Solving Quadratic Equations (ALG.QUAD.03)

Solve each equation by taking the square root.

1. $x^2 = 64$ $x = \pm 8$

2. $x^2 = 50$ $x = \pm 5\sqrt{2}$

3. $x^2 = -121$ $x = \pm 11i$

4. $x^2 = -240$ $x = \pm 4i\sqrt{5}$

5. $x^2 - 25 = 0$ $x = \pm 5$

6. $x^2 - 75 = 0$ $x = \pm 5\sqrt{3}$

7. $x^2 + 81 = 0$ $x = \pm 9i$

8. $x^2 + 27 = 0$ $x = \pm 3i\sqrt{3}$

9. $49x^2 - 16 = 0$ $x = \pm \frac{4}{7}$

10. $25x^2 - 18 = 0$ $x = \pm \frac{3\sqrt{2}}{5}$

11. $36x^2 + 169 = 0$ $x = \pm \frac{13}{6}i$

12. $75x^2 + 144 = 0$ $x = \pm \frac{4\sqrt{3}}{5}i$

13. $0.05x^2 - 5 = 0$ $x = \pm 10$

14. $\frac{5}{6}x^2 - 30 = 0$ $x = \pm 6$

15. $4.75x^2 + 684 = 0$ $x = \pm 12i$

16. $\frac{7}{4}x^2 + 343 = 0$ $x = \pm 14i$

Solve each equation by factoring.

17. $x^2 + 9x + 20 = 0$ $x = -4, -5$

18. $x^2 - 13x + 40 = 0$ $x = 5, 8$

19. $x^2 + 8x + 16 = 0$ $x = -4$

20. $x^2 - 10x + 25 = 0$ $x = 5$

21. $x^2 - 2x - 15 = 0$ $x = -3, 5$

22. $x^2 + 4x - 21 = 0$ $x = -7, 3$

23. $-4x^2 + 4x + 8 = 0$ $x = -1, 2$

24. $10x^2 + 19x + 6 = 0$ $x = -\frac{3}{2}, -\frac{2}{5}$

25. $14x^2 = 35 + 39x$ $x = -\frac{5}{7}, \frac{7}{2}$

26. $6x^3 + 5x^2 = 6x$ $x = -\frac{3}{2}, 0, \frac{2}{3}$

27. $9x^2 + 16 = 24x$ $x = \frac{4}{3}$

28. $3x^2 = x + 14$ $x = -2, \frac{7}{3}$

29. $100x - 4x^3 = 0$ $x = 0, \pm 5$

30. $-5x^2 + 45 = 0$ $x = \pm 3$

31. $10x^3 + 48x^2 = 10x$ $x = -5, 0, \frac{1}{5}$

32. $4x(x+3) + 2(x-2) + x = 0$ $x = -4, \frac{1}{4}$

33. $5x(5x-4) = 4(1-5x)$ $x = \pm\frac{2}{5}$

34. $(x+1)(x-1) = 5(x+1)$ $x = -1, 6$

35. $(x-2)^2(x+1) = x(x+3)^2$
$x = -\frac{4}{3}, \frac{1}{3}$

36. $-x^2(x^2-2) = 2x^4 + 5x^2(x-2)$
$x = -3, 0, \frac{4}{3}$

37. $3x(3x+5) - 7 = -x(x+6) + 3$
$x = -\frac{5}{2}, \frac{2}{5}$

38. $(5x+2)(2x-3) = 2(2x-1)(x-2) + 5$
$x = -\frac{3}{2}, \frac{5}{3}$

39. $4x(x^2+4) + 5 = 5(4x^2+1) + 4x + x^3$
$x = 0, \frac{2}{3}, 6$

40. $(x+3)^2 - (2x-1)^2 = 0$
$x = -\frac{2}{3}, 4$

41. $4x(4x+1) = 15(1-2x)$
$x = -\frac{5}{2}, \frac{3}{8}$

42. $6(x+1)^2 + 7x = -9$
$x = -\frac{5}{3}, -\frac{3}{2}$

43. $-x(x-6)^2 + 3x(x+4)(x-3) - 5x^2 = 0$
$x = -9, 0, 4$

44. $(x-2)^3 + (x-2)[(5x-1) + (x-3)] = 0$
$x = 0, \pm 2$

45. $\frac{x+4}{3} = \frac{-3}{x-2}$ $x = -1$

46. $\frac{2x^2}{3} = \frac{3}{2}$ $x = \pm\frac{3}{2}$

47. $x = \frac{9}{6-x}$ $x = 3$

48. $x = \frac{6}{x-5}$ $x = -1, 6$

49. $\frac{x+3}{-3x} = \frac{4}{x+7}$ $x = -21, -1$

50. $\frac{4x}{x+7} = \frac{10}{x-2}$ $x = -\frac{5}{2}, 7$

Write a quadratic function from the given set of roots.

51. $x = 2, 4$ $f(x) = x^2 - 6x + 8$

52. $x = -3, 6$ $f(x) = x^2 - 3x - 18$

53. $x = 5, -3$ $\boldsymbol{f(x) = x^2 - 2x - 15}$

54. $x = -5, -8$ $\boldsymbol{f(x) = x^2 + 13x + 40}$

55. $x = 0, 9$ $\boldsymbol{f(x) = x^2 - 9x}$

56. $x = 0, -2$ $\boldsymbol{f(x) = x^2 + 2x}$

57. $x = \pm 4$ $\boldsymbol{f(x) = x^2 - 16}$

58. $x = -\frac{1}{3}, \frac{1}{3}$ $\boldsymbol{f(x) = 9x^2 - 1}$

59. $x = 4, -\frac{1}{6}$ $\boldsymbol{f(x) = 6x^2 - 23x - 4}$

60. $x = \frac{1}{2}, \frac{5}{3}$ $\boldsymbol{f(x) = 6x^2 - 13x + 5}$

61. $x = -\frac{8}{3}, \frac{3}{5}$ $\boldsymbol{f(x) = 15x^2 + 31x - 24}$

62. $x = -\frac{5}{3}, -\frac{3}{5}$ $\boldsymbol{f(x) = 15x^2 + 34x + 15}$

63. For the equation, $x^2 + kx + 24 = 0$, what value(s) of k will result in integer solutions? Justify your answer.

$\boldsymbol{k = \pm 10, \pm 11, \pm 14, \pm 25}$

64. For the equation, $x^2 + kx - 12 = 0$, what value(s) of k will result in integer solutions? Justify your answer.

$\boldsymbol{k = \pm 1, \pm 4, \pm 11}$

65. For the equation, $x^2 + kx + 30 = 0$, what value(s) of k will result in whole number solutions? Justify your answer.

$\boldsymbol{k = -11, -13, -17, -31}$

66. For the equation, $x^2 - kx + 16 = 0$, what value(s) of k will result in whole number solutions?

$\boldsymbol{k = 8, 10, 17}$

67. For the equation, $x^2 - 8x + k = 0$, what value of k will result in a single solution? What is the solution? $\boldsymbol{k = 16}$

68. For the equation, $x^2 + 10x + k = 0$, what value of k will result in a single solution? What is the solution? $\boldsymbol{k = 25}$

69. Describe and correct the error.

$$3(x+2)^2 + 5 = 53$$
$$3(x+2)^2 = 48$$
$$(x+2)^2 = 16$$
$$x + 2 = 4$$
$$x = 2$$

The second to last step should be:
$\boldsymbol{x + 2 = \pm 4}$.

70. Describe and correct the error.

$$-7x^2 - 63 = 0$$
$$-7x^2 = 63$$
$$x^2 = -9$$
$$x = \pm 3$$

The final answer should be: $\boldsymbol{x = \pm 3i}$.

71. A rectangle has a width of x units and a length $(x + 4)$ units. If the area is 32 square units, then determine the value of x and the perimeter of the rectangle. **$x = 4$; 24 units**

72. A rectangle has a perimeter of $(6x + 14)$ meters. If the width of the rectangle is $(2x + 1)$ meters and the area of the rectangle is 195 square meters, then determine the value of x and the dimensions of the rectangle. **$x = 7$; 13 meters by 15 meters**

73. The area of a circle is 81π square inches and the diameter is $(4x + 10)$ inches. Determine the value of x and the circumference of the circle. **$x = 2$; $C = 18\pi$ inches**

74. The circumference of a circle is $(8x + 6)\pi$ yards. The area of the circle is 225π square yards. Determine the value of x and the radius of the circle. **$x = 3$; $r = 15$ yards**

75. The height of a triangle is $(x + 5)$ centimeters and its base length is $(3x + 8)$ centimeters. If the area of the triangle is 90 square centimeters, then determine the value of x and the dimensions of the triangle. **$x = 4$; the height is 9 cm and the base is 20 cm**

76. The area of a trapezoid is 275 mm^2. The lengths of the parallel sides are $(3x + 2)$ mm and $(2x + 3)$ mm. The height of the trapezoid is $(x + 2)$ mm. Determine the value of x and the dimensions of the trapezoid. **$x = 9$; the height is 11 mm, the bases are 29 mm and 21 mm**

77. The difference of two integers is 25 and their product is -126. Write and solve an equation to determine the two pairs of integers. **The two numbers are 7 and -18 or -7 and 18**

78. The sum of two integers is 42 and their product is 416. Write and solve an equation to determine the two integers. **The two numbers are 16 and 26**

Solve each equation by factoring. Use a u-substitution where $u = x^2$.

79. $x^4 - 13x^2 + 36 = 0$ **$x = \pm 2, \pm 3$**

80. $x^4 - 2x^2 + 1 = 0$ **$x = \pm 1$**

81. $x^4 - 9x^2 + 20 = 0$ **$x = \pm 2, \pm\sqrt{5}$**

82. $x^4 - 13x^2 + 30 = 0$ **$x = \pm\sqrt{3}, \pm\sqrt{10}$**

83. $36x^4 - 97x^2 + 36 = 0$ **$x = \pm\frac{2}{3}, \pm\frac{3}{2}$**

84. $2x^4 - 5x^2 + 2 = 0$ **$x = \pm\frac{\sqrt{2}}{2}, \pm\sqrt{2}$**

85. $9x^4 - 5x^2 - 4 = 0$ **$x = \pm 1, \pm\frac{2}{3}i$**

86. $x^4 + 13x^2 + 40 = 0$ **$x = \pm 2i\sqrt{2}, \pm i\sqrt{5}$**