Quadratic Equations: Exercise Supplement*

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Abstract

This module is from Elementary Algebra</link> by Denny Burzynski and Wade Ellis, Jr. Methods of solving quadratic equations as well as the logic underlying each method are discussed. Factoring, extraction of roots, completing the square, and the quadratic formula are carefully developed. The zero-factor property of real numbers is reintroduced. The chapter also includes graphs of quadratic equations based on the standard parabola, y = x^2, and applied problems from the areas of manufacturing, population, physics, geometry, mathematics (numbers and volumes), and astronomy, which are solved using the five-step method. This module contains an exercise supplement for the chapter "Quadratic Equations".

1 Exercise Supplement

1.1 Solving Quadratic Equations (here[1]) - Solving Quadratic Equations by Factoring (here[2])

For the following problems, solve the equations.

Exercise 1 *(Solution on p. 7.)*

$(x-2)(x-5)=0$

Exercise 2

$(b+1)(b-6)=0$

Exercise 3 *(Solution on p. 7.)*

$(a+10)(a-5)=0$

Exercise 4

$(y-3)(y-4)=0$

Exercise 5 *(Solution on p. 7.)*

$(m-8)(m+1)=0$

Exercise 6

$(4y+1)(2y+3)=0$

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[1]"Quadratic Equations: Solving Quadratic Equations" <http://cnx.org/content/m18880/latest/>

[2]"Quadratic Equations: Solving Quadratic Equations by Factoring" <http://cnx.org/content/m21933/latest/>

Exercise 7 *(Solution on p. 7.)*

$(x+2)(3x-1)=0$

Exercise 8

$(5a-2)(3a-10)=0$

Exercise 9 *(Solution on p. 7.)*

$x(2x+3)=0$

Exercise 10

$(a-5)^2=0$

Exercise 11 *(Solution on p. 7.)*

$(y+3)^2=0$

Exercise 12

$c^2=36$

Exercise 13 *(Solution on p. 7.)*

$16y^2-49=0$

Exercise 14

$6r^2-36=0$

Exercise 15 *(Solution on p. 7.)*

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

Exercise 16

$r^2+7r+10=0$

Exercise 17 *(Solution on p. 7.)*

$s^2-9s+8=0$

Exercise 18

$y^2=-10y-9$

Exercise 19 *(Solution on p. 7.)*

$11y-2=-6y^2$

Exercise 20

$16x^2-3=-2x$

Exercise 21 *(Solution on p. 7.)*

$m^2=4m-4$

Exercise 22

$3\left(y^2-8\right)=-7y$

Exercise 23 *(Solution on p. 7.)*

$a(4b+7)=0$

Exercise 24

$x^2-64=0$

Exercise 25 *(Solution on p. 7.)*

$m^2-81=0$

Exercise 26

$9x^2-25=0$

Exercise 27 *(Solution on p. 7.)*

$5a^2-125=0$

Exercise 28

$8r^3-6r=0$

Exercise 29 *(Solution on p. 7.)*
$m^2 - 6m + 5 = 0$

Exercise 30
$x^2 + 2x - 24 = 0$

Exercise 31 *(Solution on p. 7.)*
$x^2 + 3x = 28$

Exercise 32
$20a^2 - 3 = 7a$

Exercise 33 *(Solution on p. 7.)*
$2y^2 - 6y = 8$

Exercise 34
$a^2 + 2a = -1$

Exercise 35 *(Solution on p. 7.)*
$2r^2 = 5 - 3r$

1.2 Solving Quadratic Equations Using the Method of Extraction of Roots (here[3])

For the following problems, solve the equations using extraction of roots.

Exercise 36
$y^2 = 81$

Exercise 37 *(Solution on p. 7.)*
$a^2 = 121$

Exercise 38
$x^2 = 35$

Exercise 39 *(Solution on p. 7.)*
$m^2 = 2$

Exercise 40
$r^2 = 1$

Exercise 41 *(Solution on p. 7.)*
$s^2 - 10 = 0$

Exercise 42
$4x^2 - 64 = 0$

Exercise 43 *(Solution on p. 7.)*
$-3y^2 = -75$

Exercise 44
Solve $y^2 = 4a^2$ for y.

Exercise 45 *(Solution on p. 7.)*
Solve $m^2 = 16n^2p^4$ for m.

Exercise 46
Solve $x^2 = 25y^4z^{10}w^8$ for x.

Exercise 47 *(Solution on p. 7.)*
Solve $x^2 - y^2 = 0$ for y.

[3] "Quadratic Equations: Solving Quadratic Equations Using the Method of Extraction of Roots" <http://cnx.org/content/m21922/latest/>

Exercise 48
Solve $a^4b^8 - x^6y^{12}z^2 = 0$ for a^2.

Exercise 49 *(Solution on p. 7.)*
$(x-2)^2 = 9$

Exercise 50
$(y+3)^2 = 25$

Exercise 51 *(Solution on p. 8.)*
$(a+10)^2 = 1$

Exercise 52
$(m+12)^2 = 6$

Exercise 53 *(Solution on p. 8.)*
$(r-8)^2 = 10$

Exercise 54
$(x-1)^2 = 5$

Exercise 55 *(Solution on p. 8.)*
$(a-2)^2 = -2$

Exercise 56
Solve $(x-2b)^2 = b^2$ for x

Exercise 57 *(Solution on p. 8.)*
Solve $(y+6)^2 = a$ for y.

Exercise 58
Solve $(2a-5)^2 = c$ for a.

Exercise 59 *(Solution on p. 8.)*
Solve $(3m-11)^2 = 2a^2$ for m.

1.3 Solving Quadratic Equations Using the Method of Completing the Square (here[4]) - Solving Quadratic Equations Using the Quadratic Formula (here[5])

For the following problems, solve the equations by completing the square or by using the quadratic formula.

Exercise 60
$y^2 - 8y - 12 = 0$

Exercise 61 *(Solution on p. 8.)*
$s^2 + 2s - 24 = 0$

Exercise 62
$a^2 + 3a - 9 = 0$

Exercise 63 *(Solution on p. 8.)*
$b^2 + b - 8 = 0$

Exercise 64
$3x^2 - 2x - 1 = 0$

Exercise 65 *(Solution on p. 8.)*
$5a^2 + 2a - 6 = 0$

[4] "Quadratic Equations: Solving Quadratic Equations Using the Method of Completing the Square" <http://cnx.org/content/m21935/latest/>

[5] "Quadratic Equations: Solving Quadratic Equations Using the Quadratic Formula" <http://cnx.org/content/m21927/latest/>

Exercise 66
$a^2 = a + 4$

Exercise 67 *(Solution on p. 8.)*
$y^2 = 2y + 1$

Exercise 68
$m^2 - 6 = 0$

Exercise 69 *(Solution on p. 8.)*
$r^2 + 2r = 9$

Exercise 70
$3p^2 + 2p = 7$

Exercise 71 *(Solution on p. 8.)*
$10x^3 + 2x^2 - 22x = 0$

Exercise 72
$6r^3 + 6r^2 - 3r = 0$

Exercise 73 *(Solution on p. 8.)*
$15x^2 + 2x^3 = 12x^4$

Exercise 74
$6x^3 - 6x = -6x^2$

Exercise 75 *(Solution on p. 8.)*
$(x + 3)(x - 4) = 3$

Exercise 76
$(y - 1)(y - 2) = 6$

Exercise 77 *(Solution on p. 8.)*
$(a + 3)(a + 4) = -10$

Exercise 78
$(2m + 1)(3m - 1) = -2$

Exercise 79 *(Solution on p. 8.)*
$(5r + 6)(r - 1) = 2$

Exercise 80
$4x^2 + 2x - 3 = 3x^2 + x + 1$

Exercise 81 *(Solution on p. 8.)*
$5a^2 + 5a + 4 = 3a^2 + 2a + 5$

Exercise 82
$(m + 3)^2 = 11$

Exercise 83 *(Solution on p. 8.)*
$(r - 8)^2 = 70$

Exercise 84
$(2x + 7)^2 = 51$

1.4 Applications (here[6])

For the following problems, find the solution.

Exercise 85 ***(Solution on p. 8.)***

The revenue R, in dollars, collected by a certain manufacturer of inner tubes is related to the number x of inner tubes sold by $R = 1400 - 16x + 3x^2$. How many inner tubes must be sold to produce a profit of \$1361?

Exercise 86

A study of the air quality in a particular city by an environmental group suggests that t years from now the level of carbon monoxide, in parts per million, in the air will be $A = 0.8t^2 + 0.5t + 3.3$.
(a) What is the level, in parts per million, of carbon monoxide in the air now?
(b) How many years from now will the carbon monoxide level be at 6 parts per million?

Exercise 87 ***(Solution on p. 8.)***

A contractor is to pour a concrete walkway around a community garden that is 15 feet wide and 50 feet long. The area of the walkway and garden is to be 924 square feet and of uniform width. How wide should the contractor make it?

Exercise 88

A ball thrown vertically into the air has the equation of motion $h = 144 + 48t - 16t^2$
(a) How high is the ball at $t = 0$?
(b) How high is the ball at $t = 1$?
(c) When does the ball hit the ground?

Exercise 89 ***(Solution on p. 8.)***

The length of a rectangle is 5 feet longer than three times its width. Find the dimensions if the area is to be 138 square feet.

Exercise 90

The area of a triangle is 28 square centimeters. The base is 3 cm longer than the height. Find both the length of the base and the height.

Exercise 91 ***(Solution on p. 8.)***

The product of two consecutive integers is 210. Find them.

Exercise 92

The product of two consecutive negative integers is 272. Find them.

Exercise 93 ***(Solution on p. 8.)***

A box with no top and a square base is to be made by cutting out 3-inch squares from each corner and folding up the sides of a piece of cardboard. The volume of the box is to be 25 cubic inches. What size should the piece of cardboard be?

[6] "Quadratic Equations: Applications" <http://cnx.org/content/m21915/latest/>

Solutions to Exercises in this Module

Solution to Exercise (p. 1)
$x = 2, 5$
Solution to Exercise (p. 1)
$a = -10, 5$
Solution to Exercise (p. 1)
$m = 8, -1$
Solution to Exercise (p. 1)
$x = -2, \frac{1}{3}$
Solution to Exercise (p. 2)
$x = 0, -\frac{3}{2}$
Solution to Exercise (p. 2)
$y = -3$
Solution to Exercise (p. 2)
$y = \pm\frac{7}{4}$
Solution to Exercise (p. 2)
$a = -4, -2$
Solution to Exercise (p. 2)
$s = 1, 8$
Solution to Exercise (p. 2)
$y = \frac{1}{6}, -2$
Solution to Exercise (p. 2)
$m = 2$
Solution to Exercise (p. 2)
$a = 0;\ b = -\frac{7}{4}$
Solution to Exercise (p. 2)
$m = \pm 9$
Solution to Exercise (p. 2)
$a = \pm 5$
Solution to Exercise (p. 2)
$m = 5, 1$
Solution to Exercise (p. 3)
$x = -7, 4$
Solution to Exercise (p. 3)
$y = 4, -1$
Solution to Exercise (p. 3)
$r = -\frac{5}{2}, 1$
Solution to Exercise (p. 3)
$a = \pm 11$
Solution to Exercise (p. 3)
$m = \pm\sqrt{2}$
Solution to Exercise (p. 3)
$s = \pm\sqrt{10}$
Solution to Exercise (p. 3)
$y = \pm 5$
Solution to Exercise (p. 3)
$m = \pm 4np^2$
Solution to Exercise (p. 3)
$y = \pm x$

Solution to Exercise (p. 4)
$x = 5, -1$
Solution to Exercise (p. 4)
$a = -11, -9$
Solution to Exercise (p. 4)
$r = 8 \pm \sqrt{10}$
Solution to Exercise (p. 4)
No real number solution.
Solution to Exercise (p. 4)
$y = -6 \pm \sqrt{a}$
Solution to Exercise (p. 4)
$m = \frac{11 \pm a\sqrt{2}}{3}$
Solution to Exercise (p. 4)
$s = 4, -6$
Solution to Exercise (p. 4)
$b = \frac{-1 \pm \sqrt{33}}{2}$
Solution to Exercise (p. 4)
$a = \frac{-1 \pm \sqrt{31}}{5}$
Solution to Exercise (p. 5)
$y = 1 \pm \sqrt{2}$
Solution to Exercise (p. 5)
$r = -1 \pm \sqrt{10}$
Solution to Exercise (p. 5)
$x = 0, \frac{-1 \pm \sqrt{221}}{10}$
Solution to Exercise (p. 5)
$x = 0, \frac{1 \pm \sqrt{181}}{12}$
Solution to Exercise (p. 5)
$x = \frac{1 \pm \sqrt{61}}{2}$
Solution to Exercise (p. 5)
No real number solution.
Solution to Exercise (p. 5)
$r = \frac{-1 \pm \sqrt{161}}{10}$
Solution to Exercise (p. 5)
$a = \frac{-3 \pm \sqrt{17}}{4}$
Solution to Exercise (p. 5)
$r = 8 \pm \sqrt{70}$
Solution to Exercise (p. 6)
No solution.
Solution to Exercise (p. 6)
$x \approx 1.29\,\text{feet}$
Solution to Exercise (p. 6)
$w = 6$
Solution to Exercise (p. 6)
$x = -15, -14, \text{ or } 14, 15$
Solution to Exercise (p. 6)
$x = \frac{18 + 5\sqrt{3}}{3}$