Global Scientific JOURNALS

The Development and Validation of Mathematics Multiple Choice Test Items for Junior Secondary School Three (JSS 3) Students in Oyo State, Nigeria

FAJOBI, OLUTOYIN OLUFUNKE (PhD)

Department of Educational Foundation,

Faculty of Education, Federal University of Oye-Ekiti, Ekiti State, Nigeria.

E-mail:fajobiolutoyinolufunke@gmail.com +2348064464127

Abstract

The basis for the study was to develop and validate a mathematics achievement test for junior secondary school three students (JSS 3) in Oyo State, Nigeria. The instrumentation research design was adopted for the study. Simple random sampling technique was used in selecting three private schools in Ibadan metropolis; from which a total sample of 90 students in JSS 3 was purposefully selected as the sample for the sample. The test instrument was face-validated by experienced secondary school mathematics teachers for clarity of words and plausibility of distractions. The MAT (mathematics achievement test) consisted of 100 multiple choice test items of four strata with Kudar-Richardson KR-20 reliability coefficient of 0.87 which was administered to students and the response of these students were used in determining students' mastery ability in the subject. The findings of the study show that the MAT is a valid and reliable instrument for measuring achievements in mathematics tests for junior secondary school three students in Nigerian secondary schools. It is recommended that teachers, educational stakeholders and researchers included; should ascertain the reliability coefficient; difficulty and discrimination indices of test items they develop in measuring educational achievements so as to ensure that items are valid and relevant to the subject contents and objectives.

KEYWORDS: Test, Testing, Item Development, Item Analysis, Validation, Mathematics Achievement Test.

Introduction

Mathematics is an essential ingredient needed for the study of core science based subjects at various levels of learning (pre-primary, primary, secondary and tertiary). It is the foundation of key scientific, industrial and economic development of societies. The teaching and learning of mathematics serves as an eye opener into scientific quest and advancement to the students, teachers and the general populace at large. The importance of mathematical learning has repeatedly been emphasized by educators and politicians (Wilkins & Ma, 2002). Teachers and parents have paid close attention to students' performance in mathematics and their progress every year. Ukeje (2005) did opine that mathematics brings about modern developed Societies. This exposes the essence and potentials inherent in the subject in the daily living of persons who might have imbibed its values.

A test is an assessment intended to measure a test-taker's knowledge, skill, aptitude, physical fitness, or classification in many other topics. A test may be administered verbally, on paper, on a computer, or in a predetermined area that requires a test taker to demonstrate or perform a set of skills. Similarly, tests are used to determine whether students have learned what they were expected to learn or the degree to which students have learned the material. They can be used to measure learning progress and achievement and to evaluate the effectiveness of educational programs. Generally, a test of educational achievement is that which is intended to assess knowledge, understanding, or skills of learners in a given subject or group of subjects. The test might be restricted to a subject like mathematics.

Testing is a vital technique for the purpose of assessment. It entails the use of instruments for assembling data. In all, the purpose of testing students may include: to assess what students have learned, to identify student strengths and weaknesses, measures effectiveness of teaching/teacher, determines recipients worthy of awards and recognition and to judge students' merit for admission or scholarship. Testing students' overtime keeps them on their toes and ensures that they are up to date with their studies and what is expected of them.

The objectives for administering tests are: to compare students' performance, to determine change in behavior, for feedback purposes, for placement purposes, for promotion purposes, to determine teacher teaching efficiency and to promote healthy rivalry among students. Ajeigbe & Afolabi (2013) in their view stressed that a typical multiple-choice objective test consists of a widely sample of subject syllabus or course outline within a well-defined ranged of cognitive levels. This definition emphasizes that multiple-choice questions cover more content area than any other types of test. It also emphasized that multiple-choice questions place more attention to cognitive domain of learning. A multiple-choice question pays great attention to the three domains of learning, namely; cognitive, affective and psychomotor. In multiple-choice questions, students must choose the correct answer from a given number of possible answers, called foils. The incorrect options are termed distracters, while the correct option is called the key.

The test constructor (the tester) should be familiar with the parameters which a good test should possess; the tester can then begin to construct the test, which may either be a unit test or a full-fledged question paper covering all the aspects of the subject syllabus. The test planning and construction steps may include: constructing the test design, weighing the test objectives, preparing questions based on blue print, assembling the questions, preparing the scoring key and the marking scheme and preparing question-wise analysis. In the same line, the guidelines for writing test items are to: choose the type of test item that measures the intended learning competence specifically, writing the test items clearly and definitively, writing the test items that will elicit performance in the learning task, writing the test items that are free from nonfunctional material, writing the test item so that irrelevant clues do not enable the uninformed student to respond correctly, writing the test item so that irrelevant factors do not prevent an informed student from responding correctly, writing the test item so that the difficulty level matches the

intent of the learning competence, the age of the students to be tested, the usefulness of the results and writing more test items than the slated number of the test plan.

Test validity and reliability is a vital factor to consider in testing and test construction. A content valid test measures what it is projected to measure — the content as depicted by the test blueprint. The tests in the field of education are generally constructed to measure some specific qualities or abilities (variables) of the students. If a test measures the traits or abilities for which it was constructed, then such a test is called valid, and these traits of the test is called validity. According to Nunnally (1978), Measurements are reliable to the extent that they are repeatable and that any random influence which tends to make measurements different from occasion to occasion or circumstance to circumstance is a source of measurement error. Also, Gay (1987) Reliability is the degree to which a test consistently measures whatever it measures. Errors of measurement that affect reliability are random errors and errors of measurement that affect validity are systematic or constant errors. Test-retest, equivalent forms and split-half reliability are all determined through correlation.

Test validation is the process of desiring comparative norms that distinguishes a formal validated test from an informal objective test of achievement. It involves: thorough analysis of subject-matter; thorough formulation of test material; exact refinement of test items; rigid statistical analysis than the usual informal objective tests; critical validation of test items forms and quality; and derivation of the set of norms. The developers must be reasonably sure that the content selected for test items is likely the one that has received instructional emphasis and conclusion Selection of content must be broad enough to fit into any school situation where the subject can be taught. In subjects where instructional objectives are clearly stated in terms of intended learning outcomes, it is easier to develop test items that sample the content adequately, as in mathematics where facts and skills are well known.

Item analysis is a process which examines student responses to individual test items (questions) in order to assess the quality of those items and of the test as a whole. Item analysis is a process of examining class-wide performance on individual test items. There are three common types of item analysis which provide teachers with three different types of information:

- Difficulty Index - Teachers produce a difficulty index for a test item by calculating the proportion of students in class who got an item correct. (The name of this index is counter-intuitive, as one actually gets a measure of how easy the item is, not the difficulty of the item.) The larger the proportion, the more students who have learned the content measured by the item.

- Discrimination Index - The discrimination index is a basic measure of the validity of an item. It is a measure of an item's ability to discriminate between those who scored high on the total test and those who scored low. Though there are several steps in its calculation, once computed, this index can be interpreted as an indication of the extent to which overall knowledge of the content area or mastery of the skills is related to the response on an item. Perhaps the most crucial validity standard for a test item is that whether a student got an item correct or not is due to their level of knowledge or ability and not due to something else such as chance or test bias.

- Analysis of Response Options - In addition to examining the performance of an entire test item, teachers are often interested in examining the performance of individual distractors (incorrect answer options) on multiple-choice items. By calculating the proportion of students who chose each answer option, teachers can identify which distractors are "working" and appear attractive to students who do not know the correct answer, and which distractors are simply taking up space and not being chosen by many students. To eliminate blind guessing which results in a correct answer purely by chance (which hurts the validity of a test item), teachers want as many plausible distractors as is feasible. Analyses of response options allow teachers to fine tune and improve items they may wish to use again with future classes.

Students' performance especially in subjects like mathematics can be detailed with the help of an achievement tests. An achievement test measures a pupil's achievement and progression in a specific subject or topic over a set period of time. The outcome of these tests will be used to administer a grade for each student. This test is most commonly applied to measure student progression and ability. The results obtained from an achievement test may display a need for review of the test type and structure as to better their performance. An achievement test does

measure the skills and knowledge students may have imbibed within a specified time through a well structured training and instruction.

Literature review had indicated that validated instruments for assessing students' mathematics achievement seem to be scanty for the upper basic classes' especially junior secondary school 3. Hence, a reason for the study. The developed test will serve as a major assistance at providing a valid and reliable Mathematics Achievement Test to be used by teachers and testers at every point in time.

Research Questions

1. Which of the test items have a good difficulty index?

2. Which of the test items have a good discrimination index?

Research Methodology

(i) Research type

The study was conducted using instrumentation. Instrumentation research as defined by Kpolovie (2010) is the science of test development. Instrumentation is the process of constructing research instruments that could be used appropriately in gathering data on the study. Instrumentation research is employed for test construction if test is used for measuring and evaluating psychological traits.

(ii) Population, Sample and Sampling technique

The population for the study was purposively selected and consisted of junior secondary school three students (JSS3) in Oyo State, Nigeria. A total of hundred test items was administered to Ninty students (90), the students that were purposefully adopted to respond to the test items was from Yinbol College, Orogun Grammer School and Glory High School, All in Ibadan Metropolis.

(iii) Instrumentation

The Mathematics Achievement Test (MAT) consisted of a section. The section contained questions designed to test the cognitive level of achievement of the learners' mathematics. It consisted of 100 multiple choice test items with four options lettered A to D. Correct response to each of the items attracted a score of 1 while an incorrect response attracted a score of 0. The Kudar-Richardson KR-20 reliability coefficient of the MAT was 0.87.

(iv) Method of Data Collection

The method that was adopted in collecting data for the exercise was visitation to the sampled schools at the eight week of the third term when the JSS 3 syllabus was already or almost completed my most schools in the State. 100-item mathematics Multiple-Choice (MC) test items

constructed by the researcher which was curbed from the JSS 3 Mathematics curriculum/Textbook; was administered to the students sampled. Scoring of the items was done on SPSS, version 20 .Thereafter; item difficulty, discrimination and point biserial analysis of each item was statistically obtained.

RESULTS

Research Question 1: Which of the test items have a good difficulty index?

Test items with difficulty index of 0.4 – 0.6 is said to be good items, Thorndike (1997). Hence, as shown on table 1, the test items that have good difficulty index included items: 4, 7-11, 13-14, 24, 30-31, 42, 44, 48-50, 52-54, 59-61, 67, 69-70, 74-75, 82, 85-87, 93, and 96-97. The range of the difficulty index is 0.24 to 0.85.

Research Question 2: Which of the test items have a good discrimination index?

Also, as reaffirmed by Thorndike (1997), test items with discrimination index value greater than 0.3 (ie. > 0.3), such test items are good. Thus, from table 1, the test items that have good discrimination index included items: 1-11, 13-14, 21-23, 125, 28-29, 31, 33-34, 36, 39-45, 48-61, 64-74, 82-83, 85-90, 92, 94 and 96-97. The range of the discrimination index is -0.39 to 0.83

Table 1: The Item Analysis Output showing Item difficulty (F8) and Discrimination Indices (F9) of the Mathematics multiple choice items.

FILING SYSTEM

S/No	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
1.	2	1	2	3	AP	1	Obj	.44	.78	.592	C
2.	2	1	2	3	AP	2	Obj	.55	.72	.569	A
3.	2	1	2	3	AP	2	Obj	.56	.72	.543	B
4.	2	1	2	3	AP	2	Obj	.53	.61	.460	A
5.	2	1	2	3	AP	2	Obj	.73	.31	.260	C
6.	2	1	2	3	AP	2	Obj	.33	.44	.333	B
7.	2	1	2	3	KN	2	Obj	.35	.44	.402	D
8.	2	1	2	3	AP	2	Obj	.42	.69	.535	A
9.	2	1	2	3	KN	2	Obj	.58	.28	.228	D
10.	2	1	2	3	KN	2	Obj	.43	.81	.655	C
11.	2	1	2	3	KN	1	Obj	.47	.83	.670	B
12.	2	1	2	3	AN	1	Obj	.76	.15	.146	A
13.	2	1	2	3	AN	1	Obj	.46	.52	.389	B
14.	2	1	2	3	AN	1	Obj	.48	.37	.308	A
15.	2	1	2	3	AN	1	Obj	.85	.22	.227	A
16.	2	1	2	3	AN	1	Obj	.81	.24	.235	A
17.	2	1	2	3	AN	1	Obj	.85	.15	.175	B
18.	2	1	2	3	AN	1	Obj	.81	.22	.207	B
19.	2	1	2	4	AN	1	Obj	.81	.28	.281	A
20.	2	1	2	4	EV	1	Obj	.28	-0.41	.378	B
21.	2	1	2	4	EV	1	Obj	.76	.30	.295	A
22.	2	1	2	4	EV	1	Obj	.78	.26	.018	B
23.	2	1	2	4	AP	1	Obj	.67	.26	.202	C
24.	2	1	2	4	AP	2	Obj	.49	.24	.191	B
25.	2	1	2	4	AP	2	Obj	.61	.48	.401	B

26.	2	1	2	4	AP	1	Obj	.25	-0.39	.237	B
27.	2	1	2	4	AP	1	Obj	.65	.00	.041	C
28.	2	1	2	4	KN	1	Obj	.24	.41	.388	A
29.	2	1	2	4	AP	1	Obj	.24	.37	.383	A
30.	2	1	2	4	AP	1	Obj	.47	.17	.095	B
31.	2	1	2	4	AP	1	Obj	.44	.48	.429	C
32.	2	1	2	4	AP	1	Obj	.76	.19	.177	B
33.	2	1	2	4	AP	1	Obj	.82	.28	.346	B
34.	2	1	2	4	AP	1	Obj	.81	.26	.340	B
35.	2	1	2	4	AP	1	Obj	.85	.07	.078	B
36.	2	1	2	4	KN	1	Obj	.72	.26	.228	C
37.	2	1	2	4	KN	1	Obj	.80	.11	.152	b
38.	2	1	2	4	AP	1	Obj	.83	.15	.117	b
39.	2	1	2	4	AP	1	Obj	.68	.43	.381	d
40.	2	1	2	4	KN	1	Obj	.61	.67	.541	a
41.	2	1	2	4	AP	1	Obj	.71	.46	.391	b
42.	2	1	2	4	AP	1	Obj	.59	.63	.506	c
43.	2	1	2	4	AP	1	Obj	.63	.57	.450	b
44.	2	1	2	4	AP	1	Obj	.55	.76	.594	a
45.	2	1	2	4	AP	3	Obj	.66	.57	.462	c
46.	2	1	2	4	AP	3	Obj	.90	.20	.241	a
47.	2	1	2	4	KN	3	Obj	.79	.17	.189	a
48.	2	1	2	4	KN	3	Obj	.51	.65	.497	b
49.	2	1	2	4	AP	3	Obj	.50	.81	.644	c
50.	2	1	2	4	AP	3	Obj	.43	.30	.252	d
51.	2	1	2	4	AP	3	Obj	.77	.31	.287	b
52.	2	1	2	4	KN	1	Obj	.56	.63	.516	a
53.	2	1	2	4	KN	2	Obj	.56	.70	.602	c
54.	2	1	2	4	KN	2	Obj	.58	.69	.566	a
55.	2	1	2	4	KN	2	Obj	.78	.41	.393	C
56.	2	1	2	4	KN	2	Obj	.70	.30	.282	C

57.	2	1	2	4	KN	2	Obj	.63	.41	.293	B
58.	2	1	2	4	KN	2	Obj	.63	.59	.480	D
59.	2	1	2	4	KN	2	Obj	.60	.54	.439	B
60.	2	1	2	4	KN	2	Obj	.59	.48	.390	C
61.	2	1	2	4	KN	2	Obj	.42	.50	.393	A
62.	2	1	2	4	KN	2	Obj	.16	.20	.374	B
63.	2	1	2	4	KN	2	Obj	.80	.22	.216	A
64.	2	1	2	4	AP	2	Obj	.69	.31	.252	C
65.	2	1	2	4	AP	1	Obj	.77	.28	.259	A
66.	2	1	2	4	AP	1	Obj	.72	.26	.229	A
67.	2	1	2	3	AP	1	Obj	.47	.76	.577	B
68.	2	1	2	3	KN	1	Obj	.61	.48	.357	C
69.	2	1	2	3	AP	2	Obj	.50	.59	.466	D
70.	2	1	2	3	KN	2	Obj	.57	.70	.470	A
71.	2	1	2	5	AN	2	Obj	.67	.48	.391	B
72.	2	1	2	5	KN	2	Obj	.81	.28	.280	C
73.	2	1	2	5	KN	2	Obj	.73	.43	.363	C
74.	2	1	2	5	AP	2	Obj	.46	.63	.493	B
75.	2	1	2	5	AP	2	Obj	.59	.63	.495	A
76.	2	1	2	5	AP	2	Obj	.71	.43	.352	B
77.	2	1	2	5	AP	2	Obj	.86	.17	.247	B
78.	2	1	2	5	AP	2	Obj	.80	.22	.103	B
79.	2	1	2	5	AP	2	Obj	.63	.48	.403	A
80.	2	1	2	5	AP	2	Obj	.69	.15	.097	B
81.	2	1	2	5	AP	2	Obj	.70	.22	.202	C
82.	2	1	2	5	AP	2	Obj	.58	.54	.447	A
83.	2	1	2	5	AP	2	Obj	.68	.50	.380	C
84.	2	1	2	5	AP	2	Obj	.69	.24	.208	B
85.	2	1	2	5	AP	2	Obj	.50	.67	.496	A
86.	2	1	2	5	AP	2	Obj	.56	.52	.391	B
87.	2	1	2	5	AP	2	Obj	.50	.74	.596	A

88.	2	1	2	5	AP	2	Obj	.62	.54	.449	A
89.	2	1	2	5	AP	2	Obj	.61	.48	.385	B
90.	2	1	2	5	AP	2	Obj	.77	.35	.336	C
91.	2	1	2	5	KN	2	Obj	.82	.20	.204	A
92.	2	1	2	5	KN	1	Obj	.70	.30	.250	C
93.	2	1	2	5	KN	1	Obj	.38	.65	.483	B
94.	2	1	2	5	KN	1	Obj	.76	.37	.352	C
95.	2	1	2	5	KN	1	Obj	.73	.13	.163	D
96.	2	1	2	5	KN	1	Obj	.50	.59	.437	A
97.	2	1	2	5	AN	1	Obj	.49	.46	.338	C
98.	2	1	2	5	AP	2	Obj	.79	.17	.194	B
99.	2	1	2	1	AP	2	Obj	.80	.22	.288	B
100.	2	1	2	1	AP	2	Obj	.75	.20	.129	A

F I (The Subject) – Mathematics.   **F II (Level of Education) –** JSS.

F III (Year/Class) - JSS2.   **F IV (Theme) - 1-5.**

F V (Taxonomy) - KN = Knowledge, CP = Comprehension, AP = Application, AN = Analysis, SY = Synthesis, EV = Evaluation.

Field VI (Topics). Field VII (Question Type).   Field VIII (Difficulty Index).

Field IX (Discrimination Index).   **Field X** (Point-bi-serial).

Field XI (Foil Analysis).   **Field XII -** The Key (the correct alternatives).

Discussion of findings

In accordance with the findings of the study, the reliability coefficient of the mathematics test items developed and validated for the junior secondary school three students was 0.87. This does not agree with the findings of Jayanthni (2014) who researched on the development and validation of achievement test in mathematics and obtained a validity coefficient of 0.942. Also, the difficulty index and discrimination index of good items are 0.4 to 0.6 and greater than 0.3 respectively; Thorndike (1991). The range of the difficulty indices and the discrimination indices obtained are 0.24 to 0.85 and -0.39 to 0.83. This negates the findings of Otuoku (2009); Muhammad, Zeeshan, Muhammad & Ali Akbar (2012) and Otuoku (2014) whose MAT items difficulty indices ranged from 0.27 to 0.68; 0.13 to 0.83 and 0.11 to 0.98 respectively.

Conclusion and Recommendations

The mathematics Achievement Test (MAT) as obtained from the study is a reliable assessment instrument for ascertaining students' mastery level/ability in Mathematics as a subject. The MAT was found to be highly reliable with Kudar-Richardson KR-20 reliability coefficient of 0.87. The range of the difficulty indices and the discrimination indices obtained are 0.24 to 0.85 and -0.39 to 0.83 respectively. Researchers, teachers and relevant educational stakeholders should always determine the reliability coefficient; difficulty and discrimination indices of test items they are to adopt or adapt for the purpose of testing students ability, knowledge and performance in a given subject.

References

Ajeigbe, T. O. & Afolabi, E. R. I (2013). A study of Item Response and Anchor Bias in Economics Objective Tests among Senior Secondary School Students in Osun State. Academic Journal of Interdisciplinary Studies, Vol. 2 No 3 p. 173-179.

Gay, L. (1987). *Eductional research: competencies for analysis and application.* Merrill Pub. Co., Columbus.

Jayanthi, J. (2014). Development and Validation of an Achievement Test in Mathematics, International Journal of Mathematics and Statistics Invention (IJMSI), 2(4) 40-46.

Kpolovie, P. J. (2010). Advanced research methods. Owerri: Spring Field Publisher Ltd.

Muhammad, Zeeshan, Muhammad & Ali Akbar (2012). Development and Validation of an Aptitude Test for Secondary School Mathematics Students. Bulletin of Education and Research June 2012, Vol. 34, No. 1 pp.65-76

Nunnally, J. (1978). *Psychometric Theory.* McGraw-Hill, New York.

Thorndike, R.M., Cunningham, G.K., Thorndike, R.L., & Hagen, E.P. (1991). Measurement and evaluation in psychology and education (5th ed.). New York: MacMillan.

Ukeje. B. O. (2005). Production and retention of mathematical sciences teachers for Nigerian educational system. In S.O. Ale & L.O. Adetula (Eds). Reflective and intellective Position papers on Mathematics Education Issues, pp. 80-102, Abuja: Marvelous Mike Nigeria Ltd.

Wilkins, J. L., & Ma, X. (2002). Predicting student growth in mathematical content knowledge. The Journal of Educational Research, 95, 288-298.

Appendix

The Junior Secondary School 3 (JSS 3) Mathematics Test Items that was administered to the students:

1. Solve the equation $\frac{t}{6} = \frac{7}{12}$ (a) $\frac{5}{3}$ (b) $\frac{4}{5}$ (c) $\frac{6}{5}$ (d) $\frac{7}{-2}$

2. $1\frac{2}{3} = 4\frac{1}{3}$, find x?   (a) $3\frac{1}{4}$ (b) $4\frac{1}{2}$ (c) $2\frac{1}{2}$ (d) $3\frac{1}{3}$

3. Solve $-\frac{3x}{5} = -\frac{9}{10}$ (a) $1\frac{1}{2}$ (b) $1\frac{3}{2}$ (c) $1\frac{1}{4}$ (d) $\frac{5}{2}$

4. 6 times a number is 48, what is the number? (a) 7 (b) 8 (c) 9 (d)10

5. Find the number which when multiplied by 10, gives 7? (a) 7 (b) 12 (c) 10 (d) 3

6. A number divided by 5, the result is 9, what is the number?(a) 35 (b) 26 (c) 45 (d)10

7. A number divided by 3 gives 12, what is the number?   (a) 26 (b) 36 (c) 40 (d) 20

8. 14 times a certain number gives -84. What is the number? (a) -3 (b) -8 (c) -5 (d) -6

9. Expand $(6 + x)(3 - x)$ (a) $18 - 3x - x^2$ (b) $9 - 3x - x^2$ (c) $18 + 3x - x^2$ (d) $18 - 3x + x^2$

10. Expand $(x - 3)^2$ (a) $x^2 - 6x - 9$ (b) $x^2 - 3x - 6$ (c) $x + 6x - 9$ (d) $a^2 - 3x + 9$

11. Expand $(a +3)(a +4)$ (a) $a^2 - 7xa - 9$ (b) $a^2 - 5a - 10$ (c) $a^2 + 7a - 12$ (d) $a^2 - 3x + a$

12. Expand $(n - 7)(n + 2)$ (a) $n^2 + 5n - 14$ (b) $n^2 - 5n - 14$ (c) $n^2 + 5n - 14$ (d) $n^2 - 3n + 14$

13. Expand $(6 + x)(3-x)$ (a) $18 + 3x - x^2$ (b) $9 - 3x - X^2$ (c) $18 - 3x + x^2$ (d) $18 - 3x + X^2$

14.Expand $(x - 3)^2$ (a) $X^2 - 6x - 9$ (b) $x^2 - 6x + 9$ (c) $x^2 - 3x + 6$ (d) x2 - 3x + 9

15. Expand $(a + 3)(a + 4)$ (a) $a^2 + 7a +12$ (b) $a^2 - 5a - 10$ (c) $a^2 - 7a - 12$

16. Expand $(n - 7)(n-2)$ (a) $n^2 - 5n +14$ (b) $n^2 - 4n - 14$ (c) $n^2 - 3n + 14$ (d) $n^2 - 3n + 14$

Justify the type of angle in the diagrams below to answer the questions below:

17.
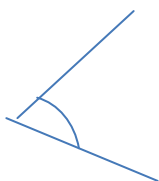
   (a) Acute (b) right angle   (c) reflex   (d) obtuse
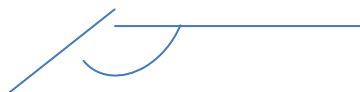
18.

   (a)   reflex   (b) straight line angle (c) comma angle (d) invested angle

19.
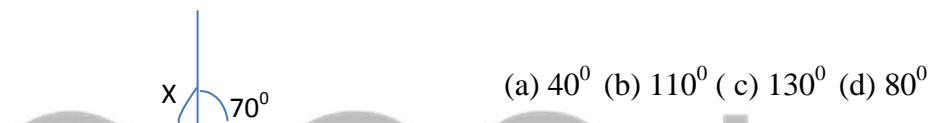
(a) right angle (b) reflex (c) acute angle   (d) obtuse

20.

21.   (a) obtuse   (b) reflex (c) acute angle   (d) right angle

(a) reflex (b) obtuse (c) acute angle   (d) right angle

22. Find x if

X 70^0

(a) 40^0 (b) 110^0 (c) 130^0 (d) 80^0

23.

(a) 100^0 (b) 90^0 (c) 180^0 (d) 150^0

24. If a cuboid has length 7cm and breadth, find the height? (a) 8cm
(b) 10cm (c) 6cm (d) 14cm

25. What is the volume of a cuboid if its length is 3cm and breath is 6cm
(a) $24cm^3$ (b) $54cm^3$ (c) $80cm^3$ (d) $30cm^3$

26. A rectangle has length 5cm and breadth 9cm, find the perimeter
(a)   14cm (b) 28cm (c) 34cm (d) 45cm

27. If the circumference of a circle is 42cm, find its radius
(a) 8cm (b) 14cm (c) 7cm (d) 16cm

28. A rectangle has length and breadth of 8cm and 9cm respectively. Find the perimeter (a)
30cm (b) 15cm (c) 25cm (d) 40cm

29. If the radius of a circle is 11cm, find the area? (a) $363cm^2$ (b) $262cm^2$(c) $443cm^2$(d) $166cm^2$

30. The area of a triangle is 12cm^2, find the base of its height is 4cm

   (a) 10cm (b) 6cm (c) 7cm (d) 2cm

31. The base and height of a triangle is 12cm and 9cm respectively. Find

   its area (a) 35cm^2 (b) 20cm^2 (c) 54cm^2 (d) 60cm^2

32.   A prism has a base area of 4m^2 and volume of 30m^3 find the height

   (a) 3m (b) 7.5m (c) 12m (d) 13.5m

33. A prism has an height of 2m with height of 13m^2, find the volume

   (a) 13m^3 (b) 26m^3 (c) 18m^3 (d) 11m^3

34. A rectangle has length 3cm and breadth 12cm. find its area

   (a) 12cm^2(b) 36cm^2 (c) 15cm^2 (d) 20cm^2

35. What shape is this?   (a) Rhombus (b) kite (c) triangle
    (d) square

36. What shape is this?   (a) Triangle (b) rectangle (c) Rhombus
    (d) none

37. What shape is this?   (a) Square (b) rectangle (c) triangle
    (d) trapezium

38. A square has a perimeter of 32m.find the length of one side of

   the square (a) 10m (b) 8m (c) 15m (d)5m

39. What is the length of a side of regular pentagon of perimeter 85mm

   (a) 20mm (b) 10mm (c) 9mm (d)17mm

40. Calculate the aired area surface of a cylinder with radius 30cmand

   height 36cm.(a) 6800cm^2 (b) 5300cm^2 (c) 4000cm^2 (d) 3200cm^2

41. Calculate the aired area surface of a cylinder with radius 10cm and

   height 18cm. (a) 420cm^2 (b) 570cm^2 (c) 390cm^2 (d) 240cm^2

42. Calculate the aired area surface of a cylinder with radius 60cm and

   height 50cm. (a) 10000cm^2 (b) 11300cm^2 (c) 19000cm^2
   (d) 12000cm^2

43. The angle of the elevation of the sun is 27^0. A man is 180cm tall.

   How long ishis shadow(a) 270cm (b) 350cm (c) 200cm (d) 503cm

44. The angle of the elevation of the top of a tower from a point 42m

   from its base on level ground is 36^0. Find the height of the tower

   (a) $30\frac{1}{2}$m (b) 40m (c) $22\frac{1}{2}$m (d) 33m

45. The angle of the elevation of the sun is 45^0. A tree has a shadow

   12m long, find the distance of the shadow from the tree (a) 18m (b) 10m (c) 12m (d) 23m

Use the question below to answer 146 and 147

A student starts from A and walks 3km east to B. she then walks 5km on a bearing 152^0 from B. she reaches a point C

46. What is the distance of c from A (a) 7km (b) 12km (c) 8 km (d) 3km

47. What is the bearing of C from A (a) 130^0 (b) 100^0 (c) 80^0 (d) 150^0

Use the question below to answer question 148 – 149

A student cycle 14km east from A and then 10km south-east to B

48. Find the distance from its starting point (a) 35km (b) 22km (c) 16km (d) 12km

49. Find the bearing from its starting point (a) 89^0 (b) 72^0 (c) 109^0 (d) 123^0
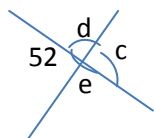
50. A cone has a base radius of 5cm and height of 12cm. calculate its slant height   (a) 8cm (b)9cm (b) 5cm (d) 13cm
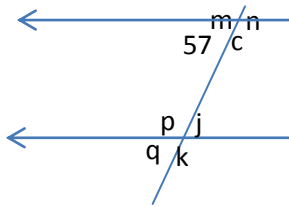
51.
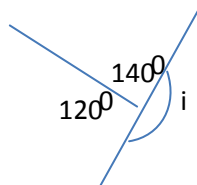
   What is i   (a) 80 (b) 100   (c) 75 (d) 20

From the above figure, answer question 152,153 and 154

52. What is C?   (a) 75^0 (b) 52^0 (c) 59^0 (d) 43^0

53.   What is D ? (a) 86^0 (b) 95^0 (c) 128^0 (d) 146^0

54.   What is e ? (a) 128^0 (b) 110^0 (c) 186^0 (d) 70^0

From the figure below, and answer questions 155 – 162

55. What is M ? (a) 86^0 (b) 95^0 (c) 123^0 (d) 146^0

56. What is N ? (a) 63^0 (b) 75^0 (c) 57^0(d) 80^0

57. What is L ? (a) 18^0 (b) 123^0 (c) 115^0 (d) 109^0

58. What is P ? (a) 130^0 (b) 100^0 (c) 96^0 (d) 123^0

59. What is J ? (a) 150^0 (b) 57^0 (c) 37^0 (d) 71^0

60. What is Q ? (a) 43^0 (b) 96^0 (c) 57^0 (d) 62^0

61. What is k ? (a) 123^0 (b) 97^0 (c) 113^0 (d) 117^0

62. The of the angle of a polygon is 1980. How many sides has the polygon (a) 18^0 (b) 13^0 (c)16^0 (d) 23^0

Find the value of the following when a = 1, b=2, c =3 in question 163 - 166

63. 3b +2c ? (a)12 (b) 17 (c) 25 (d) 14

64. 4c – 3b ? (a)10 (b) 18 (c) 6 (d) 3

65. 7a – 2b ? (a) 3 (b) 9 (c) 7 (d) 2

66. a - bc ? (a)-3 (b) -12 (c) 8 (d) -5

67. A coin is tossed once. What is the probability of getting a head or a tail (a) 2 (b) 1 (c) 0 (d) 0.5

68. There are 5 red balls and nine blue balls in a box, find the probability that the balls is yellow (a) 1 (b) 2 (c) 0 (d) 3

69. A crate contains 15 bottles of coke and nine bottles of sprite. What is the probability that it is either coke or sprite (a) 0 (b) 2 (c) 0.3 (d) 1

70. A match box contains 15 used sticks and 25 unused sticks.

How many sticks are in the box altogether (a) 40 (b) 20 (c) 10 (d) 60

71. A Businessman has 100 cars for sale, Four of them is bad, what is

the probability that a car bought is good (a) $\frac{30}{20}$ (b) $\frac{24}{25}$ (c) $\frac{21}{23}$ (d) $\frac{20}{45}$

72. Out of 1000 toy cars, 50 has fault. What is the probability of buying a toy car with fault (a) $\frac{1}{20}$ (b) $\frac{1}{30}$ (c) $\frac{1}{5}$ (d) $\frac{2}{10}$

73. The probability of passing an exam is 0.7, what is the probability of failing the exam (a) 0.1 (b) 0.5 (c) 0.3 (d) 0.2

74. The probability that a woman give birth is 0.8, find the probability that she does not (a) 0.1 (b) 0.2 (c) 0.3 (d) 0.4

75. The probability that Mr.Mensah will be rich is 0.9, find the probability that he will be poor (a) 0.1 (b) 0.8 (c) 0.3 (d) 0.2

76. A trader has 200 mangos for sale 40 of them is unripe. Find the probability of buying unripe mangoes? (a) $\frac{1}{10}$ (b) $\frac{1}{5}$ (c) $\frac{1}{3}$ (d) $\frac{1}{11}$

There are five red balls and 7 blue balls in a box. A ball is selected at random. Find the probability of the following in question 177-181

77. Obtaining a blue ball? (a) $\frac{5}{12}$ (b) $\frac{7}{12}$ (c) $\frac{3}{12}$ (d) $\frac{4}{12}$

78. Obtaining a red ball? (a) $\frac{7}{12}$ (b) $\frac{5}{12}$ (c) $\frac{7}{12}$ (d) $\frac{8}{12}$

79. Obtaining a red or blue blue? (a) 1 (b) $\frac{9}{12}$ (c) $\frac{3}{12}$ (d) $\frac{7}{12}$

80. Obtaining both a red or blue ball? (a) $\frac{70}{12}$ (b) $\frac{35}{144}$ (c) $\frac{23}{144}$ (d) $\frac{27}{144}$

81. Obtaining a yellow ball? (a) 2 (b) $\frac{1}{2}$ (c) 0 (d) $\frac{1}{5}$

A coin is tossed once, what is the probability of the following in questions 182 – 185

82. Obtaining a blue ball? (a) $\frac{1}{2}$ (b) 0 (c) $\frac{1}{3}$ (d) 1

83. Obtaining a head or tail? (a) $\frac{1}{2}$ (b) 0 (c) 1 (d) $\frac{1}{3}$

84. Obtaining both head and tail? (a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) 0

85. Obtaining neither a head nor a tail? (a) 0 (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) 1

A dice has a rolled once. Find the probability of the following in question 186 -189

86. Obtaining the number 4? (a) $\frac{1}{4}$ (b) $\frac{1}{6}$ (c) $\frac{1}{5}$ (d) 1

87. Obtaining the number 10? (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{1}{3}$

88. Obtaining one of the numbers 1 to 6? (a) 1 (b) 2 (c) $\frac{1}{2}$ (d) $\frac{1}{3}$

89. Not obtaining the number 6? (a) $\frac{3}{6}$ (b) $\frac{5}{6}$ (c) $\frac{1}{3}$ (d) $\frac{1}{4}$

90. What is the value of ||||-|||| || (a) 10 (b) 11 (c) 12 (d) 8

91. What is the value of ||| |||| |||| |||| (a) 20 (b) 19 (c) 17 (d) 1

92. What is the value of (a) 10 (b) 9 (c) 8 (d) 14

93. Names, colour, taste are example of what data? (a) Quantitative (b) Qualitative (c) discrete (d) continuous data

94. Data obtained from counting is called (a) continuous (b) qualitative (c) Discrete (d) none

95. Data obtained from measurement is called (a) qualitative (b) surplus (c) discrete (d) continuous

96. A crate contains 18 eggs. 6 of them is broken. What fraction is not broken (a) $\frac{2}{3}$ (b) $\frac{3}{4}$ (c) $\frac{5}{4}$ (d) $\frac{1}{3}$

97. A bag contains 25 mangoes. 10 of them is ripe. How many is ripe (a) $\frac{2}{5}$ (b) $\frac{4}{5}$ (c) $\frac{3}{5}$ (d) $\frac{6}{5}$

98. The probability that a student passes an exam is $\frac{2}{5}$, find the probability that the student failed the exam (a) $\frac{1}{5}$ (b) $\frac{3}{5}$ (c) $\frac{2}{5}$ (d) $\frac{4}{5}$

99. Find the value of $\sqrt{\frac{4}{25}}$ (a) $\frac{3}{5}$ (b) $\frac{2}{5}$ (c) $\frac{4}{5}$ (d) $\frac{6}{5}$

100. Find the value of $\sqrt{\frac{9}{49}}$ (a) $\frac{3}{7}$ (b) $\frac{2}{4}$ (c) $\frac{5}{4}$ (d) $\frac{6}{4}$