

Evaluating and Simplifying Algebraic Expressions

1. Evaluate the algebraic expression for the given values of the variables.

$$x^2 - 4(x - y), \text{ for } x = 7 \text{ and } y = 3$$

2. Evaluate the expression for the given value of the variable.

$$\frac{2(x + 3)}{6x - 24} \text{ for } x = 14$$

3. A football is kicked vertically upward from a height of 6 feet with an initial speed of 55 feet per second. The formula $h = 6 + 55t - 16t^2$ describes the ball's height above the ground, h , in feet, t seconds after it was kicked. Use this formula to find the ball's height 2 seconds after it was kicked.
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4. Simplify the algebraic expression.

$$16x^2 + 4 - [5(x^2 - 3) + 7]$$

EXPONENTS AND RADICALS

5. Simplify the exponential expression.

$$xy^{-4}$$

6. Simplify the expression using the power rule.

$$(x^{15})^2$$

7. Simplify the given exponential expression.

$$(-5x^4y^4)^4$$

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8. Simplify the exponential expression.

$$\frac{-8x^{14}y^7}{2x^3y^4}$$

9. Simplify the exponential expression.

$$\frac{28x^4y^4}{21x^7y^{-3}}$$

10. Simplify the exponential expression.

$$\left(\frac{-24a^5b^6}{8a^7b^{-4}} \right)^3$$

11. Simplify the exponential expression. Assume that variables represent nonzero real numbers.

$$(3x^{-5}yz^{-3})(3x)^{-3}$$

12. Simplify the exponential expression. Assume that the variables represent nonzero real numbers.

$$\left(\frac{x^5y^2z^6}{x^{-5}y^{-2}z^{-6}} \right)^{-3}$$

13. Use the product rule to simplify the following expression. Assume that variables represent nonnegative real numbers.

$$\sqrt{4x} \cdot \sqrt{2x}$$

14. Use the product rule to simplify the following expression. Assume that variables represent nonnegative real numbers.

$$\sqrt{x^{11}}$$

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15. Use the quotient rule to simplify the following expression. Assume that $x > 0$.

$$\frac{\sqrt{8x^3}}{\sqrt{2x}}$$

16. Add the terms if possible.

$$\sqrt{98} + 6\sqrt{2}$$

17. Add and subtract the following terms, if possible.

$$2\sqrt{8} - \sqrt{32} + 2\sqrt{72} - \sqrt{75}$$

18. Rationalize the denominator.

$$\frac{17}{5 + \sqrt{37}}$$

19. Rationalize the denominator. Simplify the answer.

$$\frac{\sqrt{11}}{\sqrt{7}}$$

20. Evaluate the following expression or indicate that the root is not a real number.

$$\sqrt[6]{\frac{1}{64}}$$

21. Simplify.

$$\sqrt[3]{54}$$

22. Simplify by factoring. Assume that the variable in the radicand represents a positive real number and that the radicand does not involve negative quantities raised to even powers.

$$\sqrt[3]{y^{17}}$$

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23. Simplify the radical expression.

$$\sqrt[3]{49} \cdot \sqrt[3]{21}$$

24. Add or subtract terms whenever possible.

$$6\sqrt[3]{16} + \sqrt[3]{128}$$

25. Evaluate the expression without using a calculator.

$$32^{-2/5}$$

26. Simplify using properties of exponents.

$$(5x^{1/2})(2x^{1/5})$$

27. Simplify by reducing the index of the radical.

$$\sqrt[10]{19^2}$$

28. Simplify by reducing the index of the radical.

$$\sqrt[20]{x^{15}y^5}$$

29. Simplify the given expression. Assume that all variables represent positive numbers.

$$(32x^{-5}y^{10})^{-1/5}(xy^{1/5})$$

30. Simplify the given expression. Assume that all variables represent positive numbers.

$$\left(\frac{x^{-5/8}y^{1/3}}{x^{-1/8}} \right)^{-6}$$

POLYNOMIALS

31. Perform the indicated operation.

$$(6x^3 - 6x^2 + 4x - 2) - (9x^3 - 9x^2 - 3x + 7)$$

32. Perform the indicated operations. Write the resulting polynomial in standard form and indicate its degree.

$$(5x^2 - 6x - 7) + (3x^2 - 5x + 8) - (x^2 - 4x - 3)$$

33. Perform the indicated operations. Write the resulting polynomial in standard form and indicate its degree.

$$(7x^2 + 8x - 1) - (2x^2 - 5x) - (-4x^3 - 3x^2 + 1)$$

34. Find the product.

$$(5x + 9)(x^2 + 2x + 6)$$

35. Multiply.

$$(x + 7)(x + 4)$$

36. Find the product.

$$(5x - 3)(4x + 5)$$

37. Find the product.

$$(3x + 5)^2$$

38. Find the product.

$$(8x + 7)^3$$

39. Find the product.

$$(x - y)(x^2 + 2xy + y^2)$$

40. Find the product.

$$(x + y + 11)(x + y - 11)$$

41. Perform the indicated operations.

$$(8x + 9y)^2 - (8x - 9y)^2$$

42. Factor the polynomial using the greatest common factor. If there is no common factor other than 1 and the polynomial cannot be factored, so state.

$$15x + 35$$

43. Factor the greatest common factor from the polynomial.

$$18x^2 + 21x$$

44. Factor by grouping.

$$x^3 - 6x^2 + 3x - 18$$

45. Factor the following by grouping.

$$x^3 - 9x^2 + 4x - 36$$

46. Factor the expression by grouping.

$$3x^3 - 5x^2 - 15x + 25$$

47. Factor the given polynomial.

$$x^2 + 18x + 77$$

48. Factor the trinomial, or state that the trinomial is prime.

$$x^2 - 4x - 45$$

49. Factor the given polynomial.

$$x^2 - 9x + 20$$

50. Factor the trinomial completely.

$$5x^2 - 14x - 3$$

51. Factor the following trinomial, or state that the trinomial is prime.

$$6x^2 - 13x + 6$$

52. Factor the trinomial, or state that the trinomial is prime.

$$6y^2 + 11y + 5$$

53. Factor the trinomial completely.

$$7a^2 + 15ab + 2b^2$$

54. Factor the difference of two squares.

$$16x^2 - 49$$

55. Factor the difference of two squares.

$$81x^2 - 169y^2$$

56. Factor the following difference of two squares.

$$y^4 - 256$$

57. Factor the difference of two squares.

$$256x^4 - 81$$

58. Factor the following polynomial using the formula for the difference of two cubes.

$$y^3 - 729$$

59. Factor using the formula for the sum or difference of two cubes.

$$27x^3 + 1$$

60. Factor the trinomial completely.

$$3x^2 + 15x + 18$$

61. Factor completely, or state that the polynomial is prime.

$$x^3 - 5x^2 - 16x + 80$$

62. Factor the expression completely or state that the polynomial is prime.

$$7x^2 - 7x - 42$$

63. Factor completely, or state that the polynomial is prime.

$$x^2 + 64$$

64. Factor completely.

$$14x^2(x - 3) - 9x(x - 3) - 8(x - 3)$$

RATIONAL EXPRESSIONS (FRACTIONS)

65. Find all numbers for which the rational expression is undefined. If the rational expression is defined for all real numbers, state this.

$$\frac{y+9}{y^2-81}$$

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66. Find all numbers that must be excluded from the domain of the rational expression.

$$\frac{x-5}{x^2+5x+4}$$

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67. Simplify the rational expression. Find all numbers that must be excluded from the domain of the simplified rational expression in order for it to be equivalent to the original expression.

$$\frac{5x-20}{x^2-8x+16}$$

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68. Simplify the rational expression. Find all numbers that must be excluded from the domain of the simplified rational expression in order for it to be equivalent to the original expression.

$$\frac{x^2-8x+16}{5x-20}$$

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69. Simplify the rational expression. Find all numbers that must be excluded from the domain of the simplified rational expression.

$$\frac{y^2-y-2}{y^2+2y-8}$$

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70. Multiply.

$$\frac{x^2-81}{x^2} \cdot \frac{x^2-9x}{x^2+x-90}$$

71. Multiply the following rational expressions.

$$\frac{x^2 - 4}{x^2 - 4x + 4} \cdot \frac{4x - 8}{x + 2}$$

72. Multiply the following rational expressions.

$$\frac{x^2 + 8x + 16}{x^3 + 64} \cdot \frac{3}{x + 4}$$

73. Divide as indicated.

$$\frac{x^2 - 9}{x} \div \frac{x + 3}{x - 3}$$

74. Divide the following rational expression.

$$\frac{x^2 - 25}{x - 5} \div \frac{x + 5}{5x - 25}$$

75. Multiply and divide as indicated.

$$\frac{x^2 + x - 72}{x^2 + x - 30} \cdot \frac{x^2 + 10x + 24}{x^2 - 7x - 8} \div \frac{x + 4}{x^2 + 7x + 6}$$

76. Add as indicated.

$$\frac{9x + 1}{6x + 5} + \frac{3x + 9}{6x + 5}$$

77. Add.

$$\frac{x^2 - 9x}{x^2 + 10x} + \frac{x^2 + 8x}{x^2 + 10x}$$

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78. Perform the following subtraction.

$$\frac{x^2 - 6x}{x^2 - 2x - 15} - \frac{x - 10}{x^2 - 2x - 15}$$

79. Perform the indicated operations.

$$\frac{2x^2 - 7x - 11}{x^2 + 4x + 3} - \frac{x}{x + 1} + \frac{10}{x + 3}$$

80. Perform the indicated operation and simplify the result. Leave your answer in factored form.

$$\frac{3 + \frac{1}{x}}{8 - \frac{1}{x}}$$

81. Simplify the following complex rational expression.

$$\frac{\frac{x - 5}{5}}{x - \frac{5}{x - 4}}$$

SOLVING EQUATIONS

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82. Find the value of the variable that satisfies the equation. Check your solution. Answers that are not integers may be left in fractional form or decimal form.

$$8x - 5 = 51$$

83. Solve the equation. Be sure to check your proposed solution by substituting it for the variable in the original equation.

$$8x - (3x - 16) = 61$$

84. Solve the linear equation.

$$6x + 8 = 4x + 38$$

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85. Solve and check the linear equation.

$$5(x - 2) + 19 = 4(x + 4)$$

86. Solve and check the linear equation.

$$\frac{x}{5} = 5 + \frac{x - 9}{3}$$

87. Complete parts a and b for the following equation.

$$\frac{6}{7x + 7} = \frac{2}{x + 1} - \frac{4}{7}$$

- a.** Write the value or values of the variable that make a denominator zero.
These are the restrictions on the variable.
b. Keeping the restrictions in mind, solve the equation.
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88. Solve the following formula for the specified variable.

$$A = Skw \text{ for } S$$

89. Solve the formula for q.

$$B = W + qm$$

90. Solve the following formula for the specified variable.

$$C = \frac{1}{2}m(r + k) \text{ for } r$$

91. Solve the formula for f.

$$\frac{1}{a} + \frac{1}{t} = \frac{1}{f}$$

92. Find the solution set for the equation.

$$|x - 6| = 9$$

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93. Find the solution set for the equation.

$$3|2x - 1| = 3$$

94. Solve the absolute value equation or indicate that the equation has no solution.

$$3\left|4 - \frac{3}{2}x\right| + 10 = 25$$

95. Find the solution set for the equation.

$$|6x - 3| + 5 = 5$$

96. Use factoring to solve the quadratic equation. Check by substitution or by using a graphing utility and identifying x-intercepts.

$$x^2 - 5x - 14 = 0$$

97. Solve.

$$3x^2 = 54x$$

98. Solve the following quadratic equation by the square root property.

$$2x^2 + 6 = 78$$

99. Solve the equation by the square root property.

$$2(x + 4)^2 = 90$$

100. Solve the quadratic equation by completing the square.

$$x^2 + 4x = 5$$

101. Solve the following equation using the quadratic formula.

$$x^2 + 6x + 8 = 0$$

102. Solve the equation using the quadratic formula.

$$x^2 + 7x + 3 = 0$$

103. Solve the equation using the quadratic formula.

$$3x^2 = 4x + 5$$

104. Solve the equation by the method of your choice.

$$2x^2 - x = 6$$

105. Solve the equation using any method.

$$5x^2 + 7 = 36x$$

106. Solve the equation by the method of your choice.

$$(5x + 2)(x + 1) = 1$$

107. Solve the following equation.

$$4x^2 - 48x + 144 = 0$$

108. Solve the equation by the method of your choice.

$$\frac{1}{x} + \frac{1}{x+4} = \frac{1}{2}$$

109. Find the real solutions of the equation.

$$\sqrt{28 - 3x} = x$$

110. Solve the radical equation.

$$\sqrt{2x + 14} = x - 5$$

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111. Solve the radical equation. Check all proposed solutions.

$$\sqrt{2x + 5} - 1 = x$$

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112. Solve and check the following linear equation.

$$30 - [3 + 4y - 2(y + 2)] = -4(2y - 6) - [5(y - 1) - 3y + 14]$$

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113. Solve the equation by the method of your choice.

$$\frac{1}{x^2 + 3x + 2} = \frac{1}{x - 1} + \frac{2}{x^2 - 1}$$

LINEAR EQUATIONS

Use the given conditions to write an equation for the line in point-slope form.

1) Slope = 2, passing through (4, 2)

2) Slope = $\frac{8}{9}$, passing through (3, 7)

3) Passing through (7, 2) and (8, 8)

4) Passing through (1, -6) with x-intercept = -1

Use the given conditions to write an equation for the line in slope-intercept form.

5) Slope = $\frac{5}{9}$, y-intercept = 2

6) Passing through (2, 3) and (5, 2)

Use the given conditions to write an equation for the line in the indicated form.

- 7) Passing through (5, 4) and parallel to the line whose equation is $y = 2x - 6$;
point-slope form
- 8) Passing through (2, 2) and perpendicular to the line whose equation is $y = 4x + 7$;
point-slope form
- 9) Passing through (5, 3) and parallel to the line whose equation is $y = -2x + 3$;
point-slope form
- 10) Passing through (2, 4) and perpendicular to the line whose equation is $-7x + y - 7 = 0$;
slope-intercept form
- 11) Passing through (5, 3) and parallel to the line whose equation is $8x + y - 2 = 0$;
slope-intercept form

Logarithms and Exponentials

Solve the problem.

- 1) The rabbit population in a forest area grows at the rate of 9% monthly. If there are 290 rabbits in September, find how many rabbits (rounded to the nearest whole number) should be expected by next September. Use $y = 290(2.7)^{0.09t}$.
- 2) A city is growing at the rate of 0.8% annually. If there were 2,632,000 residents in the city in 1993, find how many (to the nearest ten-thousand) are living in that city in 2000. Use $y = 2,632,000(2.7)^{0.008t}$.

Approximate the number using a calculator. Round your answer to three decimal places.

3) $e^{3.4}$

4) $e^{-2.9}$

Solve the problem.

- 5) The size of the bear population at a national park increases at the rate of 4.7% per year. If the size of the current population is 198, find how many bears there should be in 8 years. Use the function $f(x) = 198e^{0.047t}$ and round to the nearest whole number.

Use the compound interest formulas $A = P\left(1 + \frac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$ to solve.

- 6) Find the accumulated value of an investment of \$17,000 at 6% compounded annually for 13 years.
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Write the equation in its equivalent exponential form.

7) $\log_5 125 = 3$

8) $\log_2 16 = x$

Write the equation in its equivalent logarithmic form.

9) $6^3 = 216$

10) $6^2 = x$

11) $4^x = 64$

Evaluate the expression without using a calculator.

12) $\log_3 27$

13) $\log_5 \frac{1}{25}$