Development and Validation of The Geometry Achievement Test for Colleges of Education Students

Bashiru Aliyu Gada
Department of Educational Technology,
Shehu Shagari University of Education Sokoto,
Sokoto State, Nigeria
bashirualiyugada@gmail.com
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Abstract
The aim of this study was to construct and validate Geometry achievement test for NCE I Students, Four research questions were employed in constructing the study. The design of the study is instrumentation research design. stratified random sampling technique 76 NCE II Students were drawn from the total Population of NCE II Students from Shehu Shagari College of Education, Sokoto. The Form 1 GAT was face- validated in terms of clarity of words and plausibility of distracter by specialist in Educational Measurement and Evaluation and mathematics teachers. The Form II MAT consists of what was administered to 76 Students and their responses were used in determining proportions of Students whoshowed mastery ability. The findings of this study show that the GAT is a valid and reliable instrument for measuring achievements in mathematics tests. The study recommended that Teachers, researchers and relevant educational agencies should always establish the content validity index of any instrument they develop, for measuring educational achievements inorder to ensure the items are valid that is, relevant to the course objective.

Keywords: *Test, Geometry achievement test, development and validation*

INTRODUCTION

Geometry is the practical branch of Mathematics that deals with the shapes and sizes of figures and their properties. The basic elements of geometry are points, lines, angles, surfaces and solids. This aspect of Mathematics helps students to develop the skills of visualization, critical thinking, problem solving, conjecturing, deductive reasoning and logical arguments. Therefore, geometry is a process that helps students to think, reason and draw inferences. For instance, all architectural designs are done using the knowledge and skills acquired in geometry. Geometry, as a branch of Mathematics has a very significant place in education. Geometry covers a substantial part of the COE's Mathematics curriculum content and to perform optimally in geometry, the learner must have adequate grip and understanding of spatial skills used in manipulating objects in the 2 and 3 dimensions. Learning geometry prepares students for higher Mathematics courses and a variety of occupations requiring mathematical skills and problem-solving. It is used to develop skills that deal with understanding, manipulating, re-organizing, and interpreting relationships. Most of the items used in the environment are comprise from geometrical shapes and objects and utilizing these objects and shapes efficiently depends on understanding the relationship among them. Geometrical thoughts can also be used in solving

problems (like painting, lining-wall among others), in defining the space and running our profession as well. Geometrical shapes and objects are a part of jobs and work. Making effective use of these objects depends on defining them and understanding the relationship between the object and its duty (Altun, 2004).

The application of knowledge of Geometry is important in construction industries and professions such as building, engineering, architecture, aviation industry and military studies which are major key sectors for every country including Nigeria to attain the peak of development. The benefits of introducing Mathematics at all levels of the school system including colleges of Education (COE) are: to promote in students a deeper understanding of the physical space/geometric figures and shapes, strengthen the arithmetic programme to provide geometric models in the arithmetic process, promote more fundamental development of the nature of measurement and measuring process, promote a closer relation and integration of geometric ideas into other parts of Mathematics and to encourage imaginative thinking in science and technology.

Assessment is a critical component of the educational process, providing valuable information about students' learning and guiding instructional decisions. Effective assessment in geometry should cover a range of cognitive levels, from basic recall of facts to higher-order thinking skills such as analysis and synthesis (Van de Walle, Karp, & Bay-Williams, 2013).

Several geometry achievement tests have been developed over the years, each with varying degrees of success. For instance, the van Hiele Geometry Test, based on the van Hiele model of geometric thought, assesses students' levels of geometric reasoning (Burger & Shaughnessy, 1986). However, many of these tests are not specifically designed for the context of colleges of education and may not fully align with their curricula. The process of developing an achievement test involves several steps, including defining the content domain, designing test items, and conducting pilot testing. The content domain should be based on a thorough review of the curriculum and relevant literature to ensure comprehensive coverage of essential geometric concepts and skills (Nitko, 2004). Test items should be designed to assess a range of cognitive levels, and pilot testing should be conducted to refine items and ensure clarity and appropriateness.

The absence of standardized test items constructed by experts with high validity and reliability poses a significant challenge for assessing geometry achievement in many subjects, including mathematics, in Nigerian colleges of education. This issue extends to all courses, including the Geometry Achievement Test. In this context, mathematics educators in colleges of education are no exception. A valid approach to addressing the scarcity of valid and reliable tests for evaluating student proficiency is the development and validation of a criterion-referenced test in geometry to assess students' mastery of the subject.

The development and validation of a Geometry Achievement Test for colleges of education students is an essential step towards improving the quality of geometry education. A reliable and valid test will provide valuable insights into students' geometric understanding, inform instructional practices, and contribute to the overall goal of preparing competent future teachers. This study therefore focus on the iterative process of test development, including item analysis, pilot testing, and validation studies, to ensure the test's effectiveness and accuracy. To

achieve this the study aimed and sought to answer the following questions: The following research questions guided the study.

i. What is the content validity index (CVI) for the Geometry Achievement test?
ii. What is the cut-off score of the Geometry achievement test.?
iii. Determine reliability coefficients of the test measuring the various Geometry test?

The Literature Review

Geometry is a crucial component of the mathematics curriculum, especially for students in colleges of education who are training to become future teachers. Understanding geometry is essential not only for its applications in various fields but also for developing logical reasoning and problem-solving skills. To ensure that students acquire the necessary geometric knowledge and skills, it is essential to have reliable and valid assessment tools. The development and validation of a Geometry Achievement Test (GAT) for colleges of education students aim to fill this need by providing a standardized measure of students' geometric understanding.

Geometry plays a significant role in the overall mathematics curriculum. It helps in developing spatial reasoning, which is essential for various real-life applications and advanced studies in science, technology, engineering, and mathematics (STEM). Moreover, the National Council of Teachers of Mathematics (NCTM, 2020) emphasizes the importance of geometry in developing students' abilities to visualize and understand the world around them.

A well-designed achievement test is crucial for evaluating students' understanding and proficiency in geometry. Such a test can help identify areas of strength and weakness, guide instructional strategies, and provide a measure of accountability for educational institutions. However, many existing tests either do not align well with the curriculum or fail to meet psychometric standards for validity and reliability (Bennett et al., 2007). Hence, there is a need for a new test specifically designed for colleges of education students that meets these standards.

Studies on Test Development and Validation

Validity and reliability are essential psychometric properties of a good test. Validity refers to the extent to which a test measures what it is intended to measure. It includes content validity, criterion-related validity, and construct validity (Messick, 1989). Reliability refers to the consistency of test scores across different administrations of the test. It is typically assessed using measures such as test-retest reliability, internal consistency, and inter-rater reliability (Crocker & Algina, 2006).

Several studies have contributed to the field of test development and validation. For example, the development of the Test of Geometry Skills for Elementary Teachers (T-GSET) involved a rigorous process of item development, pilot testing, and validation to ensure that the test accurately assessed the geometric skills needed by elementary teachers (Leong & Chick, 2011). Similar methodologies can be applied to develop a Geometry Achievement Test for colleges of education students.

METHODS

The study was conducted using instrumentation. Instrumentation research is defined by Kpolovie (2010, p.467) as the science of test development. Instrumentation research is

employed for test construction if test is used for measuring and evaluating psychological traits, it therefore follows logically that without instrumentation research, human abilities or social and psychological constructs cannot be satisfactorily measured and evaluated. This shows how crucial and indispensable an overview of instrument research is, the population of the study was all NCE II Mathematics students in the Colleges of Education in Sokoto State. The Colleges of Educations in the state are Shehu Shagari College of Education Sokoto, Biga College of Education and Federal College of Education Gidan Madi. However, the researcher conducted a based line study in which shows that only Shehu Shagari College of Education Sokoto currently offered Mathematics courses at NCE II level with 76 NCE II students made up of 52 males and 24 females at the time researcher visited the College to conduct based line. The justification for using NCE II students is that NCE II have reasonably covered the NCCE syllabus and have acquired more knowledge than NCE I and are still more stable than NCE III which is an examination class. This makes the NCE II students more cognitively ready than their counterparts, the NCE I and III. The sample of the study will be the Shehu Shagari College of Education Sokoto out of the three colleges of education in Sokoto it is the only COE that has a Mathematics department. The sample of students will consist of all NCE II Mathematics students of Shehu Shagari college of Education Sokoto, there are 76 NCE II students consisting of 52 males and 24 females. Systematic random sampling will be used to determine sample size of 76 students for the study. The sample into two equal groups, one half each for experimental and control groups, as suggested by Thomas (2023) to ensure obtaining equality, and unbiased sample, the systematic random sampling allow well documentation and possess the key principles in assigning participants to the experimental and control groups.

The instrument for this study is titled “Geometry Achievement Tests” (GAT) for NCE II students. This Geometry Achievement Test was based on five sections of mathematics curriculum for NCE II students. Items were constructed on: 1. Compound angle geometry Sine and cosine rules. 2. Small angle approximations Triangular relations. 3. Areas of right angle and isosceles triangles; Circumferences and areas of circles and segments. 4. Areas and volumes of rectangular blocks, cylinders and spheres. 6. Pythagoras' theorem, similarity of triangles and angle sum of a triangle. 6. Sines, Cosines and Tangents. Test items constructed on each geometry test is based on, the cognitive domain specifications.

The following Procedures would be considered in this study, for development and validation of criterion-referenced test, they are; Specifying of the content outline, Specification of the domain, Determination of test formats and length, Building the test blueprint, Item writing, Face validation of the items, Establishing content validity, Determination of cut-off point, Pilot testing, Statistical item analysis, Item selection, Item arrangement**,** Final administration, Production of test.

The 50 multiple choice objective item GAT developed was face validated by five experts in educational measurement and evaluation and experience mathematics teachers for clarity and ambiguous item removed. The face-validated items were submitted to two content experts who jointly rated the items relevance in terms of how closely related they match the objective or cognitive specification.

The following procedure was adopted in analysing the data of this study.

1. The content validity index (CVI) of Geometry Achievement Test was computed based on the joint ratings by two specialists.

2. Cut- off point: In order to decide whether a student has mastered an objective or not we need to see whether he/she has met the standard of minimal acceptable performance that would constitute mastery. This was done using Angoff method.
3. The reliability coefficient of the mathematics was established using test –retest method

The researcher and the research assistants and the arranged the students on their seats. The students will be instructed to fill the bio data part on the booklets. The GAT was administered as pre-test to both the experimental and control groups within one week. During administering the instrument, the researcher together with the research assistants will strictly supervise the conduct of students to curtail the problem of malpractice. The students will start the GAT at the same time. The 50-multiple choice GAT objective test will last for two hours. The test scripts was retrieved, marked and scored by the researcher. Each item on the GAT will carry 2marks for the correct option and zero marks for incorrect options. The GAT was scored out of 100and the scores students obtained was categorized into high, average and low achievement. Students who score from 60% and above was regarded as high achievement, students who score between 50-59% was considered average achievement, while students' score between 0-49% was considered as low achievement.
The GAT post-test was administered to both experimental and control groups after the treatment. The research assistant and the researcher administered the instrument to the groups. An interval of six weeks was given between the period of administration of a pre-test and post-test to control the effect of extraneous variables especially the effect of a pre-test. This will prove that changes in results are only due to treatment. The researcher was sure sure only the scores of students who participated in both pre-test and post-test was used for analysis. The two groups received the GAT after being taught geometry for the period of six weeks. The groups spent two hours taking the GAT. The test scripts was collected, marked and scored by the researcher. The GAT will consist of 50 items objective GAT lasted for two hours. The test scripts was retrieved, marked and scored by the researcher. Each item on the GAT will 2 marks for correct option and 0 mark for incorrect option. The total marks for the instrument was scored out of 100. The scores students obtained was categorized into high, average and low achievement. Scores of students 60% and above was regarded as high achievement, students' score 50-59% was considered average achievement, while students who score 0-49% was considered as low achievers.

RESULTS AND FINDINGS

The reliability of internal consistency of the Geometry Achievement Test (GAT) was estimated using the Kuder-Richardson formula 20 (K-R-20). The justification for the use of Kuder-Richardson was because the items were dichotomously scored and because though the items had multiple options, there is only one key as the correct answer and no point for incorrect answer A reliability coefficient of 0.7 and above was considered reliable (Corriveau, & Bednarz, 2017).

The results of the data analysis are shown in the tables below

Research Question 1:

What is the content validity index (CVI) for the mathematics test?

The content validity index (CVI) of Geometry Achievement Test was computed based on thejoint ratings of relevance of MAT items by two content specialists. Table showing Joint ratings of the relevance of GAT items, by two content specialists. Rating on 50 items

relevance of GAT.

		Specialist 1		
		Item rated 1&2	**Item rated 3&4**	**TOTAL**
Specialist 2	Items rated 1&2	(a) 4	(b) 8	**a+ b=12**
	Items rated 3&4	(c) 6	(d) 32	**c+ d+38**
	TOTAL	**a+c= 10**	**b+d=40**	**a +b+c+d=50**

This was carried out using a 4-point rating scale,4 stands for very relevant,3 stands for quiterelevant,2 stands for somewhat relevant, and 1stands for not relevant.

i. Cell 'a' indicates number of items rated 1&2 by first and second content specialist.
ii. Cell 'b' indicates the number of items rated 3&4 by first content specialist and then 1&2by second content specialist.
iii. Cell 'c' indicated the number of items rated 1&2 by first content specialist and then 3&4 by the second specialist.
iv. Cell 'd' indicated the number of items rated 3&4 by both content specialists.

Thus, $CVI = ((b+d)/(a+b+c+d)) = ((40)/(4+8+6+32)) = ((40)/(50)) = 0.80$

This implies that 80% of items which is equivalent to 40 items out of 50, as they were rated quiterelevant and very relevant to the component objectives.

Research Question 2

What is the cut-off score of the geometry achievement test.?

The cut-off score was determined using Angoff method. Where panel of experts, examine every item on the test and estimate the percentage of the minimally acceptable cut- off score.

Table 4.2 Determination of cut-off score using Angoff method.

TEST ITEM	EXPERT 1	EXPERT 2	EXPERT 3	EXPERT 4	EXPERT 5	AVERAGE PERCENTAGE
1	58	60	45	50	50	**52.6**
2	55	60	50	50	55	**54**
3	50	50	55	52	54	**52.2**
4	50	50	50	50	56	**51.2**
5	38	46	55	40	50	**45.8**
6	50	48	45	55	50	**49.6**
7	40	58	55	60	45	**51.6**
8	50	60	55	58	50	**54.6**
9	50	55	45	50	48	**49.6**
10	50	50	50	50	50	**50**
11	55	55	50	50	55	**53**
12	56	50	54	45	55	**52**
13	54	40	48	55	60	**51.4**

14	48	48	50	55	50	**50.2**
15	50	50	55	45	50	**50**
16	55	54	50	50	50	**51.8**
17	55	60	46	50	50	**52.2**
18	40	50	55	50	50	**49**
19	45	50	50	50	50	**49**
20	50	50	48	55	62	**53**
21	55	50	60	55	50	**54**
22	43	48	49	55	50	**49**
23	50	45	40	55	50	**48**
24	50	50	30	55	55	**48**
25	45	52	46	40	40	**44.6**
26	50	60	50	50	54	**52.8**
27	60	55	60	50	50	**55**
28	50	45	40	55	50	**48**
29	40	50	50	50	50	**48**
30	58	55	55	50	60	**55.6**
31	56	50	38	55	48	**49.4**
32	50	45	40	55	50	**48**
33	50	52	60	50	54	**53.2**
34	40	45	48	50	52	**47**
35	46	48	52	50	55	**50.2**
36	55	50	55	55	60	**55**
37	55	50	45	50	50	**50**
38	50	45	40	55	50	**48**
39	48	46	50	50	50	**48.8**
40	50	60	50	55	55	**54**
41	55	58	50	50	54	**53.4**
42	50	55	50	60	55	**54**
43	46	45	55	40	50	**47.2**
44	50	54	56	50	44	**50.8**
45	48	46	45	50	50	**47.8**
46	50	48	48	50	52	**49.6**
47	55	60	50	50	55	**54**
48	48	46	40	50	50	**46.8**
49	50	48	52	44	50	**48.8**
50	55	50	56	55	50	**53.2**
CUT-OFF SCORE						**50.7**

In determining the cut-off score using Angoff method, each of the expert examine, every item onthe test, with regards to item content, in order to determine the maximum number of items an examinee must answer correctly in order to be considered in the mastery group. The sum of the percentage across the set of items was computed by the five experts and the average of the scoresacross all the experts were used to establish a minimally acceptable

performance for the GAT. Acut-off score of 50.7% was reached for the GAT. In the item selection, 10 out of 50 GAT items, which constitute 20% of the 50 GAT items, were dropped on the bases, that they did not meet thecut-off score, as they were rated less than 50.7% by the experts. The remaining 40 GAT items were rated 50.7% and above, which imply that 80% of the 50 GAT items were relevant, and as such wasselected for the final study.

Research question 3

What is the reliability coefficient of the mathematics achievement test?

To answer the research question test-retest method was used for the computation of the data, usingthe three statistics such as P_O, k and P_C which stands for P_O determines the degree of agreement of decision made on two administrations of a test, k measure degree of agreement uncontaminated by chance. While Pc. measures the proportion of individual to have consistent classification. Thesewere computed using Data obtained from the 76 students in MAT based on their score

Table 4.1: showing decision based on test 1 & 2.

	TEST 1				**Po**	**K**	**Pc**
		MASTERY	**NON-MASTERY**	**TOTAL**			
TEST 2	**MASTERY**	**A (29)**	**B (12)**	**41**	0.73	0.46	0.50
	NON-MASTERY	**C (12)**	**D (23)**	**35**			
	TOTAL	**41**	**35**	**76**			

The reliability coefficient of the Geometry Achievement Test (GAT) was computed using test-retest method, with three statistics Po, Pc and K. the data obtained from the 858 students in the Geometry Achievement Test based (GAT) on their scores shows that 398 students were consistently classified as masters, 41 were consistently classified as non-masters, 35 were classified as non-masters, in test form 1 and masters for test form 2, while 12 were classified as masters in the test form 1 and non-masters in test form 2. From the study the Po = 0.73, K = 0.44 and Pc = 0.52. The computation of Po, K and Pc.

DISCUSSION OF FINDINGS

The Content Validity Index (CVI) was computed based on the joint ratings of the relevance of GAT items by two test experts/subjects specialists. Thus, based on the ratings obtained from the two raters a value of 0.80 was obtained which indicates 80% of the 50 GAT items were rated relevant by the specialists. This is in line with Otuoku (2009), whose Content Validity Index (CVI)was also computed using joint ratings of the relevance of mathematics test items by subjects specialists based on their ratings obtained from two raters a value of 0.74 was obtained also Jayanthni (2014) researched on development and validation of achievement test in mathematics, had validity coefficient of 0.942.

The cut-off scores of the mathematics test were established by using Angoff method. The cut-off score are computed as shown in table 4.2 which indicate that the cut-off score of the

mathematicstest as 50.7%. This study is in agreement with the finding of Otuoku (2009), where he had a standard of minimally acceptable performance of 45%, where he used Contrasting group's method to established minimally acceptable performance of 45% as cut-off score in the Development and Validation of Mathematics (MT) Test for SS1 Students.
The reliability coefficient of the Geometry Achievement Test (GAT) was computed using test-retest method, with three statistics Po, pc and k. the data obtained from the 858 students in the Geometry Achievement Test based (GAT) on their scores shows that 398 students were consistently classified as masters, 107 were classified as non-masters in test form 1 and masters intest form 2, 12 were classified as masters in test form 1 and non-masters in test form 2 while 23 were classified as non- masters in test 1&2.

This is in line with Otuoku (2009) findings using the three statistics Po = 0.55, K= 0.12, and Pc =0-49.The difficulty indices of MAT items range from 0.27 to 0.68. All the distracters of items possess positive except item 34.This is in agreement with Jayanthni (2014) researched on development and validation of achievement test in mathematics. The study aimed at developing and validating an achievement test in mathematics for high school students of standard 10 in Chennai district in India. 150 multiple choice objective test items were developed from 10^{TH} Standard Mathematics syllabus. The answer sheets were evaluated and marks were prepared to perform item analysis though the result shows the value of facility index lies between 0.20 and 0.78. Item number 19 has largest value 0.78 and item number 139 has smallest value 0.20. Essien(2007) Researched on development and validation of a test on geographic skills (TOGS) for senior secondary schools. The study aimed at constructing and validating multiple-choice objective test items on the geographic skills emphasized in SSII syllabus on geography. In carrying out the research, 14 items were developed and had a difficulty indices range from 0.18-0.75
Muhammad, Zeeshan, Muhammad & Ali Akbar (2012) researched on the Development and Validation of an Aptitude Test for Secondary School Mathematics Students in Pakistan. The studyshows the value of difficulty index lies between 0.13 and 0.83. Item number 22 has the largest value (0.83) and item number 23 has the smallest value (0.13). Otuoku (2014) researched on development and validation of mathematics test for SS1 students. The study aimed at constructing and validating a mathematics test. The study show the value of difficulty indices of mathematics test items ranges from 0.111 to 0.981 all the distracters of items possess positive value

CONCLUSION

The Geometry Achievement Test is a valid evaluation instrument. The content validity index (CVI) was found perfect. Based on the numbers obtained from 2 raters, the value of CVI was 0.80,this was carried out on a 4-point rating scale very relevant, quite relevant, somehow relevant, andnot relevant.

The Geometry Achievement Test (GAT) was found to be highly reliable with three statistics Po, Pc and k. the computation shows that Po= 0.73, Pc= 0.52, and k=0.44. The Geometry Achievement Test (GAT) was found to be of appropriate difficulty index and distracted positively.The Geometry Achievement Test items are suitable test items. The suitability of the items wasa function of the average rating score accorded each item of the appropriateness

of each item

RECOMMENDATIONS

i. Based on the findings of the study, the following recommendations were made;
ii. Teachers, researchers and relevant educational agencies should always establish the content validity index of any instrument they develop, for measuring educational achievements inorder to ensure the items are valid that is, relevant to the course objective.
iii. There should always be established cut-off scores or a predetermined proficiency level byteachers and relevant educational agencies, in order to determine mastery level of the specified objectives
iv. Teachers, researcher and relevant educational agencies, should ensure that the instrument they develop for measuring achievements is reliable, as instrument of measuring achievement areused in decision making of achievement of Students.

REFERENCES

Angoff, W. H. (1971). Scales, norms and equivalent scores. In R. L. Thorndike (Ed.), Educationalmeasurement (2nd ed., pp. 508-600). Washington, DC: American Council on Education

Bennett, R. E., Gottesman, R. L., Rock, D. A., & Cerullo, F. (2007). Influences of behavior perceptions and gender on educational outcomes. International Journal of Educational Research, 43(1), 78-96.

Burger, W. F., & Shaughnessy, J. M. (1986). Characterizing the van Hiele levels of development in geometry. Journal for Research in Mathematics Education, 17(1), 31-48.

Crocker, L., & Algina, J. (2006). Introduction to Classical and Modern Test Theory. Holt, Rinehart and Winston, Inc.

Leong, Y. H., & Chick, H. L. (2011). Developing a test of geometry skills for elementary teachers (T-GSET). Journal of Mathematics Teacher Education, 14(3), 199-221.

Messick, S. (1989). Validity. In R. L. Linn (Ed.), Educational Measurement (3rd ed., pp. 13-103). American Council on Education/Macmillan.

National Council of Teachers of Mathematics (NCTM). (2020). Principles and Standards for School Mathematics. NCTM.

Nitko, A. J. (2004). Educational Assessment of Students (4th ed.). Prentice Hall.

Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2013). Elementary and Middle School Mathematics: Teaching Developmentally (8th ed.). Pearson.

APPENDIX A

GEOMETRY ACHIEVEMENT TEST (GAT)

Instruction: answer all questions each question carries 2 marks. **Time: 2hours**

1. ABCD is a cyclic quadrilateral whose side AB is a diameter of the circle through A, B, C and D. If ∠ADC=130∘, ∠BAC ___.

A 52^0

B 40^0

C 12^0

D 86^0

E None of these

2. The area of quadrilateral ABCD whose vertices in order are A (1, 1) B (7, -3), C (12, 2) and D (7, 21) is

A 66 sq.units

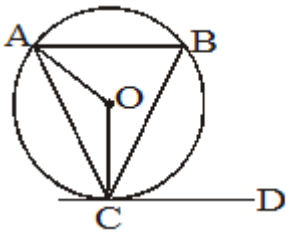
B 132 sq.units

C 124 sq.units

D 86 sq.units

E None of these

3. In the given diagram O is the center of the circle and CD is a tangent. ∠CAB and ∠ACD are supplementary to each other ∠OAC = 30∘. Find the value of ∠OCB



A 30∘

B 20∘

C 60∘

D 50∘

E None of these

4. If two medians BE and CF of a triangle ABC, intersect each other at G and if BG = CG, ∠BGC = 60°, BC = 8 cm, then area of the triangle ABC is

A $96\sqrt{3cm^2}$

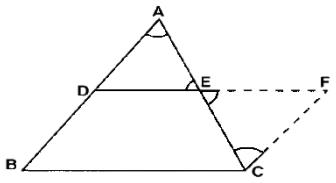
B $48\sqrt{3cm^2}$

C $48\ cm^2$

D $54\sqrt{3cm^2}$

E None of these

5. In the given figure D, E and F are mid points of AB, AC and BC respectively. P, Q and R are mid points of DE, DF and EF. Find ratio of area of triangle PQR to that of parallelogram ADFE.



A (1:8)

B (1:3)

C (1:4)

D (1:5)

E (2:9)

6. A triangle ABC is inscribed inside a circle. Bisectors of the angle ∠A, ∠B and ∠C meet the circle at P, Q and R respectively. Then ∠PQR =?

A 90° - (1/2)∠ABC

B 45° - (1/2)∠ABC

C 180° - (1/2)∠ABC

D 165° - (1/4)∠ABC

E None of these

7. The graph of the equation 4x - 5y = 20 intersects the X-axis at the point.

A (2,0)

B (5,0)

C (4,5)

D (0,5)

E None of these

8. A triangle ABC is similar to PQR. Length of AB is 36 cm and length of the corresponding side PQ is 16 cm. If area of ABC is 1296 sq cm, what is the area of PQR?

A 128 sq.cm

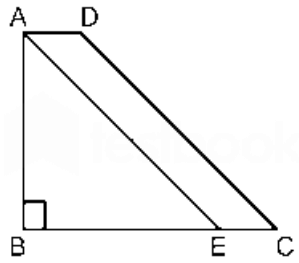
B 576 sq.cm

C 345 sq.cm

D 128 sq.cm

E None of these

9. In the given figure, area of isosceles triangle ABE is 72 cm^2 and BE = AB and AB = 2 AD, AE II DC, then what is the area (in cm^2) of the trapezium ABCD?



A 108

B 124

C 136

D 144

E None of these

10. Two circles of equal radius of 'r' intersect each other in such a way that both pass through centre of each other. What is the length of common chord?

A 2r

B $r\sqrt{3}$

C $r\sqrt{3}/2$

D R

E None of these

11. The line passing through (4, 3) and (y, 0) is parallel to the line passing through (-1,-2) and (3, 0). Find y?

A -1

B -2

C 2

D -5

E None of these

12. If a triangle ABC and DEF are similar triangles and BC = 4 cm, EF = 7 cm, area of ABC is 144 cm2 then find the area of DEF

A 252 cm^2

B 504 cm^2

C 441 cm^2

D 324 cm^2

E 325 cm^2

13. A triangle ABC is a right-angle triangle, ∠B = 90°, BD is perpendicular to AC. If AC = 14 cm, BC= 12 cm, find the length of CD.

A 10 (2/7) cm

B 11(2/7) cm

C 77 cm

D 68 cm

E None of these

14. Two circles of radii 10cm and 8 cm intersect and the length of the common chord is 12 cm. find of the common chord is 12 cm. Find the distance between their centres.

A 6 cm

B 12 cm

C 13.29 cm

D 15 cm

E 16 cm

15. Triangle ABC is similar to triangle PQR and their areas are in ratio 1:4 respectively. If PQ = 6, QR = 8 and PR = 10, find the length of AB

A 2

B 3

C 4

D 5

E 6

16. In a triangle ABC, the lengths of the sides AB, AC and BC are 3, 5 and 6 cm respectively. If a point D on BC is drawn such that the line AD bisects the ∠A internally, then what is the length of BD?

A 2 cm

B 2.25 cm

C 2.5 cm

D 3 cm

E 45 cm

17. The length of the chord of a circle is 8 cm and perpendicular distance between centre and the chord is 3 cm. Then the radius of the circle is equal to:

A 4 cm

B 5 cm

C 6 cm

D 8 cm

E 9 cm

18. O is the centre of Δ ABC and ∠A = 30° then ∠BOC is

A 108^0

B 105^0

C 110^0

D 90^0

E None of these

19. In a Δ ABC, O is the centre and ∠BOC = 110°, then the measure of ∠BAC is

A 20^0

B 40^0

C 55^0

D 110^0

E None of these

20. Which of the following option is CORRECT for SAS similarity criterion for the triangle ABC and DEF?

A ∠A = ∠D and AB/DE = AC/DF

B ∠B = ∠E and AB/DE = BC/EF

C ∠C = ∠F and AC/DF = BC/EF

D All the options are correct

E None of these

21. A trapezoid A, B, C, D, and E has bases of length 10 and 14 cm. If the height of the trapezoid above is 5 units, what is the length of the diagonal BC?

A 13

B 10

C 12

D 14

E 11

22. A and B are the centres of two circles with radii 11 cm and 6 cm respectively. A common tangent touches these circles at O & D respectively. If AB = 13 cm, then the length of OD is ____

A 13 cm

B 17 cm

C 8.5 cm

D 7.5 cm

E 9 12 cm

23. Let G be the centroid of the equilateral triangle ABC of perimeter 24 cm. Then the length of AG is _____.

A $2\sqrt{3}$ cm

B $3\sqrt{3}$ cm

C $4\sqrt{3}\ cm$

D $6\sqrt{3}\ cm$

E $8\sqrt{3}\ cm$

24. The angle made by the line $x + \sqrt{3}y - 6 = 0$, with positive direction of x-axis is

A 120^0

B 150^0

C 30^0

D 60^0

E None of these

25. If ABCD be a cyclic quadrilateral in which $\angle A = 4x°$,$\angle B = 7x°$, $\angle C = 5y°$, $\angle D = y°$, then x : y is

A 4 ; 3

B 3 ; 4

C 5 ; 4

D 4 ; 5

E 8 ; 3

26. A triangle ABC is a right angle triangle where BD is perpendicular to AC. If AD = 12 cm and DC = 8, then BD =?

A $5\sqrt{6}$

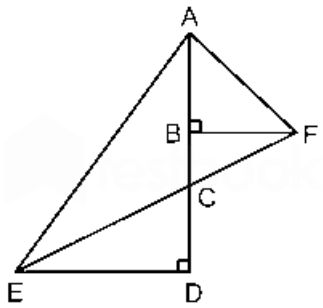
B $4\sqrt{6}$

C 8

D $6\sqrt{3}$

E $82\sqrt{9}$

27. In the diagram given below, CD = BF = 10 units and $\angle CED = \angle BAF = 30°$ .What would be the area of a triangle AED?



A $100(\sqrt{2+3})$

B $100(\sqrt{3+4})$

C $25(\sqrt{2+3})$

D $50(\sqrt{3+4})$

E $10(\sqrt{2+3})$

28. Equation of line passing through (1, 4) and perpendicular to y = 2x + 3 is?

A 2y=x+7

B y=2x+2

C 2y+x=9

D y+2x=6

E y=2x

29. A line DE parallel to the side BC intersects the other two sides of triangle at points D and E such that AD = (1/6) AB and AE = (1/6) AC. If the value of BC is 18 cm, calculate the value of DE (in cm).

A 2

B 3

C 6

D 8

E 0

30. The two lines 3x - 8y =16 and 2x + 4y = 6 intersect at (a, b). Find the value of (aÂ² - 4bÂ²).

A 5

B 10

C 15

D 20

E 21

31. In a triangle ABC, AB = AC, BA is produced to D in such a manner that AC = AD. The circular measure of ∠ (BCD) is

A $\boldsymbol{\pi}/6$

B $\boldsymbol{\pi}/3$

C $\mathbf{2}(\boldsymbol{\pi})/3$

D $\boldsymbol{\pi}\sqrt{2}$

E $\boldsymbol{\pi}/2$

32. If the line DE is drawn parallel to the base of a triangle ABC by intersecting the other two sides, then which of the following is the CORRECT equation for this case.

A AB/DB = AC/EC

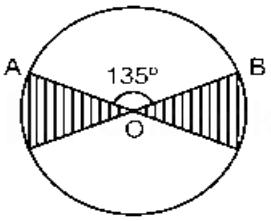
B AD/AB = DB/EC

C AD/DB = EC/AE

D AD/DB = AE/EC

E AD/DB = AE

33. Consider the circle shown below having angle AOB as 135º and the shaded portion is the x part of the circular region. Calculate the value of x.



A 1/12

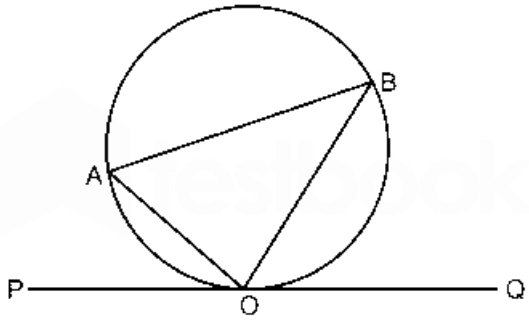
B 1/9

C 1/6

D ¼

E 1/3

34. In the diagram given figure <BOQ = 60^0 and AB is a diameter of the circle find <ABO



A 30^0

B 20^0

C 40^0

D 50^0

E 60^0

35. AB and CD are two parallel chords on the opposite sides of the center of the circle. If AB = 10 cm, CD = 24 cm and the radius of the circle is 13 cm, the distance between the chords is

A 16 cm

B 15 cm

C 18 cm

D 17 cm

E 8 cm

36. In a triangle ABC, ∠A + ∠B = 65° and ∠B + ∠C = 140°. Then, ∠B is equal to

A 25°

B 35°

C 40°

D 45°

E 27°

37. Find the centre of the circle whose equation is x^2 + y^2 -10x + 12y -10 = 0

A (5, -6)

B (5, 6)

C (-5, -6)

D (10, 12)

E (1, -3)

38. Find the distance between the points (2, 2) and (-1, 6)

A 5 units

B 4 units

C 7 units

D $\sqrt{26}$)Units

E 12.9 units

39. Find the area of the triangle formed by the three points whose coordinates are (2, 3), (4, 5) and (6, 3).

A 3 sq.units

B 2 sq.units

C 4 sq.units

D 6 sq.units

E 8 sq.units

40. Find the center of the circle whose equation is x^2 + y^2 + 6x - 10y - 120 = 0

A (3, 6)

B (3, 5)

C (-3, -5)

D (-3, -5)

E (3, 8)

41. Find the height of the triangle whose base is 20 with an area of 40 sq. units.

A 10

B 8

C 16

D 4

E 2

42. In triangle PQR length of the side QR is less than twice the length of the side PQ by 2 cm. Length of the side PR exceeds the length of the side PQ by 10 cm. The perimeter is 40 cm. The length of the smallest side of the triangle PQR is:

A 6

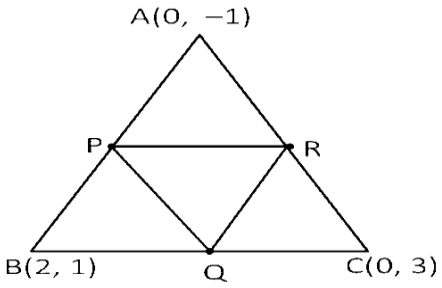
B 8

C 10

D 12

E 9

43. Given a triangle ABC, another triangle is formed by connecting the midpoints of the sides of the triangle ABC, then the area of the new triangle formed will be how many times the area of the triangle ABC



A One fourth

B Half of

C One third of

D Cannot be determined

E None of the above

44. In a triangle ABC, such that AB = AC, then ratio of the angle B to angle C =?

A 1: 2

B 2:1

C Cannot be given

D 1:1

E 0:7

45. Find the area of the triangle whose coordinates are (1, 2), (3, 4) and (5, 10)

A 3

B 4

C 5

D 8

E 10

46. The shortest distance of the point (4, 8) form the X-Axis is

A 12

B 6

C Sqrt (80)

D 8

E 4

47. A wall is of the form of a trapezium with height 4 m and parallel sides being 3 m and 5 m. What is the cost of painting the wall, if the rate of painting is Rs. 25/- per square metre?

A 240

B 280

C 400

D 440

E 300

48. Find the area of the sector which makes 90 degree at the center for the circle with radius 14 cm

A 134

B 144

C 154

D 164

E 182

49. Find the circumference of the semicircle of radius 2.

A 10

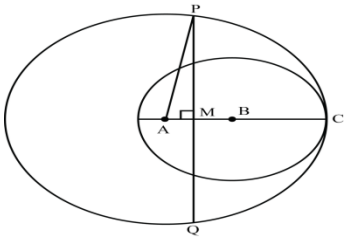
B 11

C 6.29

D 11.3

E 4.5

50. Two circles of radius 3 cm and 4 cm, are drawn in such a way that they touch each other exactly at one point. A and B are two points on these two circles. If AB denotes the distance between them, then the maximum value of AB can be



A $11\sqrt{6}$

B $5\sqrt{6}$

C $4\sqrt{6}$ cm.

D $12\sqrt{6}$

E 4