

Jesuit High School

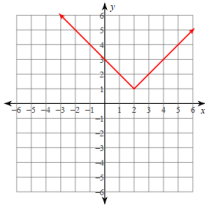
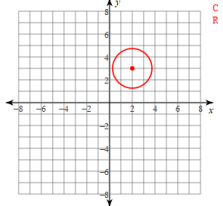
Algebra 1 Challenge Exam Practice Problems

This is a comprehensive list of Algebra 1 practice problems – not all types of problems will be found on the challenge exam. As no calculators are allowed on the exam, it is recommended that you work these problems without a calculator. Answers are posted separately.

Equations & Inequalities

- | | |
|---|---|
| 1) Simplify: $4 + 2(3 - 5)^2 \div 4$ | 2) Simplify: $24 \div 2(3)$ |
| 3) Solve: $2x - (x + 4) = x - 1$ | 4) Solve: $3x + 7 = 2x + 9x - x + 10$ |
| 5) Solve: $5 + (4x + 1) = 3x - (x + 7)$ | 6) Solve: $\frac{2x - 8}{2} = \frac{3x + 3}{6}$ |
| 7) Solve: $ 2x - 1 = 7$ | 8) Solve: $ x + 4 = 3x - 2$ |
| 9) Solve: $2 + 6x - 12 < 4 + x - 2x$ | 10) Solve: $4 - x \geq 20$ |
| 11) Solve for a: $2a - 3b = 5a - 2b + c$ | 12) Graph on a number line: $x > -1$ |
| 13) Graph on a number line: $x < 0$ or $x \geq 3$ | 14) Graph on a number line: $-2 < x \leq 5$ |
| 15) Graph on a number line: $x \neq 2$ | 16) Graph the solution to the inequality: $2 - 4x > 22$ |

Functions

- 17) Determine if the following is a function: a)  b) 
- 18) Determine if the following is a function: a) $\{(3, 2), (4, -1), (3, 1), (8, -2)\}$ b) $\{(1, 5), (-2, -6), (2, 3), (7, 3)\}$
- 19) Determine if the following is a function: a) $y = -\frac{1}{2}x + 2$ b) $y = 2x^2 - 3$
- 20) Determine if the following is a function: a)

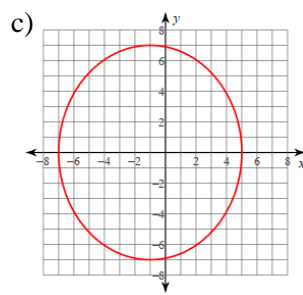
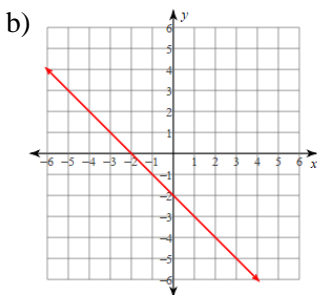
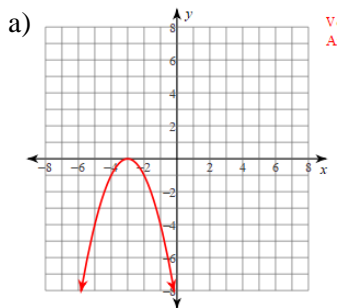
x	y
0	-5
1	6
3	1
-4	5

 b)

x	y
2	-5
-1	6
3	1
-1	0
- 21) State the domain and range:

x	y
0	2
5	5
-6	-3
4	1

22) State the domain and range:



23) If $f(x) = -2x + 7$, evaluate $f(5)$

24) If $g(x) = -3x^2 - 2x$, evaluate $g(-4)$

Linear Functions and Graphs

25) Find the slope of the line that contains $(-2, 4)$ and $(3, 8)$

26) Find the slope of the line that contains $(-2, 0)$ and $(-2, 4)$

27) Find the x-intercept and y-intercept for: $3x - 6y = 12$

28) Graph: $y = \frac{2}{5}x - 1$

29) Graph: $y = -3x + 4$

30) Graph: $4x + 3y = 12$

31) Graph: $y - 2 = -\frac{1}{2}(x - 3)$

32) Graph: $y = -3$

33) Graph: $x = 1$

34) Find the slope of the line parallel to $y = \frac{1}{3}x - 4$

35) Find the slope of the line parallel to $4x - y = 7$

36) Find the slope of the line perpendicular to $y = -5x - 1$

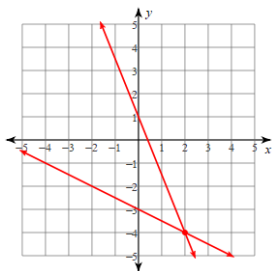
37) Write the equation of the line, in slope-intercept form, that has a slope of $\frac{3}{2}$ and a y-intercept of $(0, 4)$

38) Write the equation of the line, in slope-intercept form, that contains $(4, 5)$ and $(1, -1)$

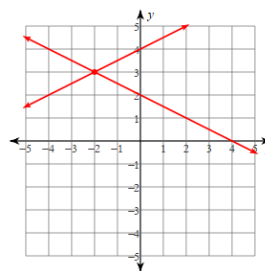
39) Write the equation of the line, in point-slope form, that contains $(-3, 2)$ and is perpendicular to $y = 2x + 1$

Systems of Equations and Inequalities

40) Solve:



41) Solve:



42) Solve:
$$\begin{cases} 3x - 2y = 18 \\ x + 6y = -14 \end{cases}$$

43) Solve:
$$\begin{cases} x + 8y = 8 \\ -2x - 16y = 5 \end{cases}$$

44) Solve: $\begin{cases} -2x + 3y = 18 \\ 4x - y = 14 \end{cases}$

45) Solve: $\begin{cases} 2x - 6y = 8 \\ -6x + 9y = 12 \end{cases}$

46) Solve: $\begin{cases} -9x + 7y = 15 \\ -18x + 14y = 30 \end{cases}$

47) Graph on a coordinate plane: $y \geq 2$

48) Graph on a coordinate plane: $x < -3$

49) Solve: $\begin{cases} y \leq -4x + 1 \\ y > -x - 2 \end{cases}$

Exponents and Radicals

50) Simplify: $\frac{25x^3y^6}{15x^7y^3}$

51) Simplify: $3x^2x^5y^{-4}$

52) Simplify: 3^{-2}

53) Simplify: $3x^{-2}$

54) Simplify: $(3x)^{-2}$

55) Simplify: $(3xy^2)^3$

56) Simplify: $\left(\frac{2ab}{3c}\right)^{-2}$

57) Simplify: $\frac{5^0x^{-3}}{y^{-2}}$

58) Simplify: $\frac{x^{11}}{x^{-3}}$

59) Simplify: $25^{\frac{1}{2}}$

60) Simplify: $8^{\frac{1}{3}}$

61) Simplify: $27^{\frac{2}{3}}$

62) Simplify: $\sqrt{50}$

63) Simplify: $\sqrt{45ab^2}$

64) Simplify: $\sqrt[3]{-24}$

65) Simplify: $\sqrt[3]{54ab^2c^3}$

66) Simplify: $3\sqrt{2} - 5\sqrt{2} + 7\sqrt{3}$

67) Simplify: $3\sqrt{20} + \sqrt{45}$

68) Simplify: $2\sqrt{3} \cdot 4\sqrt{6}$

69) Simplify: $\sqrt{3}(2\sqrt{3} - \sqrt{12})$

70) Simplify: $\frac{2}{\sqrt{5}}$

71) Simplify: $\frac{3\sqrt{2}}{2\sqrt{3}}$

72) Simplify: $\frac{5 + \sqrt{2}}{\sqrt{2}}$

73) Simplify: $\frac{6}{3 + \sqrt{2}}$

Polynomials and Factoring

74) Name by degree and number of terms: $3x^2 - 2x + 8$

75) What is the degree of $f(x) = x^3 - 2x + 1$

76) Find the sum: $(3x^3 - 2x^2 + 6x - 1) + (5x^2 - 3x - 4)$

77) Find the difference: $(5x^4 + 10x^3 - x + 8) - (2x^3 + 2x^2 + x - 2)$

78) Find the product: $2x(x^2 - 5x + 4)$

79) Find the product: $(4x - 2)(5x + 3)$

80) Find the product: $(x - 3)(4x^2 + x - 5)$

81) Simplify: $(x + 10y)^2$

82) Factor completely: $4x^2 - 81$

83) Factor completely: $25x^2 + 20x + 4$

84) Factor out the GCF: $2a^2b^3 - 12ab^2 + 8a^4b$

85) Factor out the GCF: $3x^3 + 6x^2 - 21x$

86) Factor completely: $x^2 + 3x$

87) Factor completely: $p^2 + 13p + 36$

88) Factor completely: $x^2 + 2x - 80$

89) Factor completely: $3x^3 + 6x^2 - 45x$

90) Factor completely: $3x^2 + 6x - 72$

91) Factor completely: $5p^2 - 5$

92) Factor completely: $3x^2 + 4x - 4$

93) Factor completely: $10x^2 - 11x - 6$

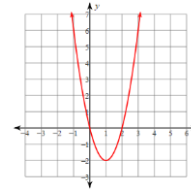
94) Factor completely: $35x^2 + 15x - 50$

95) Factor completely: $9x^3 + 12x^2 + 6x + 8$

Quadratic Functions and Equations

96) Which of the following is a quadratic function? a) $f(x) = x^2 - 3$

b)



c)

x	y
-2	-4
-1	-1
0	2
1	5
2	8

97) Identify the vertex and axis of symmetry of $f(x) = (x + 2)^2 + 1$

98) Describe how $g(x) = x^2 - 5$ is transformed from the parent quadratic function.

99) Describe how $h(x) = (x - 5)^2$ is transformed from the parent quadratic function.

100) Describe how $j(x) = -x^2$ is transformed from the parent quadratic function.

101) Give the domain and range of $f(x) = 3(x - 4)^2$

102) Give the domain and range of $f(x) = -x^2 + 2$

103) Identify the vertex and axis of symmetry of $f(x) = 2x^2 - 8x + 5$

104) Identify the y-intercept of $f(x) = -2x^2 + 11x + 3$

105) Give the domain and range of $f(x) = 2x^2 + 4x + 7$

106) Graph: $f(x) = (x - 3)^2 - 4$

107) Graph: $f(x) = -(x + 1)^2 + 5$

108) Graph: $f(x) = x^2 - 2x + 5$

109) Graph: $f(x) = 2x^2 + 8x + 9$

110) Solve: $x^2 = 16$

111) Solve: $25x^2 - 1 = 0$

112) Solve: $x^2 - x - 12 = 0$

113) Solve: $x^2 + 7 = -8x$

114) Solve: $2x^2 + 3x = 14$

115) Solve: $x^2 - 10x + 25 = 0$

116) Solve: $x^2 - 12 = 0$

117) Solve: $5x^2 + x - 2 = 0$

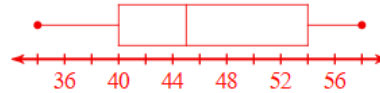
118) Solve: $2x^2 - 6x - 5 = 0$

Data Analysis and Probability

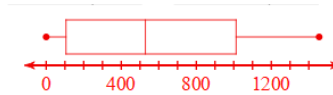
119) Give the mean, median and mode for the following data set: $\{2, 3, 5, 8, 8, 12\}$

120) Give the range for the following data set: $\{12, 31, 37, 50, 68\}$

121) The box-and-whisker plot below shows student scores on a 60 point test. Find the median, the interquartile range and the range.



122) The box-and-whisker plot below shows the melting point of a group of metallic elements. What percentage of shown elements had a melting point over 1000°C ? What was the lowest melting point that was found?



123) The stem-and-leaf plot below shows the average lifespan of some animals. What is the median lifespan for these animals?

Stem	Leaf
0	3 6 6 8 9
1	1 4 5 5 7
2	0 8
3	3
4	
5	0 5 5

Key: $1|4 = 14$

124) The stem-and-leaf plot below shows the life expectancy of people from some countries. What is the modal life expectancy for these countries?

Stem	Leaf
5	2 7
6	3 6 8
7	0 1 2 4 5 5 5 6 8 9
8	2 2

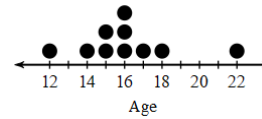
Key: $7|1 = 71$

125) The stem-and-leaf plot below shows the annual precipitation in some US cities. What is the mean annual precipitation for these cities?

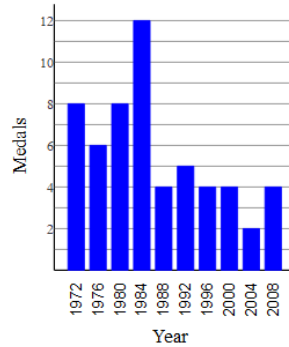
Stem	Leaf
0	8
1	
2	1 3 9
3	0 9
4	7 8
5	3 9

Key: $3|9 = 39$

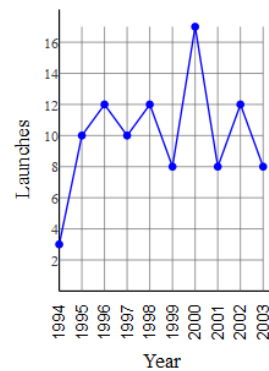
126) The dot plot below shows the ages when some people got their first job. Find the mean, median, mode, minimum, maximum and range for this group.



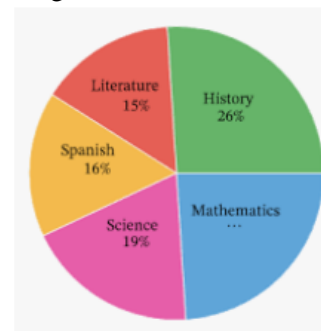
127) The bar graph below shows the Olympic medal count for some country from 1972-2008. Find the mean, median and mode for this data set.



128) The line graph below shows the number of European spacecraft launches from 1994-2003. Find the median and mode for this data set.



129) The circle graph below shows the favorite class of 240 ninth-grade students. How many students preferred mathematics?



130) A bag contains 11 red, 4 blue and 7 yellow marbles. What is the theoretical probability of drawing a yellow marble?

131) A bag contains 11 red, 4 blue and 7 yellow marbles. What is the theoretical probability of drawing a yellow marble and then a blue marble, if the first drawn marble is not replaced?

132) A bag contains 11 red, 4 blue and 7 yellow marbles. What is the theoretical probability of drawing three blue marbles in a row, if drawn marbles are replaced before the next draw?

133) A student guesses randomly on a multiple choice test question that has five answer options. What are the odds she gets the question correct?