

THE GUIVY ZALDASTANISHVILI AMERICAN ACADEMY IN TBILISI



MATH PRACTICE TEST

YEAR 10

DURATION: 90 minutes

The American Academy in Tbilisi

Algebra

Grade X (GZAAT IX)

Introduction

1. Sets, operations with sets
2. Natural numbers, integers, whole numbers, the absolute value
3. Prime and composite numbers
4. Fractions, rational numbers
5. Operations with fractions, problems
6. Decimals
7. Percent, proportions, problems (financial problems, may be some excel applications)
8. Word problems

Unit II – Linear function

13. Slope
14. Equation of a linear function (slope-intercept form)
15. Slopes of parallel lines, perpendicular lines
16. Lines parallel to the axes

Unit III – absolute value and quadratic equations

17. Definition of the absolute value
18. Simple equations with absolute value
19. Zero product property
20. Quadratic equations, completing a square, the discriminant
21. Viete's theorem
22. Equations that may be reduced to the quadratic form
23. Factoring quadratic trinomials

Unit IV - Inequalities

25. Linear inequalities
26. Double inequalities and inequalities with absolute value (AND/OR operations)
27. Simple quadratic inequalities $x^2 > a, x^2 < a, (x+a)^2 > a, (x+a)^2 < a$
28. Graphing inequalities in two variables

Unit V – Quadratic function

28. $y = k/x, y = \sqrt{x}, y = x^2, y = x^3$ functions and their graphs
29. Transformations of $y = |x|$
30. Parent graph $y = x^2$. Horizontal and vertical shifts/stretching/Shrinking
 $y = x^2 + a, y = (x + a)^2, y = ax^2$
31. $y = ax^2 + bx + c$
32. Problems of minimum and maximum using parabola

Unit VI –Systems of equations and inequalities

33. System of linear equations in 2 variables

34. System of inequalities in 1 and 2 variables. Graphing solutions on a number line and coordinate plane

35. Word problems

End of mandatory topics

Optional topics

1. Simple probabilities
2. Introductions to sequences (arithmetic sequence)

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Geometry

Grade X (IX)

Unit I - Angles

1. Angle, its measure in degrees
2. Bisector of an angle
3. Supplementary, complementary and vertical angles
4. Property of bisectors of supplementary angles
5. Perpendicular lines, parallel lines
6. Parallel lines and Transversal (Interior/exterior alternate/consecutive angles)

Unit II - A Triangle

7. Triangle, its types and elements
8. Congruence of triangles, proving triangles congruent
9. Isosceles triangle, its properties. Equilateral triangle
10. Triangle inequality
11. Sum of the angles in the triangle
12. Important lines in Triangle
13. Altitude for an obtuse triangle
14. Distance between point and line
15. Construction of a triangle given its sides using compass and straightedge
16. Interior and exterior angles of a triangle, their properties

Unit IV - Right triangle

17. Right triangle
18. Proving right triangles congruent
19. Property of median drawn to the hypotenuse in the right triangle
20. Properties of 30-60° angle right triangle
21. Property of perpendicular bisector of line segment, its construction, bisecting a line segment

Unit V - Quadrilaterals

22. Quadrilateral, convex quadrilateral
23. Property of angles in a quadrilateral, property of sides
24. Parallelogram, its properties
25. Property of angle bisector in a parallelogram
26. Rhombus, rectangle, square, kite, their properties
27. Trapezoid, its angles, isosceles trapezoid

Unit VI - Similarity

28. Thales's theorem
29. Similarity of triangles (Signs of similarity)
30. Proving triangles similar
31. Midsegment of a triangle
32. Point of intersection of medians in a triangle
33. A midline of a trapezoid
34. Ratios of perimeters of similar triangles (figures)

35. Relations between legs, their projections on the hypotenuse and the altitude drawn to the hypotenuse in a right triangle
36. Revision problems

Unit VII – Area

37. Concept of area
38. Area of a rectangle and right triangle
39. Area of a parallelogram
40. Area of a scalene triangle
41. Area of a trapezoid, rhombus, kite
42. Surface area of a rectangular prism (and its volume)
43. Heron's formula (without proof)

Unit VIII – Introduction to Coordinate geometry

44. Midpoint coordinates
45. Distance between two points
46. Circle Equation
47. Simple coordinate proofs

End of Mandatory Requirement -----

Unit XI – Circles

48. Circle – definition, radius, chord, diameter, tangent
49. Properties of tangents. Quadrilateral subscribed about a circle
50. Central and inscribed angles
51. Quadrilateral inscribed in a circle
52. Secant angles with vertices inside and outside a circle
53. The tangent-chord angle
54. The tangent-secant angle
55. Degrees vs. radians
56. Circumference of a circle, length of an arc
57. Areas of a circle, sector and segment

Unit X - Polygons:

58. Regular polygon,
59. Sum of the angles
60. Number of diagonals and the perimeter
61. Area of a regular Polygon

Unit VII – Intro to trigonometry

62. Trigonometric ratios of an acute angle in right triangle
63. Simple applications

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

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Sample Test in Mathematics for Sophomores

Suggested Time – 90 Minutes

Please show the step-by-step solution of each problem.

Each problem is worth 10 points.

Answers without explanation will not count.

1. Graph the function $y = x^2 - x - 2$
 - a. What is the name of the graph?
 - b. Find its vertex
 - c. Find its x and y intercepts
 - d. Find its domain and range
2. Points A(3;3), B(6;5) and C(-6;-3) are given. Answer the following questions:
 - a. Are points A, B and C collinear? (collinear = located on the same line)
 - b. Write an equation of line that passes through points A and B.
 - c. Write an equation of line that is perpendicular to AB line segment and passes through the origin
3. Sides of a parallelogram are 10 and 15 centimeters long. Height drawn to the longer side is 8cm. Find length of the height drawn to the shorter side.
4. Solve equation and inequality:
 - a. $4|2x + 6| - 5 = 11$
 - b. $|x - 3| + 2 < 5$
5. Area of a triangle is 12cm^2 . Find the area of a trapezoid, that results by cutting the top of this triangle along the midsegment of the triangle.
6. What is the value of a if the system $\begin{cases} x + 5y = 12 \\ ax - y = 8 \end{cases}$ has no solution?
7. Solve the equation $2x^2 - x = 3x^2 + 5x$
8. Triangle ABC is inscribed in circle O. Points A, B and C divide the circle with the ratio 2:3:7. Find angles of triangle ABC.
9. Legs of a right triangle are 12 and 5 meters long.
 - a. Find the area of this triangle
 - b. Find the length of the altitude (height) drawn to the hypotenuse.
10. Graph the function $y = 2|x - 6| - 3$, and find its x and y intercepts.