

Geometry Performance Test (GPT)

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Abstract: The researcher developed Geometry Performance Test (GPT) through the validations of senior lecturers in science education Ahmadu Bello University Zaria, Shehu Shagari College of Education and Mathematics Teachers in Sokoto State. The aim is to assist researchers with instrument for data collection strictly JSS 3, since researches of mathematics education show that students are failing mathematics particularly in secondary schools which is termed as the foundation for the future study or academic. GPT is a 60 items multiple choice objective test with four options A,B,C, or D, each item carries 1 mark. The contents of the GPT consist of all Geometry content of Junior Secondary School (JSS) three. Current Mathematics curriculum of Nigeria Educational Research Development Council (NERDC) 2013 was strictly used. Different mathematics test books and Basic Education Certificate Examination (BECE) pass question papers were used to form GPT. Reliability was carried out with two schools in Sokoto Metropolis using test retest method, and cronbach alpha was used to analyse the data. 0.63 was obtained as the reliability value, which shows that the instrument is valid and reliable, and can be used to conduct experimental study particularly at JSS 3 level. In the African countries like Ghana, and many more.

Keywords: Geometry, Performance Test.

Introduction

I, Dr. ISAH (Mathematics Education) was born in Gidan Aduwa Maberai, Sokoto State. I started my Primary school in the year 1989-1995 at Model Primary School Sokoto, and then proceeded to Sheik Abubakar Gumi Memorial College Sokoto in the year 2001. In the year 2001-2004 I obtained Nigeria Certificate in Education in Mathematics and Computer Science at Shehu Shagari College of Education Sokoto in the year 2004. I also obtained degree in Science Education Mathematics at Usmanu Danfodio University Sokoto in the year 2007. I then proceeded to Ahmadu Bello University Zaria for Masters and PhD in Science Education Mathematics in the year 2010-2015 and 2016-2021 respectively.

I started teaching at Maberai Magaji Model Primary School Sokoto in the year 2001; I taught Mathematics at Tafida Aminu model primary school Maberai and Nana Girls Secondary

School Sokoto in the year 2003 and 2005. I also taught Computer Studies at Sultan Muhammad Macido Institute for Quran and General Studies Sokoto in the year 2005-2012. I became a full time lecturer at Shehu Shagari College of Education Sokoto in the 2012-date as assistant lecturer handling Basic General Mathematics 1,2,3,4,5 and history of Mathematics respectively. Having under gone these stages; I experienced problems in teaching and learning particularly in Mathematics Education. Thus, I was encouraged to develop Instrument for teaching and learning Mathematics called Geometry Performance Test (GPT).

Geometry Performance Test GPT is a 60 multiple choice objective test with four options (A,B,C and D), each to determine the academic performance and retention of students in Geometry of JSS III students. The content and face validity of the GPT was validated by subject experts from Science Education and psychology departments of Ahmadu Bello University Zaria, Mathematics and Psychology departments of Shehu Shagari College of Education and some secondary schools in Sokoto state. The experts include Professors and Senior Lecturers. The GPT was pilot tested using two schools in Sokoto State to ascertain the reliability of the instrument using Pearson's Product Moment Coefficient (PPMC) formula and 0.63 was obtained as the reliability of GPT, which shows that the instrument is reliable and can be used for data collection in the study.

The contents used in the class instruction were developed based on the revised NERDC 2013 mathematics syllabus. The GPT with the marking scheme were validated by Senior lecturers from Science Education Ahmadu Bello University Zaria; and Shehu Shagari College of Education Sokoto and Mathematics Teachers from Sokoto State.

GPT was structured according to cognitive bloom taxonomy based on knowledge, comprehension and applications only; the reason for restricting to only three out of the six cognitive bloom taxonomy was for the level of the students and the convenience of the researcher. Table 1 showed specification of GPT

What the test measure:

1. Academic performance of students
2. Retention ability among learners
3. Gender differences etc

Steps to Use GPT

The GPT is use to test the performance or retention of JSS 3 students as follows:

1. Administer GPT before the treatment which is called pre-test o_1
2. Give the treatment for six weeks X_1 , then re-administer GPT again; which is called Post-test o_2 , to measure performance of students
3. After two weeks of treatment, the teacher re-administers GPT which we call Post-Post-test to test the retention level of the students.

Topics with distribution of questions based on domain of knowledge, considered during the formulation of GPT:

Table of Specification of (GPT) Based on Cognitive Bloom Taxonomy of Education

S/N	Topics (contents)	K	C	A	Total
1.	Similar Shapes	1	3	4	8
2.	Enlargements and Scale Factor	1	0	4	5
2.	Length, Area, and Volume of Similar Shapes	0	0	2	2
3.	The Sine, Cosine, and Tangent of an Acute Angle	1	2	0	3
4.	Application of Trigonometric Ratios	2	0	10	12
5.	Area of Triangles	1	1	1	3
6.	Area of Parallelogram	1	2	1	4
7.	Area of Trapezium	0	1	0	1
8.	Area of Circles	1	0	1	2
9.	Word Problems Involving Area	1	0	4	5
10	Construction of Angle 45°	2	3	0	5
11	Construction of Angle 30°	2	1	0	3
12	Copying Given Angles	0	0	0	0
13	Construction of Simple Plane Shapes	2	3	2	7
Total		15	16	29	60

Key:

K= Knowledge

C= Comprehension

A= Application

T= Total. See appendix C for the details of the GPT

Geometry Performance Test (GPT)

Name:-----

School:-----

Gender: Male [] Female []

Time Allowed: 1:30 Min

Location: Rural [] Urban [] School Type: Day [] Boarding []

INSTRUCTIONS: Select from the options a-d what you believe to be the correct answer of each question. You are to answer all the questions and all questions carry equal marks.

1. Ruler is used in construction to measure the ----- of a line before going into other activities.
(a) Protractor (b) Compasses (c) Divider (d) Length

Use figure 3.1 to answer question 2.

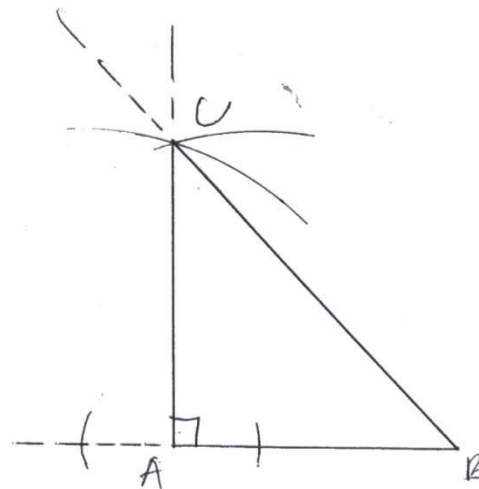


Figure 3.1

2. Angle $\angle BAC$ is?
(a) 30° (b) 45° (c) 90° (d) 60°

Use figure 3.2 to answer question 3

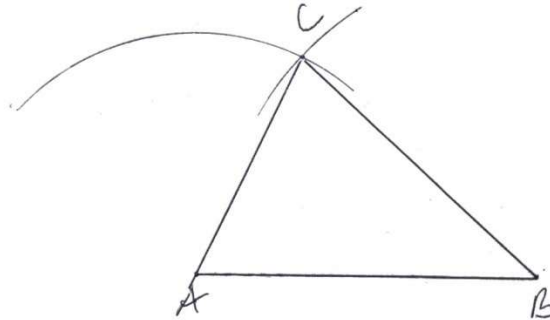


Figure 3.2

3. $|AC|$ and $|BC|$ are equal to: _____
(a) 3.5cm and 4.5cm (b) 5cm and 7cm (c) 5cm and 8cm (d) 7cm and 3cm.

Use figure 3.3 to answer questions 4 and 5

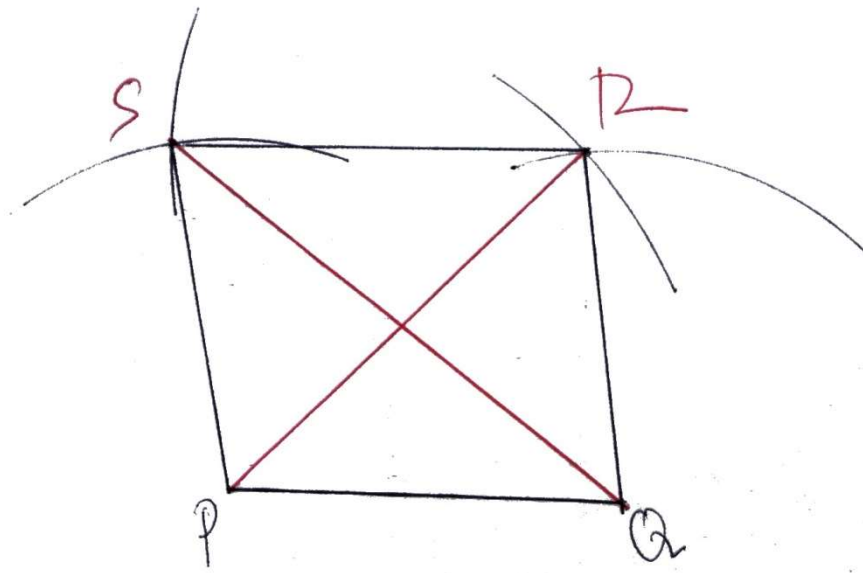


Figure 3.3

4. Diagonal $|PR|$ is equal to: _____
(a) 7.2cm (b) 8cm (c) 9cm (d) 6.5cm
5. Diagonal $|QS|$ is equal to: _____
(a) 12cm (b) 7.5cm (c) 8cm (d) 8.5cm

Use figure 3.4 to answer questions 6 and 7

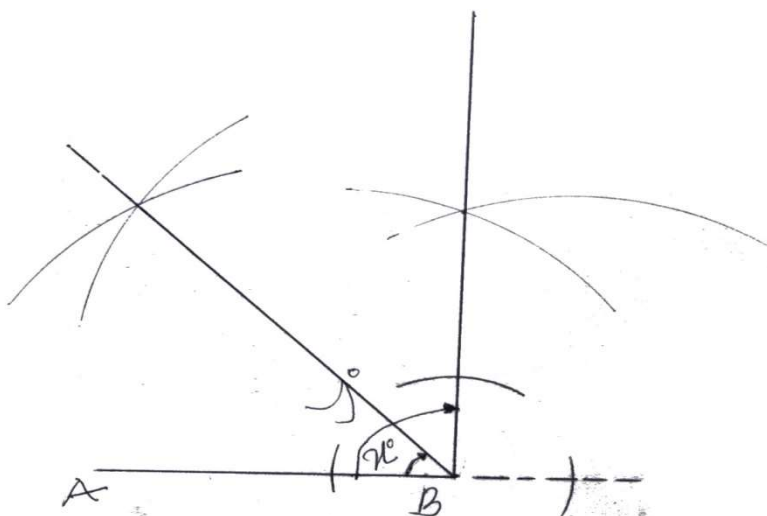


Figure 3.4

6. Angle y° in figure 3.4 is equal to _____
(a) 30° (b) 45° (c) 90° (d) 105°
7. Angle x° in figure 3.4 is equal to _____
(a) 25° (b) 40° (c) 15° (d) 45°
8. One of the following is necessary in the geometrical construction
(a) A pair of compasses and ruler (b) Divider and ruler (c) Pencil and ruler (d) All of the above
9. One of the following is not necessary in geometrical construction
a. Sharp pencil (b) Pair of compasses (c) Fresh eraser (d) Graph
10. The instrument for measuring angles is called _____.
(a) Compass (b) Set square (c) Protractor (d) Ruler
11. Bisection of angle 60° will give -----
(a) 90° (b) 180° (c) 360° (d) 30°
12. Bisection of angle 90° will give -----
(a) 45° (b) 60° (c) 90° (d) 30°

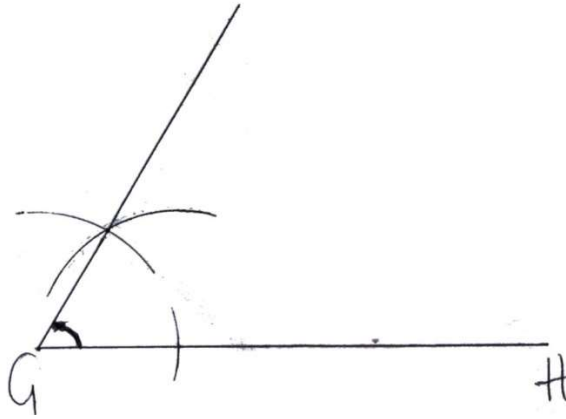


Figure 3.5

13. The figure 3.5 shows the construction of _____

- (a) 30° (b) 45° (c) 60° (d) 90°

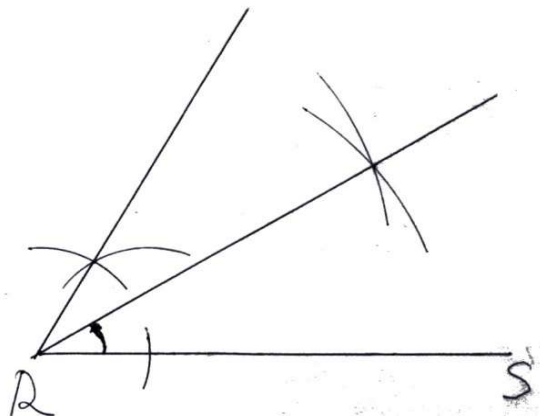


Figure 3.6

14. In figure 3.6, $\angle ARS$ is _____

- (a) 30° (b) 45° (c) 60° (d) 90°

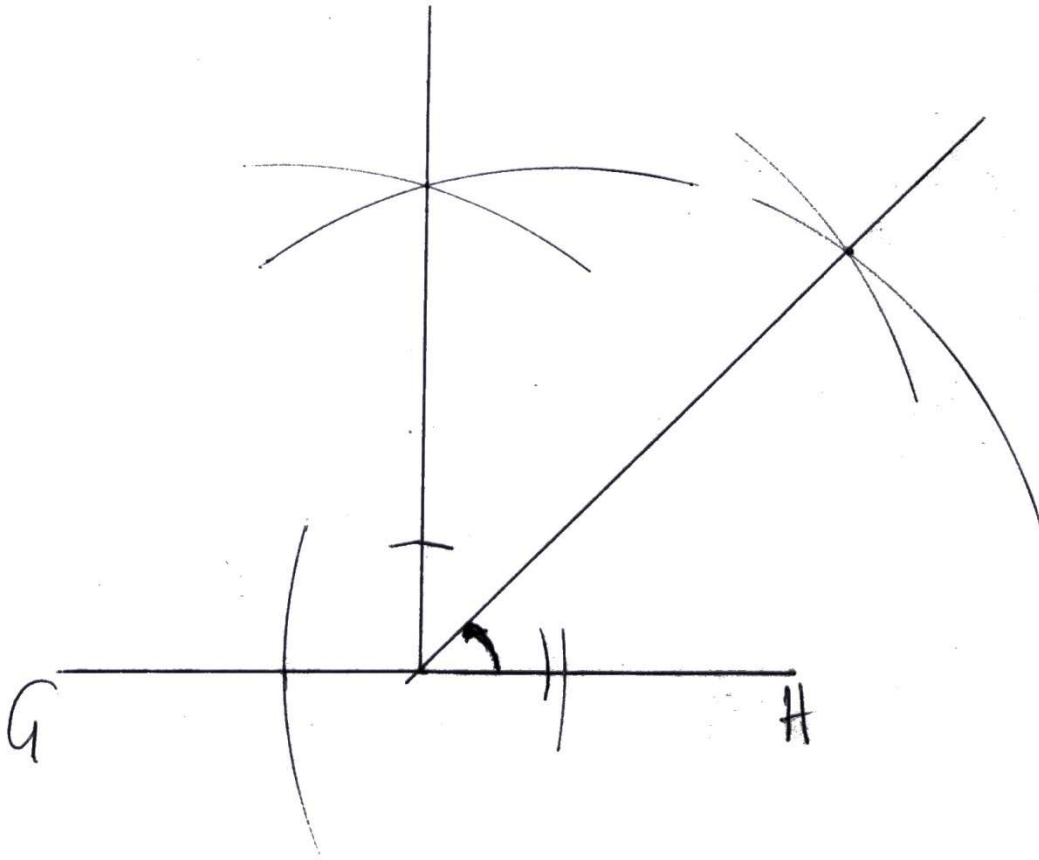


Figure 3.7

15. The figure 3.7 shows an angle of _____

- (a) 30° (b) 90° (c) 60° (d) 45°

16. Calculate the area of rhombus whose diagonals are 6cm and 8cm

- (a) 42cm^2 (b) 24cm^2 (c) 86cm^2 (d) 48cm^2

17. The value of x in figure 3.8 is _____

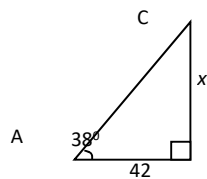


Figure 3.8

- (a) 38.2 (b) 14 (c) 82.3 (d) 13

18. The area of square in figure 3.9 is _____

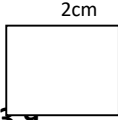


Figure 3.9

- (a) 2cm^2 (b) 4cm^2 (c) 5cm^2 (d) 6cm^2

19. The area of a circle is 154cm^2 , calculate its radius

- (a) 12.3cm (b) 10cm (c) 7cm (d) 14cm

20. The area of triangle is given by _____

- (a) $\frac{1}{3}bh$ (b) $\frac{1}{2}bh$ (c) $\frac{1}{4}bh$ (d) $\frac{1}{5}bh$

21. The base and height of a triangle are 6cm and 16cm, calculate its area

- (a) 48cm^2 (b) 38cm^2 (c) 58cm^2 (d) 84cm^2

22. _____ theorem states that in a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

- (a) Sine theorem (b) Cosine theorem (c) Tangent theorem (d) Pythagoras theorem

23. If $\triangle ABC$ is similar to $\triangle PQR$, which side correspond to AB?

- (a) QR (b) PR (c) PQ (d) QP

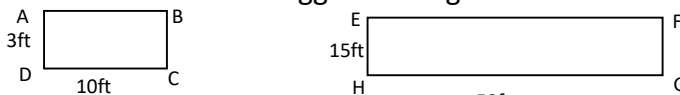
24. If the area of trapezium is 52m^2 , and its parallel sides are 7m and 9m respectively. Calculate the distance between the parallel sides.

- (a) 5m (b) 10m (c) 6.5m (d) 7.2m

25. The ratio of any two corresponding length in two similar geometrical figures is called ____

- (a) Scale factor (b) Enlargement scale (c) Similar (d) Different

26. The scale factor from the bigger rectangle to the small rectangle is _____



- (a) 5:5 (b) 1:3 (c) 5:3 (d) 5:1

27. The angle whose tangent is $\frac{5}{9}$, the angle equal to-----

- (a) 30° (b) 29° (c) 20° (d) 40°

28. Rectangle ABCD and PQRS are similar, $CD = 3\text{cm}$ and $RS = 5\text{cm}$. If $AD = 12\text{cm}$, calculate the length of PS.

- (a) 30cm (b) 25cm (c) 20cm (d) 35cm

29. Two or more geometrical figures are said to be _____ if they have the same shape but different sizes.

- (a) Equal (b) Different (c) Less than (d) Similar

30. The scale factor of figure 3.10 is _____

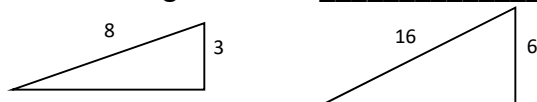


Figure 3.10

- (a) 2:1 (b) 3:8 (c) 8:20 (d) 6:3

31. The missing side of figure 3.11 is _____

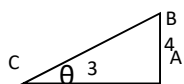


Figure 3.11

- (a) 5 (b) 4 (c) 3 (d) 7

32. The longest side of a right angle triangle is called _____

- (a) Opposite (b) Adjacent (c) Hypotenuse (d) Non of the above

33. A plane figure with four equal sides and four equal angles is called _____

- (a) Square (b) Rectangle (c) Triangle (d) Rhombus

34. The area of figure 3.12 is _____

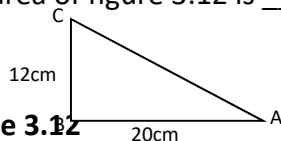


Figure 3.12

- (a) 12cm^2 (b) 20cm (c) 1220cm^2 (d) 120cm^2

35. The area of circle is given by _____

- (a) πr^3 (b) $A\pi r^2$ (c) πr^2 (d) $2\pi r^2$

36. In $\triangle ABC$, $\angle ABC = 90^\circ$, $AB = 5\text{cm}$, $BC = 3\text{cm}$, calculate AC

- (a) 11cm (b) 5.8cm (c) 6cm (d) 4cm

37. Another name for plane shapes are _____

- (a) 4 dimensional shape (b) 3 dimensional shape (c) 2 dimensional shape (d) kite

38. If $\sin y^\circ = \frac{3}{5}$, calculate $\tan y^\circ$,

- (a) $\frac{3}{5}$ (b) $\frac{5}{3}$ (c) $\frac{5}{4}$ (d) $\frac{3}{4}$

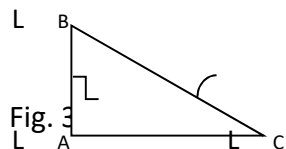
39. Two shapes are similar if _____

- (a) One is an enlargement of another (b) One is greater than another
(c) One is less than another (d) One is two times another

40. A student travels 8km north, and then 5km east. What is then his bearing from his starting point?

- (a) 42° (b) 042° (c) 052° (d) 032°

41. In a triangle $\triangle ACB$, the ratio $\frac{AB}{CA}$, in fig. 3.13 is called

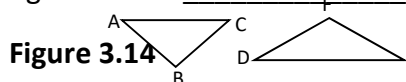


- (a) Cos of angle C (b) sin of angle A (c) Tangent of angle B (d) All of the above

42. The area of trapezium is given by _____

- (a) $\frac{1}{2}(a+b)h$ (b) $\frac{1}{2}abh$ (c) $\frac{1}{2} + bh$ (d) $\frac{1}{2}(a)h$

43. figure 3.14 is _____



- (a) Not similar (b) Equal (c) Different (d) Similar

44. Figure 3.15 is _____

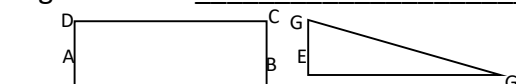
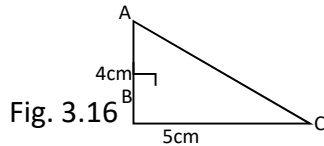


Figure 3.15

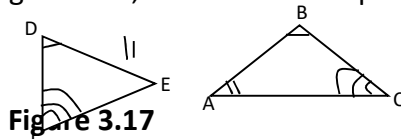
- (a) Similar (b) Different (c) Equal to (d) Equivalent

45. The unknown side in fig. 3.16 is _____



- (a) 5.1cm (b) 6.1cm (c) 7.2cm (d) 6.4cm

46. In figure 3.17, side AB is corresponds to _____ side



- (a) FD (b) EF (c) DF (d) ED

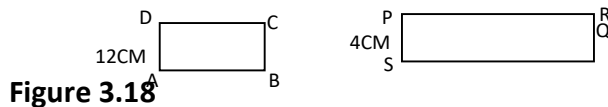
47. In figure 3.17, angle C correspond to angle _____

- (a) F (b) E (c) D (d) B

48. For triangles to be similar, their corresponding angles need to be _____

- (a) Different (b) Adjacent (c) Similar (d) Equal

49. The length of **SQ** in figure 3.18 is _____



- (a) 1.7cm (b) 2.5cm (c) 3.6cm (d) 7cm

50. All plane shapes are equal _____

- (a) Constant (b) Different (c) Equal (d) Non of the above

51. The radius of a circle is 10cm, calculate its area

- (a) 142.2cm^2 (b) 413cm^2 (c) 341.2cm^2 (d) 314.2cm^2

52. Calculate the area of square whose side is 19cm.

- (a) 361cm^2 (b) 316cm^2 (c) 631cm^2 (d) 136cm^2

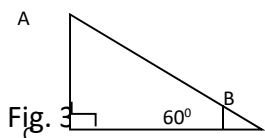
53. A cuboid is 4cm long, 7cm wide, and 10cm height. A similar cuboid is 25cm height, calculate its length.

- (a) 5cm (b) 7cm (c) 11cm (d) 10cm

54. If $\sin x = \frac{3}{5}$, calculate $\cos x$

- (a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) $\frac{4}{5}$ (d) $\frac{1}{4}$

55. Calculate the missing angle $\angle BAC$, in fig. 3.19

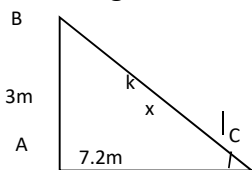


- (a) 60° (b) 40° (c) 50° (d) 30°

56. From a point on level ground 40cm away, the angle of elevation of the top of a tree is $32\frac{1}{4}^\circ$, calculate the height of the tree.

- (a) 30cm (b) 35cm (c) 25cm (d) 20cm

Use fig. 3.20 to answer questions 57 and 58



57. The letter k is _____

- (a) 7.8m (b) 6.8m (c) 8.7m (d) 10m

58. Angle x° is _____

- (a) 25.6° (b) 22.6° (c) 23.5° (d) 28.2°

59. A plane shape with four equal sides is called: _____

- (a) Square (b) Triangle (c) Trapezium (d) Rectangle

60. A triangle can be enlarge to another _____

- (a) Square (b) Rectangle (c) Triangle (d) Trapezium

Geometry Performance Test (GPT) Marking Scheme

Q1.	D	Q11.	D	Q21.	A	Q31.	A	Q41.	C	Q51.	D
Q2.	C	Q12.	A	Q22.	D	Q32.	C	Q42.	A	Q52.	A
Q3.	A	Q13.	C	Q23.	A	Q33.	A	Q43.	D	Q53.	D
Q4.	D	Q14.	A	Q24.	C	Q34.	D	Q44.	B	Q54.	C
Q5.	B	Q15.	D	Q25.	A	Q35.	C	Q45.	D	Q55.	D
Q6.	C	Q16.	B	Q26.	D	Q36.	B	Q46.	D	Q56.	C
Q7.	D	Q17.	D	Q27.	B	Q37.	C	Q47.	A	Q57.	A
Q8.	A	Q18.	B	Q28.	C	Q38.	D	Q48.	C	Q58.	B
Q9.	D	Q19.	C	Q29.	D	Q39.	A	Q49.	A	Q59.	A
Q10.	C	Q20.	B	Q30.	A	Q40.	D	Q50.	D	Q60.	C

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