JESUIT HIGH SCHOOL MATH DEPARTMENT

INFORMATION ABOUT THE
ALGEBRA I CHALLENGE EXAM
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PRACTICE PROBLEMS

The exam is 20 items long, and takes about 1 hour to complete.
Use of calculators is not allowed on any portion of the exam.

The Algebra Challenge Exam covers the following topics:

- Determining the slope of a line given two points
- Determining the slope of a line given the equation of the line in any form
- Solving a linear equation
- Solving an equation of two or more variables for a given variable
- Solving a linear inequality
- Graphing a linear function
- Solving a system of linear equations by graphing
- Graphing a quadratic function
- Solving a system of linear equations by substitution or linear combinations
- Adding and subtracting polynomials
- Multiplying and dividing rational expressions
- Adding and subtracting rational expressions
- Simplifying square roots
- Adding, subtracting, and multiplying square roots
- Simplifying exponential expressions using the rules of exponents
- Solving equations with square roots
- Solving quadratic equations by taking square roots
- Solving quadratic equations by factoring
- Solving quadratic equations by using the quadratic formula

Algebra Challenge Exam Practice Problems

The following are examples of some of the problems with which students should be familiar from an Algebra I course. For the exam, students should be able to show appropriate steps in the process of solving or responding to each question.

FIND THE SLOPE FOR THE GIVEN POINTS.

1. $A(4, 5)$, $B(9, 10)$ 2. $A(-5, -3)$, $B(2, -3)$ 3. $A(-2, 5)$, $B(-2, -1)$ 4. $A(-4, -2)$, $B(-6, 5)$

SOLVE EACH LINEAR EQUATION.

5. $\frac{3}{5}x = 9$ 6. $7 + \frac{2}{3}k = 13$ 7. $8r + 2 = 6r + 10$ 8. $4b + 2(b - 4) = 8(b + 3)$

9. $\frac{1}{3}y - 2 = \frac{1}{2}y + 4$ 10. $8n - 3 - 9n = 5 + n - 12$ 11. $8b + 3(1 - b) = 6b - 4$

FIND THE SLOPE AND THE Y-INTERCEPT OF EACH LINEAR FUNCTION AND GRAPH.

12. $y = \frac{3}{4}x - 1$ 13. $4x - 3y = 9$ 14. $6 + 2y = 8$ 15. $-3x - 7 = 2$

SOLVE THE SYSTEM OF LINEAR EQUATIONS BY SUBSTITUTION.

16. $\begin{aligned} y &= 5x \\ x + 3y &= 12 \end{aligned}$ 17. $\begin{aligned} 3x - 4y &= 19 \\ x + y &= 4 \end{aligned}$

SOLVE THE SYSTEM OF LINEAR EQUATIONS BY LINEAR COMBINATIONS.

18. $\begin{aligned} x + y &= 4 \\ 3x - 2y &= 2 \end{aligned}$ 19. $\begin{aligned} 5x &= 2y + 8 \\ 3x + 4y &= 10 \end{aligned}$

SOLVE THE SYSTEM OF LINEAR EQUATIONS BY GRAPHING.

20. $\begin{cases} y = -2x + 3 \\ y = 3x - 2 \end{cases}$

21. $\begin{cases} 3x - 2y = 6 \\ x - y = 2 \end{cases}$

SOLVE EACH LINEAR INEQUALITY.

22. $-3x + 7 > -8$

23. $x + 5 < x + 1$

24. $-a + 2 \geq -2a + 10$

25. $\frac{1}{3}c - \frac{5}{6} \leq \frac{1}{2}c$

SOLVE EACH QUADRATIC EQUATION BY FACTORING.

26. $x^2 + 9x + 20 = 0$

27. $16m = 35 - 3m^2$

28. $x^2 + 3x = 0$

29. $2x^3 + 5x^2 - 12x = 0$

30. $-19x - 10 = -15x^2$

SIMPLIFY EACH RATIONAL EXPRESSION.

31. $\frac{36 - m^2}{2m^2 - 8m - 24}$

32. $\frac{x^6 y^4 (n^2 - 2n + 1)}{x^3 y^2 (1 - n)}$

33. $\frac{x^4 - 17x^2 + 16}{4 + 3x - x^2}$

34. $\frac{x^2 - 13x + 36}{x^2 - 6x - 16}$

35. $\frac{2c^2 - 10cd + 12d^2}{3c^2 - 21cd + 30d^2} \cdot \frac{15c^2 + 12cd + 3d^2}{4c^2 - 8cd - 12d^2}$

36. $\frac{5x}{3x - 12} \div \frac{x^2 - 2x}{x^2 - 6x + 8}$

ADD OR SUBTRACT AND SIMPLIFY, IF POSSIBLE.

37. $\frac{2b - 1}{b^2 + 2b - 10} + \frac{2}{b^2 - b - 30}$

38. $\frac{3a - 2}{a + 4} - \frac{2a}{16 - a^2} + \frac{7}{a - 4}$

39. $\frac{x + 5}{2x^2 - 5x - 12} + \frac{x - 1}{2x + 3}$

40. $\frac{3n - 4}{20} + \frac{7n}{5} - \frac{4n - 1}{2}$

SIMPLIFY EACH RADICAL EXPRESSION.

41. $\sqrt{5}\cdot\sqrt{11}$ 42. $\sqrt{81}\cdot\sqrt{4}$ 43. $\sqrt{60}$ 44. $\sqrt{75}$ 45. $\sqrt{9x^{10}y^4}$

46. $\sqrt{24x^7y^8}$ 47. $-4ab^2\sqrt{72a^5b^{10}}$ 48. $7\sqrt{3}-4\sqrt{3}+2\sqrt{3}$ 49. $\sqrt{5}(\sqrt{6}+2\sqrt{5})$

50. $-2\sqrt{3}(\sqrt{6}+4\sqrt{12})$ 51. $(2\sqrt{3}-\sqrt{8})(\sqrt{3}+2\sqrt{8})$ 52. $(3-2\sqrt{6})^2$

SIMPLIFY EACH EXPRESSION.

53. $t^6\cdot t^2$ 54. $(a^4b^2c^3)^3$ 55. $(-4ab^2c)(-ab^3c)(-2a^2b^5c)$

56. $(-p^2)(3p)(-2p^5)$ 57. $2m(3m)^2$ 58. $(3x^2y^3)^2$

SOLVE EACH QUADRATIC EQUATION BY USING THE QUADRATIC FORMULA.

59. $x^2+11x+28=0$ 60. $y^2-3y=-2$ 61. $-12a-4=-2a^2$

SOLVE THE FOLLOWING RADICAL AND QUADRATIC EQUATIONS.

62. $\sqrt{3t}=4$ 63. $\sqrt{2p-4}+5=7$ 64. $x-2=\sqrt{7-2x}$

65. $3-\sqrt{5n+3}=6$ 66. $5a^2=40$ 67. $(x+2)^2=38$