that require an individual to visualise objects in 3-dimensions, such as in manufacturing industry, drafting, designing (fashion, interior, toys and games, jewellery, urban planning, landscape designing, etc.), architecture, astronomy, chemist, visual arts, animation, multimedia art, etc.

7. Perceptual Aptitude (PA)

Perceptual aptitude refers to a person's ability to quickly, accurately and meaningfully compare visual information, i.e. letters, numbers, objects, pictures or patterns. In this sub-test, perceptual aptitude assesses how the students rapidly compare the paired groups of letters or numbers and identify the similarity or differences.

This sub-test helps the students to meet the classroom and day-to-day standards of neatness, speed and precision in their work. Perceptual aptitude is relevant for occupations/vocations concerned with bank-teller, accountants, computer programmers, police detectives, data entry, assembly work, record keeping, dispatching, filing, etc.

CONSTRUCTION AND STANDARDISATION OF THE TEST

The following procedure was followed in the development of the aptitude test.

1. Preparation of Items

Items were generated related to the seven dimensions of aptitude. The items were written in English language.

- 1.1 Language Aptitude (LA): The language aptitude sub-test intended to measure the student's ability to choose correct synonym, detect errors in spellings and find out the right meaning of proverbs. The item types used in synonyms were selected from their common usage in everyday vocabulary.
- 1.2 Abstract Reasoning (AR): The abstract reasoning sub-test intended to check the student's reasoning ability through non-verbal measures. The items are presented in the series of abstract patterns presented in each problem which requires understanding and finding out the basic/operating principles in the changing pattern/diagram logically. The patterns/figures/diagrams which were selected are clear and large to rule out/avoid visual acuity and visual discrimination errors. Complexity of items or level of difficulty is acquired through increasing conceptual difficulty.
- 1.3 Verbal Reasoning (VR): The verbal reasoning sub-test aimed at the evaluation of student's ability to find out the relationship between pair of words to generalise and think logically and constructively, rather than simply recognising word fluency or vocabulary. In this test, items were developed in the form of analogy which is considered appropriate for measuring reasoning ability. In part-I, simple one word analogy was used to increase the complexity, in part-II double ended analogy was used where the first and the last terms were missing. The student needs to choose from the pairs of words the one pair that best suits/completes the analogy. The usage of this type of items in versatility provides a good measure of reasoning which is complex and requires real thinking to find the correct response to each item. The words used in these items were chosen from literature, social sciences and science so that the item measures the student's knowledge and his/her ability to abstract and generalize relations which is known to him/her through his/her knowledge.
- 1.4 Mechanical Reasoning (MR): The mechanical reasoning sub-test intended to measure the student's ability to understand the basic principles of physical sciences and mechanical concepts. In this, test items consist of a pictorial figure with a simple worded question.
- 1.5 Numerical Aptitude (NA): The numerical aptitude sub-test items was designed to check the understanding of numerical relationship and numerical concepts. The items were framed in such a way that the test measures arithmetic computation. This was done to avoid the usage of language element in understanding arithmetic reasoning.
- 1.6 Spatial Aptitude (SA): The spatial aptitude sub-test items where devised to measure the student's ability to visualize and imagine how an object would appear if rotated and folded in various ways and to visualise a constructed object from a pattern of picture. The items devised require mental manipulation of objects in three dimensional spaces. The patterns and drawings are large and clear, ruling out the errors of visual discrimination or perception. Perception of drawings and patterns is easy without any ambiguity. The student needs to choose only with the judgements of how the objects would look if constructed and/or rotated/folded. During the item development, it was ensured that minute differences in size don't determine/affect the answers. Student's answers will

be correct if s/he has the ability to imagine the constructed/rotated/folded object.

1.7 Perceptual Aptitude (PA): The perceptual aptitude test items intended to measure speed and accuracy of response in a simple perceptual task. The items were designed with simple letters/numbers/letter-number combinations which are same in digits (8) throughout the test. The student must select the exact same letters/numbers/combinations from given four options. Little or no intellectual ability is required, as the tests' objective is to measure speed and accuracy of perception and response. It was ensured that items which were clear-cut and self-explanatory were retained.

Some principles maintained rigorously in the construction of items were:

1. Items had to be clearly identified with the appropriate dimension and the difficulty level was average.
2. The items had to be independent of all other dimensions except the one for which they were constructed.
3. Items were constructed for all the seven sub-tests. The number of the items was sufficient to make rigorous selection using expert opinion as well as empirical analysis (item difficulty and discrimination index).
4. Items developed for all sub-tests were on the format of four options (A,B,C,D) of which one option was the correct answer.
5. Each sub-test had separate instructions and practice items to reduce anxiety and create readiness/preparedness in the students to enable optimal performance on the respective sub-test.
6. Time for each sub-test was calculated after the pilot testing. Rigorous recording of time (least time taken and maximum time taken) provided the basis for deciding time for different sub-tests.
7. Expert opinion was sought on the number of items in each sub-test. It was opined that 30 test items would be an optimum number to gauge the potential of student in a specific dimension of aptitude. Only in case of perceptual aptitude the number of items was 60 (in view of the nature of aptitude assessed).
8. An additional consideration in construction of items, number of items and time allocated to each sub-test was administration of test by school teachers.

2. Expert Validation

After the construction of items, they were shown to experts in the field. The items were modified, discarded and language was changed (Table 1).

Table 1: Number of Items before and after Experts' Opinion

S.No.	Dimensions of Aptitude	Items developed	Items selected
1	Language Aptitude (LA)	62	45
2	Abstract Reasoning (AR)	64	42
3	Verbal Reasoning (VR)	69	41
4	Mechanical Reasoning (MR)	52	38
5	Numerical Aptitude (NA)	63	47
6	Spatial Aptitude (SA)	65	49
7	Perceptual Aptitude (PA)	75	68

3. Try-out of Preliminary Version of the Items

A thorough scrutiny of the items was further undertaken for each dimension. To ascertain that the language, illustration and content of the items were suitable to children of the target group, the preliminary version of the test items was tried out on a group of 50 students studying in Class IX, Kendriya Vidyalaya, INA, New Delhi.

The responses of the students indicates that in certain items they were able to understand the statement of the question, or figures/illustrations were not clear, or meaning of words was not understood, or did not understand the stated language. It was ascertained whether the instructions were clear to perform on given items of a dimension of aptitude. The time taken by the students to complete each sub-test was also noted. Difficulties faced by the students in understanding items were taken into account to further modify, simplify or delete the item. The items which were ambiguous were discarded or reconstructed. In all 292 items were retained for pilot testing.

Table 2: Number of Items Selected for Pilot Testing

S.No.	Dimensions of Aptitude	No. of Items
1	Language Aptitude (LA)	40
2	Abstract Reasoning (AR)	40
3	Verbal Reasoning (VR)	38
4	Mechanical Reasoning (MR)	34
5	Numerical Aptitude (NA)	40
6	Spatial Aptitude (SA)	40
7	Perceptual Aptitude (PA)	60

4. Pilot Testing of the Aptitude Test

The test was administered to students (N=86) studying in Class IX, Kendriya Vidyalaya, R.K. Puram, Sector-2, New Delhi. The selection of sample was purely on the basis of access to school and availability of students for pilot testing.

The main objectives of pilot testing were to know:

- Whether the items elicit desired response?
- Whether the items elicit varied response?
- Whether the diagrams and language are understood by the students?
- Whether the order of presenting the different sub-tests is conducive?

- What are the difficulties faced by the examiner/tester and test takers/students?
- What is the average time taken to complete the different sub-tests?
- Whether students face difficulty in filling OMR sheets?

Based on the findings of the pilot testing, some changes were made in the instructions, language of sentences, words, etc. The following changes were made in items across the seven dimensions of the test:

- 1.1 Language Aptitude (LA): Difficult and ambiguous words were deleted. Also some changes were made in distractors. Thus from 15 synonyms, 10 were retained; 15 spelling items were retained and 10 proverb/idiom type items were retained.
- 1.2 Abstract Reasoning (AR): Patterns which were ambiguous where rules were not clear or have different meaning for different test takers were removed. 30 such items/patterns/figures which were large, clear with the obvious differences were retained.
- 1.3 Verbal Reasoning (VR): It was ensured that 30 out of the 38 items used in this test were simple and the content was reasonably familiar to the student.
- 1.4 Mechanical Reasoning (MR): Out of the 34 items, only 30 test items which were retained were simple and frequently used in students' day to day life rather than known through text-book knowledge.
- 1.5 Numerical Aptitude (NA): Items which were complex to measure handling of the numerical concepts were removed and 30 items were retained.
- 1.6 Spatial Aptitude (SA): Only those items which were unambiguous and easy to understand were retained.
- 1.7 Perceptual Aptitude (PA): 20 items which were higher in difficulty level were replaced to obtain total 60 items each having 8 digits.

5. Final Version of the Aptitude Test

The final version of the Aptitude Test consists of 7 dimensions. The total number of items across the dimensions are as follows (Table 3).

Table 3: Number of Items across the Dimensions

S. NO.	Dimensions	Pilot Testing No. of Items	Final No. of Items
1	Language Aptitude (LA)	40	30
2	Abstract Reasoning (AR)	40	30
3	Verbal Reasoning (VR)	38	30
4	Mechanical Reasoning (MR)	34	30
5	Numerical Aptitude (NA)	40	30
6	Spatial Aptitude (SA)	40	30
7	Perceptual Aptitude (PA)	60	60

TECHNICAL INFORMATION ON THE APTITUDE TEST

Standardisation of this Aptitude Test is based on 5491 students tested at 11 different locations in different regions of the country. The sample included school students studying in classes IX and X. Five different types of schools i.e. Kendriya Vidyalayas, Navodaya Vidyalayas, Demonstration Multipurpose Schools (RIEs), CBSE affiliated and State board affiliated schools. Table 4 provides demographic profile of the sample.

Table 4: Demographic Profile of the Standardisation Sample

S. No	Place of Data Collection	Class IX		Class IX Sample Total	Class X		Class X Sample Total
		Boys	Girls		Boys	Girls	
1	Delhi	351	206	557	278	182	460
2	Ajmer	199	68	267	110	32	142
3	Jammu	248	124	372	160	72	232
4	Lucknow	153	108	261	124	81	205
5	Gurgaon	43	38	81	45	31	76
6	Noida	241	175	416	0	0	0
7	Mysuru	256	137	393	66	59	125
8	Bhubaneswar	206	175	381	189	166	355
9	Ranchi	67	25	92	60	9	69
10	Shillong	50	96	146	34	30	64
11	Bhopal	290	196	486	189	122	311
Total		2104	1348	3452	1255	784	2039

Reliability

The reliability estimates were derived using the methods of Split-Half Reliability, Spearman-Brown Coefficient and Guttman Split-Half Coefficient as measures of internal consistency. As PA is purely a speed test, the measures of internal consistency were not calculated for this sub-test. Since all the sub-tests have time limit, reliability coefficient using correlation for test-retest reliability have also been derived.

Table 5: Reliability Coefficients for Various Sub-tests (Combined) (N=290)

Sub-tests*	LA	AR	VR		MR	NA	SA		PA
Reliability Coefficient			Part 1	Part 2			Part 1	Part 2	
Split-Half Reliability	.57	.65	.76	.79	.72	.74	.63	.53	-
Spearman-Brown Coefficient	.73	.79	.87	.88	.83	.85	.77	.69	-
Guttman Split-Half Coefficient	.72	.79	.82	.83	.76	.83	.71	.63	-
Mean	15.68	13.02	5.02	5.77	16.03	10.84	7.42	3.13	10.22
SD	5.83	5.02	2.59	3.16	4.98	3.39	3.67	1.99	2.50

Table 6: Reliability Coefficients for Various Sub-tests (Girls) (N=290)

Sub-tests*	LA	AR	VR		MR	NA	SA		PA
Reliability Coefficient			Part 1	Part 2			Part 1	Part 2	
Split-Half Reliability	.67	.72	.75	.69	.78	.75	.79	.71	-
Spearman-Brown Coefficient	.80	.84	.86	.81	.87	.86	.88	.84	-
Guttman Split-Half Coefficient	.80	.81	.83	.78	.80	.83	.86	.80	-
Mean	15.43	11.03	6.70	4.85	13.94	10.10	6.01	5.93	10.55
SD	5.53	4.75	2.51	2.42	4.30	3.67	3.43	2.36	2.53

Table 7: Reliability Coefficients for Various Sub-tests (Boys) (N=290)

Sub-tests*	LA	AR	VR		MR	NA	SA		PA
Reliability Coefficient			Part 1	Part 2			Part 1	Part 2	
Split-Half Reliability	.62	.77	.69	.92	.78	.76	.73	.77	-
Spearman Brown Coefficient	.77	.87	.82	.96	.88	.86	.84	.87	-
Guttman Split Half Coefficient	.77	.84	.79	.90	.84	.83	.80	.83	-
Mean	11.82	11.23	6.37	7.80	11.55	10.72	6.29	5.39	11.02
SD	4.69	4.41	2.68	3.73	3.94	3.97	3.19	2.34	3.01

*Considering that PA is a speed test, the split-half reliability is not calculated for this sub-test. The test-retest method was used to calculate the reliability of this sub-test.

Table 8: Test- Retest Reliability Coefficients (Correlation) for Various Sub-tests (N=301)

Subtests	LA	AR	VR	MR	NA	SA	PA
Test-Retest Reliability	.638**	.350**	.509**	.408**	.605**	.424**	.452**
Mean (test)	14.85	10.97	13.28	10.29	11.52	10.87	34.22
Mean (retest)	13.75	12.06	13.90	11.53	10.82	10.51	40.61
SD (test)	5.40	4.92	5.35	.368	5.62	4.75	12.74
SD (retest)	5.83	5.51	6.06	4.06	5.66	4.67	15.84

** : Correlation is significant at the 0.01 level (2-tailed)

Validity

Face validity of the items was established by experts. To establish concurrent (convergent) and predictive validity, test scores of Tamanna Aptitude Test were correlated with (i) David's Battery of Differential Abilitites (DBDA), and (ii) Academic Achievement.

Table 9: Correlation Coefficients for Sub-tests of Tamanna Aptitude Test with Corresponding Sub-tests of DBDA* (N=217)

KYA-DBDA	LA-VA	AR-RA	MR-MA	NA-NA	SA-SA
Pearson Correlation	.400**	.227**	.238**	.404**	.193**
Spearman's rho	.428**	.214**	.227**	.432**	.167***

**Correlation is significant at the 0.01 level (2-tailed)

***Correlation is significant at the 0.05 level (2-tailed)

*The correlation for PA (KYA) with CL (DBDA) has not been mentioned as CL has a forced choice question format with two options and PA has multiple choice format with four options. There is no sub-test measuring VR in DBDA.

Table 10: Correlation between Academic Achievement and Sub-tests of Tamanna Aptitude Test (N=576)

Tamanna Sub-tests	Mean (for Tamanna)	S.D. (for Tamanna)	English	Mathematics	Science	Social Science	Overall
LA	14.29	5.393	.517**	.439**	.467**	.511**	.525**
AR	11.38	5.171	.170**	.207**	.181**	.188**	.204**
VR	13.53	5.337	.507**	.440**	.483**	.494**	.524**
MR	10.96	3.735	.273**	.248**	.296**	.263**	.294**
NA	11.45	5.539	.403**	.456**	.436**	.419**	.468**
SA	11.22	4.644	.296**	.296**	.268**	.254**	.302**
PA	36.67	12.371	.228**	.259**	.242**	.234**	.262**

**Correlation is significant at 0.01 level

Piloting of the Aptitude Test by CBSE

1. The piloting of the aptitude test was done by the CBSE through its affiliated schools across different parts of county, in 2018-19.
2. A total of 17,568 students studying in classes IX and X undertook the test.
3. Performance of students on all the seven sub-tests of Tamanna Aptitude Test and their achievement scores in Mathematics, Science and Social Science was shared by CBSE.
4. The predictive validity was established by correlating students performance on Tamanna Aptitude Test with their academic achievement. As shown in the Table 11 below, sub-tests are significantly correlated with their academic subjects.

Table 11: Correlation between Academic Achievement and Sub-tests of Tamanna Aptitude Test (N=17586)***

Tamanna sub-tests	Mean (for Tamanna)	S.D. (for Tamanna)	English	Mathematics	Science	Social Science	Overall
LA	18.85	6.79	.465**	.383**	.378**	.402**	.441**
AR	15.25	7.38	.333**	.354**	.300**	.294**	.349**
VR	17.19	6.73	.467**	.413**	.402**	.417**	.461**
MR	13.88	5.16	.314**	.310**	.279**	.277**	.321**
NA	15.37	7.49	.378**	.417**	.345**	.355**	.408**
SA	11.98	6.15	.281**	.289**	.244**	.253**	.290**
PA	38.47	19.31	.201**	.192**	.163**	.195**	.205**

**correlation significant at 0.01 level

***2019 Data

ADMINISTRATION

General Considerations For Test Administration

There are seven sub-tests for administration. Specific and detailed instructions for each sub-test of the Aptitude Test are provided on the booklets of the respective sub-tests. As the test measures the individual's inherent potentials/abilities, care needs to be taken to adhere to the timings mentioned on the booklet for each sub-test (10 minutes each so total time is $10 \times 7 = 70$ minutes). In addition to the instructions for each sub-test, some important points regarding the Aptitude Test should be kept in mind:

1. Remember that this test is to help know the capabilities (special abilities) of an individual and not to label or find their weaknesses.
2. While introducing the test it is important to encourage and motivate the students to do their best and tell them about the importance of the test. After all, finding an individual's strengths/ aptitude would help her/him to find careers best suited for her/him.
3. Scheduling testing when students are fresh and alert and conducting them in a non-interfering and conducive environment yields best results.
4. A 15 minutes break can be given after 4 sub-tests to ensure continued interest of the students and avoid monotony.
5. In order to bring out the true aptitude/potential of the student, maintaining strict discipline is important. To avoid copying, you can ensure that only one child sits at one desk.
6. Prepare well in advance about the procedure of the test, by familiarization with testing material, timings of the sub-tests and ensuring conditions such as well-lighted, ventilated and comfortable rooms are present along with minimum distractions and interruptions.
7. Reassure the students that they are not expected to get every question/item correct. There is no pass and fail. However to know their strengths, they have to try to do as many questions as possible within the time limit given. There is no negative marking.
8. Ask the students to write their name, age, gender, class and school on their answer sheets.
9. Read the instructions given on the test booklet aloud, clearly and slowly and ask the students to read the same instructions silently. For each test say,

Read the instructions for this test to yourself as I read them aloud.

After reading the example, give a pause to allow the students more time to think about them and let them do practice item given in the each subtest in order to ensure that they understand and be mentally prepared for solving the kind of questions the specific subtest has

10. After giving the complete instructions, ask the students,

Is there any doubt or question before you begin?

Clear their question or doubt if they have any. They are allowed to read the instructions again but no new examples should be given or explained.

11. After ensuring that the students have understood the instructions clearly, ask them to start by saying,

Turn the page and you can begin the test now.

12. As soon as the students begin, start the stop watch and begin timing. When the time is up, announce in a firm and loud voice,
Stop working now. Put your pencils down and turnover the booklet immediately.
13. Stress the importance of directions such as *Do not turn the page until you are told to do so.* These need to be followed strictly. Invigilation should be done quietly and ensure that students follow the instructions.
14. Ensure that students mark only one box for an item because if more than one box is marked, it will not be counted. Encourage students to answer a question by choosing the best option among the options given. If they do not know the right answer for a particular question, ask them to try to narrow down the choices as much as possible and then put in their best guess.
15. At the end, make sure that every student has handed over then test booklets and their answer sheets.

Test Material Required for Administering the Test

Test booklets

There are total seven sub-tests contained in a single booklet of Tamanna: An Aptitude Test. The seven sub-tests are as follows:

- Language Aptitude (LA)
- Abstract Reasoning (AR)
- Verbal Reasoning (VR)
- Mechanical Reasoning (MR)
- Numerical Aptitude (NA)
- Spatial Aptitude (SA)
- Perceptual Aptitude (PA)

The test booklets are reusable. To avoid writing or marking in the test booklets by students, clear instructions need to be given to students and discipline should be maintained. After each use, check the test booklets and erase any marks or writing, if found. If the marks or writing cannot be erased, the test booklets should be discarded and should not be used for the next time.

Answer sheets

Answers have to be marked on the separate answer sheets provided with the test booklets. These can be scored by hand or by computer. The answer sheets need to be handled with care and should not be folded or torn.

Pencils

Each student must have at least two pencils with eraser and the teacher/examiner should have extra pencils.

Scoring keys

Scoring keys are given for scoring manually. See “Scoring Procedure” for more information.

SCORING AND NORMS

Scoring is an important part of the standardization procedure. The manual of Tamanna: An Aptitude Test provides scoring keys with correct answers for each sub-test along with general guidelines which need to be kept in mind before starting the scoring procedure. These include ensuring that the student has marked only one correct answer, making sure that the child has attempted maximum number of responses within the given time frame and excluding answer sheets which show clear/obvious answer patterns which indicates the casual attitude of child while attempting the answers.

The meaning of raw scores is better understood when it is converted into a standard score. The standard score used in the present test is Sten score. The norms were calculated based on the information collected from 3452 students of standard 9th and 2039 students of standard 10th across different parts of the country. The norms are provided in the Table 12 (for standard 9th- combined), Table 13 (for standard 9th- girls), Table 14 (for standard 9th- boys), Table 15 (for standard 10th- combined), Table 16 (for standard 10th- girls) and Table 17 (for standard 10th- boys) respectively.

Table 12: Norms for 9th Standard (COMBINED- Boys and Girls)

Sten Scores	1	2	3	4	5	6	7	8	9	10	Mean	SD
LA	0-4	5-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	15.68	5.83
AR	0-1	2-4	5-7	8-10	11-13	14-16	17-19	20-22	23-25	26-30	13.25	6.05
VR	0-3	4-5	6-8	9-11	12-14	15-17	18-20	21-23	24-26	27-30	14.89	5.94
MR	0-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-20	21-30	11.80	4.11
NA	0	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-25	26-30	12.85	6.12
SA	0-1	2-4	5-6	7-9	10-11	12-14	15-16	17-19	20-21	22-30	11.78	4.97
PA	0-9	10-16	17-23	24-30	31-37	38-43	44-50	51-56	57-58	59-60	37.07	13.66

Table 13: Norms for 9th Standard (Girls)

Sten Scores	1	2	3	4	5	6	7	8	9	10	Mean	SD
LA	0-4	5-7	8-10	11-13	14-16	17-19	20-22	23-24	25-27	28-30	16.24	5.80
AR	0-1	2-4	5-7	8-9	10-12	13-15	16-18	19-21	22-24	25-30	12.79	5.72
VR	0-4	5-7	8-9	10-12	13-15	16-18	19-20	21-23	24-26	27-30	15.45	5.53
MR	0-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-30	11.34	3.87
NA	0	1-3	4-6	7-9	10-12	13-15	16-17	18-20	21-23	24-30	12.16	5.77
SA	0-2	3-4	5-7	8-9	10-11	12-13	14-16	17-18	19-20	21-30	11.70	4.56
PA	0-12	13-18	19-25	26-31	32-38	39-45	46-51	52-56	57-58	59-60	38.48	13.08

Table 14: Norms for 9th Standard (Boys)

Sten Scores	1	2	3	4	5	6	7	8	9	10	Mean	SD
LA	0-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-26	27-30	15.33	5.81
AR	0-1	2-4	5-7	8-10	11-13	14-16	17-19	20-22	23-26	27-30	13.55	6.24
VR	0-2	3-5	6-8	9-11	12-14	15-17	18-20	21-23	24-26	27-30	14.53	6.16
MR	0-3	4-5	6-7	8-9	10-12	13-14	15-16	17-18	19-20	21-30	12.09	4.24
NA	0	1-3	4-6	7-10	11-13	14-16	17-19	20-22	23-25	26-30	13.29	6.30
SA	0-1	2-4	5-6	7-9	10-11	12-14	15-17	18-19	20-22	23-30	11.84	5.22
PA	0-8	9-15	16-22	23-29	30-36	37-43	44-50	51-56	57-58	59-60	36.16	13.95

Table 15: Norms for 10th Standard (COMBINED- Boys and Girls)

Sten Scores	1	2	3	4	5	6	7	8	9	10	Mean	SD
LA	0-6	7-9	10-12	13-14	15-17	18-20	21-23	24-26	27-28	29-30	17.84	5.75
AR	0-2	3-5	6-8	9-11	11-15	16-18	19-21	22-24	25-27	28-30	15.16	6.34
VR	0-4	5-7	8-10	11-13	14-16	17-19	20-22	23-25	26-28	29-30	16.76	6.05
MR	0-3	4-6	7-8	9-10	11-12	13-15	15-17	18-19	20-22	23-30	12.91	4.56
NA	0-2	3-5	6-9	10-12	13-15	16-19	20-22	23-25	26-28	29-30	15.79	6.66
SA	0-2	3-4	5-7	8-10	11-12	13-15	16-18	19-21	21-23	24-30	12.84	5.33
PA	0-11	12-19	20-25	26-31	32-37	38-43	44-50	51-56	57-58	59-60	38.62	12.76

Table 16: Norms for 10th Standard (Girls)

Sten Scores	1	2	3	4	5	6	7	8	9	10	Mean	SD
LA	0-5	6-8	9-10	11-13	14-16	17-19	20-21	22-24	25-27	28-30	19.05	5.48
AR	0-2	3-5	6-8	9-11	12-14	15-17	18-20	21-23	24-26	27-30	14.83	5.99
VR	0-6	7-8	9-11	12-14	15-17	18-20	21-23	24-26	27-28	29-30	17.46	5.73
MR	0-3	4-5	6-7	8-10	11-12	13-14	15-16	17-18	19-20	21-30	12.31	4.33
NA	0-2	3-5	6-8	9-12	13-15	16-18	19-21	22-24	25-27	28-30	15.06	6.12
SA	0-3	4-5	6-8	9-10	11-12	13-15	16-17	18-20	21-22	23-30	12.95	4.85
PA	0-10	11-17	18-23	24-30	31-38	39-43	44-50	51-56	57-58	59-60	40.05	11.88

Table 17: Norms for 10th Standard (Boys)

Sten Scores	1	2	3	4	5	6	7	8	9	10	Mean	SD
LA	0-5	6-8	9-11	12-14	15-17	18-19	20-22	23-25	26-28	29-30	17.09	5.78
AR	0-2	3-5	6-8	9-12	13-15	16-18	19-21	22-25	26-28	29-30	15.37	6.54
VR	0-3	4-7	8-10	11-13	14-16	17-19	20-22	23-25	26-28	29-30	16.32	6.21
MR	0-3	4-6	7-8	9-10	11-13	14-15	16-17	18-20	21-22	22-30	13.27	4.65
NA	0-2	3-5	6-9	10-12	13-15	16-18	19-22	23-25	26-28	29-30	16.25	6.95
SA	0-1	2-4	5-7	8-9	10-12	13-15	16-18	19-21	22-24	25-30	12.77	5.61
PA	0-11	12-17	18-24	25-31	32-37	38-44	45-50	51-56	57-58	59-60	37.73	13.21

SCORING KEY

SCORING KEY

INTERPRETATION OF SCORES

In the present test the standard score being used is the Sten score. Sten score of 1, 2 or 3 generally indicates a below average level of an aptitude. A Sten score of 4, 5 or 6 indicate an average level on the aptitude while a Sten of 8, 9 or 10 indicate a well-above and high aptitude. Given below is the description of the Sten scores for each aptitude sub-test that is being measured in this aptitude test.

Language Aptitude

Sten Score	Description
1-3	– <i>Below average</i> aptitude in understanding English words, synonyms, spelling words correctly and identifying and understanding the meaning of a proverb/idiom.
4-7	– <i>Average</i> aptitude in comprehending English vocabulary and verbal skills for practical application in everyday life.
8-10	– <i>High</i> aptitude in comprehension as well as use of English language. This indicates that the student has good vocabulary and understands synonyms and meanings of proverbs.

Abstract Reasoning

Sten Score	Description
1-3	– <i>Below average</i> aptitude in logical reasoning i.e. understanding relationship among patterns, symbols or shapes.
4-7	– <i>Average</i> aptitude in applying logical reasoning from some specific information to general concept.
8-10	– <i>High</i> aptitude in understanding abstract figures. This includes applying logical reasoning for comprehending relationships and solving problems quickly and effectively when dealing with abstract patterns in everyday life.

Verbal Reasoning

Sten Score	Description
1-3	– <i>Below average</i> aptitude in applying reasoning to word relations and deriving meaning from written information.
4-7	– <i>Average</i> aptitude in meaningfully comprehending word relations and written information to generalize to other situations.
8-10	– <i>High</i> aptitude in this area reflects well-above average skill for meaningfully comprehending word relations and written information so as to skilfully apply these in other similar situations.

Mechanical Reasoning

Sten Score	Description
1-3	– <i>Below average</i> aptitude in applying reasoning and solving problems in practical situations where mechanical concepts are being used.
4-7	– <i>Average</i> aptitude in being aware of information about basic mechanical concepts and hence applying them in daily life.
8-10	– <i>High</i> aptitude in successfully applying reasoning and solving problems in practical situations where mechanical concepts are being used.

Numerical Aptitude

Sten Score	Description
1-3	– <i>Below average</i> aptitude in correctly and quickly solving problems of mathematical operations related to primary arithmetic operations, and numerical relationships.
4-7	– <i>Average</i> aptitude in showing quick understanding and applying solutions to numerical computational tasks.
8-10	– <i>High</i> aptitude in rapidly and accurately manipulating numbers for solving arithmetic tasks and numbers in everyday life.

Spatial Aptitude

Sten Score	Description
1-3	– <i>Below average</i> aptitude in perceiving and judging relationships among visual patterns by imagining them mentally.
4-7	– <i>Average</i> aptitude to perceive and judge orientation of figures under different circumstances and to visualize objects in 3-Dimensions.
8-10	– <i>High</i> aptitude in understanding and grasping relationships among objects in 3-Dimensions.

Perceptual Aptitude

Sten Score	Description
1-3	– <i>Below average</i> aptitude in perceiving visual information (letters, numbers, etc) quickly and accurately.
4-7	– <i>Average</i> aptitude in comparing visual information and accurately perceiving it.
8-10	– <i>High</i> aptitude in quickly and accurately perceiving visual information.

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LIST OF ABBREVIATIONS

AR	Abstract Reasoning
CL	Clerical Ability
DBDA	David's Battery of Differential Abilities
LA	Language Aptitude
MA	Mechanical Ability
MR	Mechanical Reasoning
NA	Numerical Aptitude
PA	Perceptual Aptitude
RA	Reasoning Ability
SA	Spatial Aptitude
SD	Standard Deviation
VA	Verbal Ability
VR	Verbal Reasoning

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