# CONSTRUCTION AND STANDARDIZATION OF ACHIEVEMENT TEST IN MATHEMATICS (ATM)

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## Abstract

Tools are very important to measure the traits of an individual psychologically abnd Tools may be in a form of questionnaire, rating scales, inventories, batteries etc in psychology and education. Achievement is a factor to find effectiveness of any independent variable and it is called performance or outcome of the pupils or students. The investigator has developed Achievement Test in Mathematics (ATM) with 63 questions and 4 were removed based the subject expert suggestions. The questions have multiple choice answers and it has defined answer and so item analysis is computed with discrimination power and difficult index. After item analysis 50 questions were retained for final draft Achievement test in mathematics. The Adjustment scale has face validity and the reliability of the test is 0.79 which was found by using Spearman-Brown Formula. The Norm of the Achievement Test in Mathematics (ATM) has been established.

*Keywords: Achievement, Random, Preliminary Survey, Discrimination Power, Difficult Index, Norms.*

## 1.1 Introduction:

Research is a scientific and systematic process which provides a possible way to reach the solution of a problem. Research should be maintained in a proper way for attaining developments of any fields otherwise it would not be useless. The research process could not be done by single step. It involves more steps and procedures. For measuring psychological factors, the tool or instrument is essential. Tool is placed as main of conducting research. Nothing can be measured without valid and consistent/stable tool. So the standardized tool is essential in social science researches. Pilot study is a small scale of preliminary study or survey for mostly used to test the tool. It is also called as pilot project. It is not appropriate for case studies. It is a trail

run for check out the feasibility of the tool. Pilot study involves item analysis and it is used to standardize the research tools.

## 1.2 Meaning and Definitions of Achievement:

Academic achievement is the accomplishment or acquired proficiency in the performance of an individual in a given skill or body of knowledge. Academic achievement means knowledge attained and skill developed in the school subjects usually designated by test scores or by marks raised by teachers or by both. So, the academic achievement is also called academic performance of an individual. The pupils' academic achievement is an important indicator of their success in achieving their goals for higher education.

According to Good (1973) defines school (academic) achievement as, "the knowledge attained or skills developed in the school subjects, usually designated by the test scores or marks assigned by teachers or both" (Ahamed & Raheem, 2003).

Travers (1970) states that achievement is the result of what an individual has learned from some educational experiences.

De Cecco & Crawford (1977) states that achievement is the expectancy of finding satisfaction in mastering challenging and difficult performances.

Yelon, Weinstein, & Weener (1977) express achievement as the successfulness of individual,

Smith & Hudgins (1964) says that achievement is to do one's best, to be successful, to accomplish tasks requiring skill and effort and to be recognized by authority.

Tinambunan (1988) defines achievement as the student's grasp of some body of knowledge or proficiency in certain skills.

Carter (1995) defines academic achievement as "The knowledge attained or skills developed in schools usually designated by test scores or by marks assigned by teachers or both" (as cited in Chandrasekaran, 1998).

Garrison, Kingston, and McDonald (1955-1964) affirm the definition of achievement as the progress pupils make toward the goals and objectives of the curriculum, they then assert further about the definition that achievement may be the one's ability or the extent of his/her knowledge in a specific content area.

Based on the opinions of the eminent scholars about academic achievement and it concludes that achievement is the result, the successfulness, the extent or ability, the progress in learning educational experiences that the individual indicate in relation with the educational learning. In the view of the investigators, "Academic achievement is a quantitative or qualitative description of student's successfulness towards educational objectives and goals".

## 1.3 Construction of Achievement Test in Mathematics (ATM):

Tool is essential in all type of social science researches for measuring the variable. If the measuring tool is wrong in the research, the research works will be entirely erroneous. The tool occupies a main place in social science researches. Unfortunately, a tool measures something, but the measurement could not be valid. Tool construction is a essential as well as a complex   task to the investigators. It may be extended to several steps.  They are,

- ✓ Planning
- ✓ Preparation for pilot forms
- ✓ Pre try out
- ✓ Editing
- ✓ Pilot study
- ✓ Item analysis
- ✓ Preparation for final form

## 1.3.1 Planning:

The first and essential step of the item analysis is planning. In this step the investigators has referred may more definitions about achievement and defined achievement.

## 1.3.2 Preparation of Pilot Form:

In this step, the investigators prepare questions Investigators has developed the pilot form of ATM for measuring the achievement of Mathematics of VIII standards. Investigators developed 63 statements in geometry with multiple choice questions. Each and every question has four choices and one is the correct answer of the question. During the writing process of the statements, the investigators take care about the following.

- ✓ Inculcation of double barreled question,
- ✓ Repetition of question,
- ✓ Ambiguity of the question,
- ✓ Simplicity of the questions,
- ✓ Clear instructions to responses,
- ✓ Simple words of the questions,
- ✓ Misleading questions,
- ✓ Direct answers and
- ✓ Content limitations.

## 1.3.3 Pre-tryout:

The pilot form has given to the subject experts like Associate professors and Assistant Professors working in universities and School teacher who handling mathematics. Questions in the tools were further

corrected based on their suggestions. On the basis of criticisms and suggestions of the subject experts the 4 statements were removed and 59 questions were integrated.

## 1.3.4 Preliminary Survey:

The investigators have conducted a preliminary survey for identifying the question which is clearly discriminate the low achievement pupils from the high achievement pupils. Sample is an act or process or technique of selecting an appropriate sample (Suresh and Srinivasan, 2017). Achievement Test in Mathematics (ATM) was administered with the random sample of 272 VIII standard pupils from Bhuvaneswar, Odisha. The pupils are permitted to 1 hour to answer the questions. The investigators assured that the data will be only used for research purposes.

## 1.3.5 Item analysis:

ATM is a test and it has defined correct answers. Thus the investigators have adopted Discrimination Index/Power and Difficult index for selecting the questions. The item possesses both discrimination power value is greater than 0.39 and difficult index value is between 0.31 to 0.79 were retained. If item posses both critical values were only retained and all others were rejected. The statuses of the items are given in the following table 1.1.

### Table No 1.1 Item Analysis of ATM

| S.No | Question No. in Pilot Forms | Discrimination Power | Difficult Index | Question No. in Final Form | Results |
|------|------|------|------|------|------|
| 1) | 1. | 0.48 | 0.74 | 1 | Selected |
| 2) | 2. | 0.03 | 0.52 | - | **Rejected** |
| 3) | 3. | 0.72 | 0.63 | 2 | Selected |
| 4) | 4. | 0.71 | 0.59 | 3 | Selected |
| 5) | 5. | 0.76 | 0.61 | 4 | Selected |
| 6) | 6. | 0.86 | 0.56 | 5 | Selected |
| 7) | 7. | 0.88 | 0.55 | 6 | Selected |
| 8) | 8. | 0.45 | 0.34 | 7 | Selected |
| 9) | 9. | 0.55 | 0.61 | 8 | Selected |
| 10) | 10. | 0.66 | 0.55 | 9 | Selected |
| 11) | 11. | 0.04 | 0.25 | - | **Rejected** |
| 12) | 12. | 0.75 | 0.60 | 10 | Selected |
| 13) | 13. | 0.85 | 0.55 | 11 | Selected |
| 14) | 14. | 0.65 | 0.45 | 12 | Selected |
| 15) | 15. | 0.77 | 0.39 | 13 | Selected |
| 16) | 16. | 0.75 | 0.40 | 14 | Selected |

| | | | | | |
|---|---|---|---|---|---|
| 17) | 17. | 0.65 | 0.45 | 15 | Selected |
| 18) | 18. | 0.56 | 0.49 | 16 | Selected |
| 19) | 19. | 0.18 | 0.36 | - | **Rejected** |
| 20) | 20. | 0.11 | 0.72 | - | **Rejected** |
| 21) | 21. | 0.39 | 0.47 | 17 | Selected |
| 22) | 22. | 0.44 | 0.55 | 18 | Selected |
| 23) | 23. | 0.71 | 0.42 | 19 | Selected |
| 24) | 24. | 0.82 | 0.47 | 20 | Selected |
| 25) | 25. | 0.79 | 0.49 | 21 | Selected |
| 26) | 26. | 0.75 | 0.51 | 22 | Selected |
| 27) | 27. | 0.86 | 0.45 | 23 | Selected |
| 28) | 28. | 0.84 | 0.46 | 24 | Selected |
| 29) | 29. | 0.61 | 0.35 | 25 | Selected |
| 30) | 30. | 0.43 | 0.44 | 26 | Selected |
| 31) | 31. | 0.55 | 0.50 | 27 | Selected |
| 32) | 32. | 0.57 | 0.60 | 28 | Selected |
| 33) | 33. | 0.22 | 0.88 | - | **Rejected** |
| 34) | 34. | 0.86 | 0.45 | 29 | Selected |
| 35) | 35. | 0.61 | 0.33 | 30 | Selected |
| 36) | 36. | 0.86 | 0.45 | 31 | Selected |
| 37) | 37. | 0.62 | 0.56 | 32 | Selected |
| 38) | 38. | 0.55 | 0.60 | 33 | Selected |
| 39) | 39. | 0.70 | 0.52 | 34 | Selected |
| 40) | 40. | 0.76 | 0.55 | 35 | Selected |
| 41) | 41. | 0.83 | 0.59 | 36 | Selected |
| 42) | 42. | 0.05 | 0.97 | - | **Rejected** |
| 43) | 43. | 0.11 | 0.92 | - | **Rejected** |
| 44) | 44. | 0.32 | 0.83 | 37 | Selected |
| 45) | 45. | 0.6 | 0.7 | 38 | Selected |
| 46) | 46. | 0.53 | 0.74 | 39 | Selected |
| 47) | 47. | 0.59 | 0.51 | 40 | Selected |
| 48) | 48. | 0.56 | 0.49 | 41 | Selected |
| 49) | 49. | 0.55 | 0.72 | 42 | Selected |
| 50) | 50. | 0.95 | 0.52 | 43 | Selected |
| 51) | 51. | 0.87 | 0.56 | 44 | Selected |
| 52) | 52. | 0.66 | 0.66 | 45 | Selected |
| 53) | 53. | 0.05 | 0.86 | - | **Rejected** |
| 54) | 54. | 0.76 | 0.61 | 46 | Selected |
| 55) | 55. | 0.43 | 0.44 | 47 | Selected |
| 56) | 56. | 0.55 | 0.39 | 48 | Selected |
| 57) | 57. | 0.66 | 0.44 | 49 | Selected |
| 58) | 58. | 0.75 | 0.40 | 50 | Selected |
| 59) | 59. | 0.06 | 0.91 | - | **Rejected** |

After item analysis the 50 items were retained for final version of ATM.

## 1.4 Qualities of the ATM

The ATM has the following Qualities.

**1.4.1 Reliability of the ATM**

Reliability was calculated and selection of items were made on the basis of the agreement spilt half reliability using Spearman-Brown formula is 0.79.

**1.4.2 Validity of the ATM**

For finding the face validity the investigators has sent the ATM to two Associate Professors in education and one School Teacher who possesses M.Ed degree with teaching mathematics at VIII standard level and the suggestive alteration were made in the tool. As directed by the subject experts. So the ATM has face validity.  The internal validity of the tool is 0.88.

**1.4.3 Scoring procedure of the ATM**

The scoring procedure of the ATM is given in the table 1.2.

**Table 1.2 Scoring Procedure of ATM**

| Answer | Score |
|--------|-------|
| Right  | 1     |
| Wrong  | 0     |

After scoring is over, the obtained achievement scores must be converted into percentage.

**1.5 Norms of the ATM:**

For finding the level of ATM, the following Norms were developed. The Norms of the ATM is given the table 1.3.

**Table 1.3 Norms of ATM**

| Raw Score | Interpretation |
|-----------|----------------|
| below 17.4 | Poor |
| above 17.4 to 22.4 | Third Class |
| above 22.4 to 29.9 | Second Class |
| above 29.9 to 37.4 | First Class |
| above 37.4 to 44 | First Class with Distinction |
| above 44 | Super First Class |

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**1.6 Conclusion:**

The Achievement Test in Mathematics (ATM) has been constructed and standardized by the Investigator & Research Supervisor.

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