

[06-01-26-P1]

PEA-1 pages 465, 467-468, 470, 472 & answers

Exercises ^[A]

Copy and fill in the blanks.

- | | |
|-----------------------------|--|
| 1. $a^2 + 2a + ? = (?)^2$ | 6. $n^2 - 3n + ? = (?)^2$ |
| 2. $b^2 - 2b + ? = (?)^2$ | 7. $p^2 + \frac{2}{3}p + ? = (?)^2$ |
| 3. $c^2 + c + ? = (?)^2$ | 8. $x^2 - 7x + ? = (?)^2$ |
| 4. $d^2 - d + ? = (?)^2$ | 9. $y^2 + \frac{3}{4}y + ? = (?)^2$ |
| 5. $m^2 + 3m + ? = (?)^2$ | 10. $w^2 - \frac{1}{2}w + ? = (?)^2$ |

Solve, leaving irrational answers in simplest radical form:

- | | |
|--------------------------------|---|
| 11. $x^2 - 5 = 0$ | 18. $r^2 = 4$ |
| 12. $x^2 - 5x = 0$ | 19. $\frac{x-9}{3} = \frac{4}{x-9}$ |
| 13. $x^2 - 5x - 6 = 0$ | 20. $\frac{12}{x(x-9)} = 1 - \frac{9}{x}$ |
| 14. $(x - \frac{5}{2})^2 = 16$ | 21. $(a-3)(a-1) + 1 = 2a - 1$ |
| 15. $(x - \frac{5}{2})^2 = 17$ | 22. $(a-3)(a-1) = 2a - 1$ |
| 16. $(x-2)^2 + (x-3)^2 = 13$ | |
| 17. $r^2 = 4r$ | |

Example 1. Solve the equation $x^2 + 8x = 2$.

Solution: $x^2 + 8x = 2$
 Add 16 (the square of one half of 8) to both sides.

$$\begin{aligned}
 x^2 + 8x + 16 &= 2 + 16 \\
 (x + 4)^2 &= 18 \\
 x + 4 &= \sqrt{18} \quad \text{or} \quad x + 4 = -\sqrt{18} \\
 x &= -4 + 3\sqrt{2} \quad | \quad x = -4 - 3\sqrt{2}
 \end{aligned}$$

Check:

$$\begin{array}{l}
 \text{If } x = -4 + 3\sqrt{2}, \\
 \begin{array}{l}
 (-4 + 3\sqrt{2})^2 + 8(-4 + 3\sqrt{2}) \\
 16 - 24\sqrt{2} + 18 - 32 + 24\sqrt{2} \\
 \hline
 2
 \end{array} \Bigg| 2
 \end{array}$$

$$\begin{array}{l}
 \text{If } x = -4 - 3\sqrt{2}, \\
 \begin{array}{l}
 (-4 - 3\sqrt{2})^2 + 8(-4 - 3\sqrt{2}) \\
 16 + 24\sqrt{2} + 18 - 32 - 24\sqrt{2} \\
 \hline
 2
 \end{array} \Bigg| 2
 \end{array}$$

~~467~~

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Exercises [A-1]

Solve by completing the square, leaving irrational answers in simplest radical form:

1. $x^2 - 4x = 5$

3. $6s = s^2 - 17$

5. $p^2 - 2 = 7p$

2. $x^2 - 12x = -4$

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

6. $x = x^2 - 3$

Carry out the indicated operations, writing results to the nearest hundredth:

7. $5 - 2.646$

10. $-7 - 4.930$

12. -3.4 ± 6.132

8. $-2 + 5.975$

11. 6 ± 5.701

13. $\frac{-5 \pm 2.881}{2}$

9. $3 + 8.614$

Solve, giving irrational answers to the nearest hundredth:

14. $y^2 = 6y - 3$

16. $y^2 = 1.2y + .8$

18. $y^2 = y + 6$

15. $b^2 = 8b - 4$

17. $a^2 = 2.4a - 1$

19. $x^2 + x - 1 = 0$

Exercises [A-2]

Solve by completing the square, leaving irrational answers in simplest radical form:

1. $y^2 + 8y = 2$

3. $a^2 = 6 - 10a$

5. $z^2 = 11z + 4$

2. $z^2 + 10z = 24$

4. $y^2 = 5y - 2$

6. $y^2 + 25y + 50 = 0$

Carry out the indicated operations, writing results to the nearest hundredth:

7. $5 + 2.646$

9. $3 - 8.614$

11. -2.5 ± 1.520

8. $-2 - 5.975$

10. $-7 + 4.930$

12. $\frac{4 \pm 3.162}{2}$

Exercises [A]

Solve, giving irrational answers in simplest radical form:

1. $2x^2 - 3x - 6 = 0$

5. $7z = 2z^2 + 1$

2. $2k^2 + 5k = 9$

6. $5x^2 = 20x + 6$

3. $4y^2 = 8y - 3$

7. $3x^2 - 5x + 1 = 0$

4. $3x^2 = 7x + 6$

8. $4y^2 = y + 4$

Solve, giving irrational answers to the nearest hundredth:

9. $2x^2 + 7x + 4 = 0$

13. $4c^2 + .8c - 2 = 0$

10. $2z^2 - 2.4z = 2$

14. $16y^2 = 8y - 1$

11. $4x^2 - 2x - 3 = 0$

15. $2b^2 - 4b = .4$

12. $4y^2 = 60y - 45$

16. $3x^2 + 9x = 6$

Solution by Formula

We have noted that all quadratic equations can be arranged in the form

$$ax^2 + bx + c = 0,$$

where a, b, c are integers and $a \neq 0$. It follows, therefore, that any conclusion we can reach about this form, $ax^2 + bx + c = 0$, will be a valid conclusion for *any* quadratic equation. We proceed to solve this equation for x . This is done by the method of the preceding section.

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Example. Solve the equation $2x^2 + 1 = 7x$ by using the formulas (1).

Solution: By the Subtraction Rule we may write

$$2x^2 - 7x + 1 = 0$$

Since this is now in the type form $ax^2 + bx + c = 0$ we see that $a = 2$, $b = -7$, $c = 1$.

Substituting these values for a , b , and c in the formula, we have

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{7 \pm \sqrt{49 - 8}}{4} = \frac{7 \pm \sqrt{41}}{4}$$

Exercises ^(A-1)

Solve by the formula, giving irrational answers in simplest radical form:

1. $x^2 + 3x + 1 = 0$

6. $18z^2 + 44z = 45$

2. $2x^2 + 3 = 8x$

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

3. $3x^2 - 2 = 11x$

4. $9x = 4x^2 + 2$

8. $\frac{2x}{x+1} - \frac{x+1}{x} = 0$

5. $4y^2 = 3 - 13y$

Solve by the formula, giving irrational answers to the nearest hundredth:

9. $16y^2 - 8y - 1 = 0$

13. $5x^2 - 7x - 2 = 0$

10. $x^2 + 24x = 36$

14. $x^2 = 3x + 6$

11. $x^2 + 5x + 3 = 0$

12. $12x^2 + 6x = 5$

15. $2y^2 - 1.6y - 1.2 = 0$

Exercises ^(A-2)

Solve by the formula, giving irrational answers in simplest radical form:

1. $z^2 + 2z - 1 = 0$

5. $6x^2 + 10 = 19x$

2. $5k^2 = 11k + 3$

6. $x = \frac{7}{x-4}$

3. $7y^2 = 5 - 6y$

7. $\frac{2}{z+2} - \frac{1}{z-4} = 2$

4. $3x^2 - 10x = 3$

Solve by the formula, giving irrational answers to the nearest hundredth:

8. $x^2 - x - 3 = 0$

12. $15k^2 = 13k - 2$

9. $4z^2 - 16z + 13 = 0$

13. $5y^2 + 6y = .2$

10. $2z^2 + 5 = 8z$

14. $5c^2 - 7c = 1$

11. $5b^2 = 1 + 6b$

15. $x^2 - 50x - 100 = 0$

Exercises ^[A-1]

Solve by the simplest method, giving irrational answers to the nearest hundredth:

1. $2x^2 - 5x + 2 = 0$

2. $3z^2 - 5z = -2$

3. $3y^2 = 5y - 1$

4. $5t^2 + 9t + 3 = 0$

5. $6p^2 = 5p + 2$

6. $25b^2 + 10b + 1 = 0$

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

8. $5(z^2 + 2) - 9(z + 1) = 1$

9. $y^2 = 1.9y - .8$

10. $x^2 - .06x = .9991$

11. $x^2 - 15x + 52 = 0$

12. $3p(p + 7) = 2p - 22$

13. $\frac{x+2}{x-2} + \frac{x-2}{x+2} = 4$

14. $\frac{2x-5}{3x+5} - \frac{x+1}{5x-1} = 0$

Exercises ^[A-2]

Solve by the simplest method, giving irrational answers to the nearest hundredth:

1. $y^2 + 4y = 9$

2. $2x^2 + 1 = 6x$

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

4. $4x^2 - 7 = 0$

5. $9x^2 + 11 = 20x$

6. $2y^2 + 4y = 5$

7. $y^2 - 6y - 2 = 0$

8. $.7a^2 - 2.8a = 7$

9. $.2x^2 - .76x + .7 = 0$

10. $.9x^2 + 3.6x = -3.2$

11. $2x^2 - 42x = -200$

12. $y - 1 = \frac{4}{3y}$

13. $\frac{1}{x-1} - \frac{3}{8} = \frac{2}{2x+1}$

14. $\frac{3z}{2z+1} - \frac{2z}{3z-1} = 1$

Exercises ^[B]

Solve by the simplest method, giving irrational answers to the nearest hundredth:

1. $y^2 + 104y + 2700 = 0$

2. $5x^2 = \frac{1}{3}(40x + 200)$

3. $\frac{2}{y-2} = \frac{1}{2y-5} - \frac{2}{y-1}$

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

5. $\frac{a-1}{3a+2} = 2 - \frac{3a+2}{a-1}$

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

Page 465

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|--------------------------------------|--|---------------------------------|
| 1. 1; a + 1 | 8. $\frac{49}{4}$; x - $\frac{7}{2}$ | 15. $\frac{5}{2} \pm \sqrt{17}$ |
| 2. 1; b - 1 | 9. $\frac{9}{64}$; y + $\frac{3}{8}$ | 16. 0, 5 |
| 3. $\frac{1}{4}$; c + $\frac{1}{2}$ | 10. $\frac{1}{16}$; w - $\frac{1}{4}$ | 17. 0, 4 |
| 4. $\frac{1}{4}$; d - $\frac{1}{2}$ | 11. $+\sqrt{6}$, $-\sqrt{6}$ | 18. ±2 |
| 5. $\frac{9}{4}$; m + $\frac{3}{2}$ | 12. 0, 5 | 19. $9 \pm 2\sqrt{3}$ |
| 6. $\frac{9}{4}$; n - $\frac{3}{2}$ | 13. -1, 6 | 20. $9 \pm 2\sqrt{3}$ |
| 7. $\frac{1}{9}$; p + $\frac{1}{3}$ | 14. $-1\frac{1}{2}$, $6\frac{1}{2}$ | 21. 1, 5 |
| | | 22. $3 \pm \sqrt{5}$ |

Page 467 (middle)

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|---------------------------------|------------------|-----------------|
| 1. -1, 5 | 7. 2.35 | 15. 0.54, 7.46 |
| 2. $6 \pm 4\sqrt{2}$ | 8. 3.98 | 16. -0.48, 1.68 |
| 3. $3 \pm \sqrt{26}$ | 9. 11.61 | 17. 0.54, 1.86 |
| 4. $\frac{-3 \pm \sqrt{17}}{2}$ | 10. -11.93 | 18. -2, 3 |
| 5. $\frac{7 \pm \sqrt{57}}{2}$ | 11. 11.70, 0.30 | 19. 0.62, -1.62 |
| 6. $\frac{1 \pm \sqrt{13}}{2}$ | 12. 2.73, -9.53 | |
| | 13. -1.06, -3.94 | |
| | 14. 5.45, 0.55 | |

86 - Answers to Problems in Text

Pages 467-468

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|-----------------------------------|------------------|------------------|
| 1. $-4 \pm 3\sqrt{2}$ | 7. 7.65 | 13. -5.36, 3.36 |
| 2. -12, 2 | 8. -7.98 | 14. 4, 10 |
| 3. $-5 \pm \sqrt{31}$ | 9. -5.61 | 15. -7.28, 0.28 |
| 4. $\frac{5 \pm \sqrt{17}}{2}$ | 10. -2.07 | 16. -1.0, 0.2 |
| 5. $\frac{11 \pm \sqrt{137}}{2}$ | 11. -0.98, -4.02 | 17. -8.65, -0.35 |
| 6. $\frac{-25 \pm 5\sqrt{17}}{2}$ | 12. 3.58, 0.42 | 18. -5.85, -0.85 |

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|----------------------------------|----------------------------------|-------------------|
| 1. $\frac{3 \pm \sqrt{67}}{4}$ | 6. $2 \pm \frac{1}{5}\sqrt{130}$ | 11. -0.65, 1.15 |
| 2. $\frac{-5 \pm \sqrt{97}}{4}$ | 7. $\frac{5 \pm \sqrt{13}}{6}$ | 12. 0.79, 14.21 |
| 3. $\frac{1}{2}$, $\frac{1}{2}$ | 8. $\frac{1 \pm \sqrt{65}}{8}$ | 13. -0.81, 0.61 |
| 4. $\frac{2}{3}$, 3 | 9. -2.78, -0.72 | 14. $\frac{1}{4}$ |
| 5. $\frac{7 \pm \sqrt{41}}{4}$ | 10. -0.57, 1.77 | 15. -0.10, 2.10 |
| | | 16. -3.56, 0.56 |

Page 470 (middle)

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|-----------------------------------|-------------------------------------|------------------|
| 1. $\frac{-3 \pm \sqrt{5}}{2}$ | 6. $\frac{-22 \pm \sqrt{1294}}{18}$ | 11. -4.30, -0.70 |
| 2. $\frac{4 \pm \sqrt{10}}{2}$ | 7. $\frac{8 \pm 4\sqrt{10}}{3}$ | 12. -0.94, 0.44 |
| 3. $\frac{11 \pm \sqrt{145}}{6}$ | 8. $1 \pm \sqrt{2}$ | 13. 1.64, -0.24 |
| 4. $\frac{1}{4}$, 2 | 9. 0.60, -0.10 | 14. 4.37, -1.37 |
| 5. $\frac{-13 \pm \sqrt{217}}{8}$ | 10. 1.42, -25.42 | 15. 1.27, -0.47 |

Answers to Problems in Text - 87

Page 472 (middle)

- | | | |
|----------------------|----------------------------------|-----------------|
| 1. -5.61, 1.61 | 6. -2.87, 0.87 | 11. 7.30, 13.70 |
| 2. 0.18, 2.82 | 7. -0.32, 6.32 | 12. -0.76, 1.76 |
| 3. 0, 4 | 8. -1.74, 5.74 | 13. -1.89, 2.39 |
| 4. 1.32, -1.32 | 9. 1.57, 2.23 | 14. -6.16, 0.16 |
| 5. $1, \frac{11}{9}$ | 10. $-\frac{24}{9}, \frac{4}{3}$ | |

Page 472 (bottom)

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|----------------|-----------------|-------------------|
| 1. -54, -50 | 3. 1.53, 2.61 | 5. $-\frac{3}{2}$ |
| 2. -2.55, 5.22 | 4. -2.55, -0.78 | 6. -16.66, 0.66 |

Page 473 (top)

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|--------------------------------|-------------------------|
| 1. 8.5 in., 13.5 in., 10.5 in. | 5. 2.6 sec., 11.4 sec. |
| 2. 8.7 in., 14.5 in. | 6. 0.9 in. |
| 3. 28.6 ft. | 7. 35 m.p.h., 50 m.p.h. |
| 4. 2.6 sec. | 8. 1.4 in., 6.6 in. |

Pages 473-474

- | | |
|--------------------------------------|---------------------|
| 1. Altitude, 6.1 in.; base, 13.1 in. | 5. 8.8 in. |
| 2. 0.8 ft. | 6. 88 yd. x 110 yd. |
| 3. 16.2 in. | 7. 4.4 in. |
| 4. a. 40 ft. b. 68.3 or 11.7 ft. | |

Pages 474-475

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|---------------|------------------|-------------------------|
| 1. 54 | 4. 1.5 in. | 7. 180 m.p.h. |
| 2. 14 | 5. 6.9 ft. | 8. 516 ft. or 15484 ft. |
| 3. Impossible | 6. 1879.1 sq.in. | 9. 64000 ft. |

Page 475

1. $x = 3, y = 3; x = -3, y = -3$
2. $x = 4, y = 3; x = -5, y = 0$
3. $a = 3, b = 12; a = 12, b = 3$
4. $x = 5, y = 4; x = 4, y = 5$
5. $x = 10, y = 6; x = -6, y = -10$
6. $x = 11, y = 7; x = -7, y = -11$
7. $a = \frac{5}{6}, b = -\frac{1}{4}$
8. $x = 20\sqrt{2}, y = 10\sqrt{2}; x = -20\sqrt{2}, y = 10\sqrt{2}$
9. $a = 10, b = 25; a = -10, b = -25$
10. $p = 3, q = 4$
11. $d = 12 + 6\sqrt{2}, s = 6 + 6\sqrt{2}; d = 12 - 6\sqrt{2}, s = 6 - 6\sqrt{2}$
12. $x = 2 + 3\sqrt{2}, y = 4 - 3\sqrt{2}; x = 2 - 3\sqrt{2}, y = 4 + 3\sqrt{2}$

Page 476 (top)

1. $x = 9\sqrt{5}, y = 3\sqrt{5}; x = -9\sqrt{5}, y = -3\sqrt{5}$
2. $b = 6, h = 4; b = -4, h = -6$
3. $x = 7, y = 9; x = -9, y = -7$
4. $p = 15, q = 13; p = 13, q = 15$
5. $c = 7, d = 4; c = 4, d = 7$
6. $y = 11, z = 5$

86 - Answers to Problems in Text

Pages 467-468

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|-----------------------------------|------------------|------------------|
| 1. $-4 \pm 3\sqrt{2}$ | 7. 7.65 | 13. -5.36, 3.36 |
| 2. -12, 2 | 8. -7.98 | 14. 4, 16 |
| 3. $-5 \pm \sqrt{31}$ | 9. -5.61 | 15. -7.28, 0.28 |
| 4. $\frac{5 \pm \sqrt{17}}{2}$ | 10. -2.07 | 16. -1.0, 0.2 |
| 5. $\frac{11 \pm \sqrt{137}}{2}$ | 11. -0.98, -4.02 | 17. -8.65, -0.35 |
| 6. $-\frac{25 \pm 5\sqrt{17}}{2}$ | 12. 3.58, 0.42 | 18. -5.85, -0.85 |

Page 468

- | | | |
|---------------------------------|----------------------------------|-------------------|
| 1. $\frac{3 \pm \sqrt{57}}{4}$ | 6. $2 \pm \frac{1}{5}\sqrt{130}$ | 11. -0.85, 1.15 |
| 2. $\frac{-5 \pm \sqrt{97}}{4}$ | 7. $\frac{5 \pm \sqrt{13}}{6}$ | 12. 0.79, 14.21 |
| 3. $\frac{1}{2}, 1\frac{1}{2}$ | 8. $\frac{1 \pm \sqrt{65}}{8}$ | 13. -0.81, 0.61 |
| 4. $-\frac{2}{3}, 3$ | 9. -2.78, -0.72 | 14. $\frac{1}{4}$ |
| 5. $\frac{7 \pm \sqrt{41}}{4}$ | 10. -0.57, 1.77 | 15. -0.10, 2.10 |
| | | 16. -3.56, 0.56 |

Page 470 (middle)

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|-----------------------------------|-------------------------------------|------------------|
| 1. $\frac{-3 \pm \sqrt{5}}{2}$ | 6. $\frac{-22 \pm \sqrt{1294}}{18}$ | 11. -4.30, -0.70 |
| 2. $\frac{4 \pm \sqrt{10}}{2}$ | 7. $\frac{8 \pm 4\sqrt{10}}{3}$ | 12. -0.94, 0.44 |
| 3. $\frac{11 \pm \sqrt{145}}{6}$ | 8. $1 \pm \sqrt{2}$ | 13. 1.64, -0.24 |
| 4. $\frac{1}{4}, 2$ | 9. 0.60, -0.10 | 14. 4.37, -1.37 |
| 5. $\frac{-13 \pm \sqrt{217}}{8}$ | 10. 1.42, -25.42 | 15. 1.27, -0.47 |

Page 470 (bottom)

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|-----------------------------------|--------------------------------|--------------------------------|
| 1. $-1 \pm \sqrt{2}$ | 6. $2 \pm \sqrt{11}$ | 11. 1.35, -0.15 |
| 2. $\frac{11 \pm \sqrt{181}}{10}$ | 7. $\frac{5 \pm \sqrt{73}}{4}$ | 12. $\frac{1}{5}, \frac{2}{3}$ |
| 3. $\frac{-3 \pm 2\sqrt{11}}{7}$ | 8. 2.30, -1.30 | 13. -1.23, 0.03 |
| 4. $\frac{5 \pm \sqrt{34}}{3}$ | 9. 2.87, 1.13 | 14. 1.53, -0.13 |
| 5. $\frac{2}{3}, \frac{5}{2}$ | 10. 3.22, 0.78 | 15. -1.93, 51.93 |

Page 472 (top)

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|---------------------|---------------------|------------------|
| 1. $\frac{1}{2}, 2$ | 5. 1.13, -0.30 | 10. -0.97, 1.03 |
| 2. $\frac{2}{3}, 1$ | 6. $-\frac{1}{5}$ | 11. 5.44, 9.56 |
| 3. 1.43, 0.23 | 7. -1.14, 6.14 | 12. -4.81, -1.53 |
| 4. -1.3E, -0.44 | 8. $0, \frac{9}{5}$ | 13. 3.46, -3.46 |
| | 9. 1.27, 0.63 | 14. 0, 5 |