

THE GUIVY ZALDASTANISHVILI AMERICAN ACADEMY IN TBILISI



MATH PRACTICE TEST

YEAR 11

DURATION: 90 minutes

The American Academy in Tbilisi
Algebra Curriculum / Grade XI (X GZAAT)

Revision

1. Linear function (slope, slope- intercept and point – slope forms)
2. quadratic equations and parabola
3. complex numbers (definition of i , connection with quadratic equations)

Unit I – Exponents and logarithms

1. Properties of exponents (rational exponent, operations)
2. Simple exponential equations
3. Logarithms (definition, base 10 logs)
4. Operations with irrational numbers, getting rid of the irrational denominator
5. Scientific Notation (Powers of 10 film) (scales)

Unit II – Sequences

6. Sequence (definition)
7. Arithmetic sequence and its sum
8. Geometric sequence and its sum
9. Infinitely decreasing geometric sequence

Unit III – Relations and functions

10. Relation vs. function (definition and examples, vertical line test)
11. Domain and range of a function
12. $y = \frac{k}{x}$, $y = \sqrt{x}$, $y = x^2$, $y = x^3$, $y = |x|$ functions and their graphs
13. $y = ax^2 + bx + c$

Unit IV – Inequalities

14. Quadratic inequalities
15. The method of intervals
16. Absolute value equations. Solving inequalities graphically.
17. irrational equations
18. Systems of inequalities (connection with domain of the function)

Unit V – Introduction to trigonometry

19. Trigonometric functions (ratios) on the unit circle
20. Trigonometric ratios of some angles (table of values)
21. Relationships between the trig functions. Basic trigonometric identity
($\sin^2 x + \cos^2 x = 1$; $\tan x = \frac{\sin x}{\cos x}$ identities and their consequences)
22. Trigonometric functions of sum and difference
23. trigonometric functions of double and halved angles
24. problems

Unit VI – Trigonometry cont'd

25. Graphs of $y = \sin x$; $y = \cos x$, $y = \tan x$
26. Simple trigonometric equations (e.g. $\sin x = 0$, $\sin x = 1$ etc.)
27. Even/odd functions

28. Periodic functions

Unit VII – Transformation of graphs

31. $y = |f(x)|$, $y = f(x+a)$, $y = f(x)+a$ ($y = f(|x|$)) functions and their graphs
32. Inverse functions (from AMC), horizontal line test
33. Composition of functions

Unit VIII – Combinatorics and probability, Statistics

17. Permutations and combinations, repetitions, and circular combinations
18. Probability and odds (definition)
19. Probability of compound events

note: the teacher may proceed through the curriculum according to the order of his/her own choice

End of mandatory requirements

Unit IX – Complex numbers (based on the time and teacher decision)

17. Complex plane
18. Complex conjugate
19. Addition, subtraction, multiplication, division
20. Trigonometric form
21. Exponent

The American Academy in Tbilisi
Geometry Topics
Grade XI (X)

Revision

Similarity

1. Similarity of triangles, proving triangles similar
2. Ratios of perimeters and areas of similar figures
3. Relations between legs, their projections on the hypotenuse and the altitude drawn to the hypotenuse in a right triangle
4. Pythagorean theorem

Areas

5. Areas of triangle, trapezoid, parallelogram, etc.

Unit I – Introduction to trigonometry

1. Trigonometric ratios of acute angle defined in a right triangle
2. Relations between trigonometric ratios
3. Trigonometric ratios of an obtuse angle. The unit circle
4. Areas in terms of sine
5. Law of Sines
6. Bisector of a triangle and its property
7. Law of cosines
8. Property of diagonals in a parallelogram
9. Median of a triangle in terms of its sides
10. Area of a quadrilateral in terms of its diagonals and sine of an angle included

Unit II – Circles

11. Circle and its elements
12. Central and inscribed angle, their measurement
13. Quadrilateral inscribed in a circle
14. Secant angles with vertices inside and outside the circle
15. The tangent-chord and tangent secant angles
16. Ratios between the line segments formed by two secants (intersecting inside and outside the circle), tangent and secant
17. Circumference of a circle, length of arc (radians)
18. Areas of a circle, sector and segment
19. Center of a circle inscribes or subscribed about a triangle.

Unit III – Polygons

20. Polygonal line
21. A polygon, number of diagonals, interior/exterior angle sum
22. Regular polygons
23. Relation between side of a polygon inscribed in the circle and its radius
24. Area of a polygon, measuring areas of some polygons
25. Symmetries, plane tessellations

Unit IV – Coordinate Geometry

26. Circle equation (both forms)

27. Coordinate proofs

End of mandatory requirements

Unit V – Solid Geometry, introduction

- 28. Parallelism in space(line and plane, two lines, two planes), proving planes parallel
- 29. Perpendicular lines
- 30. Line perpendicular to a plane
- 31. Projection of a line segment on a plane
- 32. Angle included between line and a plane
- 33. Perpendicular planes
- 34. Distance between skew lines

Unit VI – Solid figures, their volumes, surface areas, and different sections

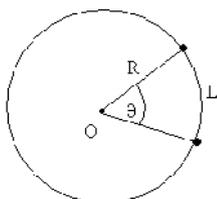
- 35. Prism (inclined and rectangular)
- 36. Pyramid
- 37. Cylinder
- 38. Cone
- 39. Sphere

The Guivy Zaldastanishvili American Academy in Tbilisi
Department of Mathematics

Entrance Examination in Math (11th grade)

*Please show the step-by-step solution of each problem. Each problem is worth 10 points.
Answers without explanation will not count.*

1. Find the area of a regular hexagon, if the radius of a circle subscribed about the hexagon is 10cm.
2. In the first quadrant of coordinate plane draw the circle, such that X and Y axis be the tangents to the circle and the radius measures 10 cm.
 - a. Write the equation of the circle.
 - b. Check which of the following points is located on this circle, inside the circle or outside the circle (2, 16); (3;-4); (19, 13); (15, 19); (20, 10)
 - c. Write equation of line that passes through the center of the circle and makes 45 degree angle with X axis.
 - d. Shift the center of this circle 6 units to the left and 4 units down. Write equation of the resulting circle.
3. Regular pentagon is a polygon having 5 vertices and all sides and angles equal. Apply the knowledge about trigonometric functions and find the area of $ABCDE$ regular pentagon if the side of the pentagon equals 10 cm.
4. Sides of a parallelogram are 5cm and 8 cm long. One of the angles equals 60 degrees. Find longer and shorter diagonals of the parallelogram.
5. Sides of a triangle are 16cm & 22cm and its area measures 88 cm^2 . Find all three angles of this triangle.
6. $a_n = 166$ is the n -th term of the following arithmetic sequence: 30, 34, 38, 42, 46 ...
Find n .
7. A pile driver drives a post 27 inches into the ground on its first hit. Each additional hit drives the post $\frac{2}{3}$ the distance of the prior hit. Find the total distance the post has been driven after 5 hits.
8. The radian measure of a central angle is 1.3 rad. Find the length of the corresponding arc, L , if radius of a circle measures 5 cm.



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9. Solve inequalities

a. $x^2 + x - 12 \leq 0$

b. $3x(x-3)(x+8) > 0$

c. $|2x-8|-1 \geq 4$

10. Graph functions (find x and y intercepts and vertex if necessary)

a. $y = -(2x-1)^2 + 4$ b. $y = |3x-18| + 4$ c. $y = -(x-1)^3 + 3$ d. $y = \frac{1}{x-4}$