Answers to Unit 11

SECTION 1 Pages 385–388

Example 2

$-5\sqrt{32} = -5\sqrt{2^5} = -5\sqrt{2^4 \cdot 2} = -5\sqrt{2^4}\sqrt{2} = -5 \cdot 2^2\sqrt{2} = -20\sqrt{2}$

Example 4

$\sqrt{216} = \sqrt{2^3 \cdot 3^3} = \sqrt{2^2 \cdot 3^2(2 \cdot 3)} = \sqrt{2^2 \cdot 3^2}\sqrt{2 \cdot 3} = 2 \cdot 3\sqrt{2 \cdot 3} = 6\sqrt{6} \approx 6(2.499) \approx 14.694$

Example 6

$\sqrt{y^{19}} = \sqrt{y^{18} \cdot y} = \sqrt{y^{18}}\sqrt{y} = y^9\sqrt{y}$

Example 8

$\sqrt{45b^7} = \sqrt{3^2 \cdot 5 \cdot b^7} = \sqrt{3^2b^6(5 \cdot b)} = \sqrt{3^2b^6}\sqrt{5b} = 3b^3\sqrt{5b}$

Example 10

$3a\sqrt{28a^9b^{18}} = 3a\sqrt{2^2 \cdot 7 \cdot a^9 \cdot b^{18}}$
$3a\sqrt{2^2a^8b^{18}(7a)} = 3a\sqrt{2^2a^8b^{18}}\sqrt{7a} =$
$3a \cdot 2 \cdot a^4 \cdot b^9\sqrt{7a} = 6a^5b^9\sqrt{7a}$

Example 12

$\sqrt{25(a-3)^2} = \sqrt{5^2(a-3)^2} = 5(a-3) = 5a - 15$

Example 14

$\sqrt{x^2 - 14x + 49} = \sqrt{(x-7)^2} = x - 7$

Pages 389–390

1. 4 **3.** 7 **5.** $4\sqrt{2}$ **7.** $2\sqrt{2}$ **9.** $18\sqrt{2}$ **11.** $10\sqrt{10}$ **13.** $\sqrt{15}$ **15.** $\sqrt{29}$ **17.** $-54\sqrt{2}$ **19.** $3\sqrt{5}$
21. 0 **23.** $48\sqrt{2}$ **25.** $\sqrt{105}$ **27.** 30 **29.** $30\sqrt{5}$ **31.** $5\sqrt{10}$ **33.** $4\sqrt{6}$ **35.** 18 **37.** 15.492
39. 16.968 **41.** 16 **43.** 16.585 **45.** 15.652 **47.** 18.76 **49.** x^3 **51.** $y^7\sqrt{y}$ **53.** a^{10} **55.** x^2y^2
57. $2x^2$ **59.** $2x\sqrt{6}$ **61.** $xy^3\sqrt{xy}$ **63.** $ab^5\sqrt{ab}$ **65.** $2x^2\sqrt{15x}$ **67.** $7a^2b^4$ **69.** $3x^2y^3\sqrt{2xy}$
71. $2x^5y^3\sqrt{10xy}$ **73.** $4a^4b^5\sqrt{5a}$ **75.** $8ab\sqrt{b}$ **77.** x^3y **79.** $8a^2b^3\sqrt{5b}$ **81.** $6x^2y^3\sqrt{3y}$ **83.** $4x^3y\sqrt{2y}$
85. $5a + 20$ **87.** $2x^2 - 8x + 8$ **89.** $x + 2$ **91.** $y - 1$ **93.** $x - 4$

SECTION 2 Pages 391–392

Example 2

$9\sqrt{3} + 3\sqrt{3} - 18\sqrt{3} = -6\sqrt{3}$

Example 4

$2\sqrt{50} - 5\sqrt{32} = 2\sqrt{2 \cdot 5^2} - 5\sqrt{2^5} =$
$2\sqrt{5^2}\sqrt{2} - 5\sqrt{2^4}\sqrt{2} = 2 \cdot 5\sqrt{2} - 5 \cdot 2^2\sqrt{2} =$
$10\sqrt{2} - 20\sqrt{2} = -10\sqrt{2}$

Example 6

$y\sqrt{28y} + 7\sqrt{63y^3} = y\sqrt{2^2 \cdot 7y} + 7\sqrt{3^2 \cdot 7 \cdot y^3} =$
$y\sqrt{2^2}\sqrt{7y} + 7\sqrt{3^2 \cdot y^2}\sqrt{7y} =$
$y \cdot 2\sqrt{7y} + 7 \cdot 3 \cdot y\sqrt{7y} = 2y\sqrt{7y} + 21y\sqrt{7y} =$
$23y\sqrt{7y}$

Example 8

$2\sqrt{27a^5} - 4a\sqrt{12a^3} + a^2\sqrt{75a} =$
$2\sqrt{3^3 \cdot a^5} - 4a\sqrt{2^2 \cdot 3 \cdot a^3} + a^2\sqrt{3 \cdot 5^2 \cdot a} =$
$2\sqrt{3^2 \cdot a^4}\sqrt{3a} - 4a\sqrt{2^2 \cdot a^2}\sqrt{3a} + a^2\sqrt{5^2}\sqrt{3a} =$
$2 \cdot 3 \cdot a^2\sqrt{3a} - 4a \cdot 2 \cdot a\sqrt{3a} + a^2 \cdot 5\sqrt{3a} =$
$6a^2\sqrt{3a} - 8a^2\sqrt{3a} + 5a^2\sqrt{3a} = 3a^2\sqrt{3a}$

Pages 393–394

1. $3\sqrt{2}$ **3.** $-\sqrt{7}$ **5.** $-11\sqrt{11}$ **7.** $10\sqrt{x}$ **9.** $-2\sqrt{y}$ **11.** $-11\sqrt{3b}$ **13.** $2x\sqrt{2}$ **15.** $-3a\sqrt{3a}$
17. $-5\sqrt{xy}$ **19.** $8\sqrt{5}$ **21.** $8\sqrt{2}$ **23.** $15\sqrt{2} - 10\sqrt{3}$ **25.** $\sqrt{x}$ **27.** $-12x\sqrt{3}$ **29.** $2xy\sqrt{x} - 3xy\sqrt{y}$
31. $-9x\sqrt{3x}$ **33.** $-13y^2\sqrt{2y}$ **35.** $4a^2b^2\sqrt{ab}$ **37.** $7\sqrt{2}$ **39.** $6\sqrt{x}$ **41.** $-3\sqrt{y}$ **43.** $-45\sqrt{2}$
45. $13\sqrt{3} - 12\sqrt{5}$ **47.** $32\sqrt{3} - 3\sqrt{11}$ **49.** $6\sqrt{x}$ **51.** $-34\sqrt{3x}$ **53.** $10a\sqrt{3b} + 10a\sqrt{5b}$
55. $-2xy\sqrt{3}$ **57.** $-7b\sqrt{ab} + 4a\sqrt{ab}$ **59.** $3ab\sqrt{2a} - ab + 4ab\sqrt{3b}$

SECTION 3

Pages 395–398

Example 2

$\sqrt{5a}\sqrt{15a^3b^4}\sqrt{3b^5} = \sqrt{225a^4b^9} = \sqrt{3^2 5^2 a^4 b^9} =$
$\sqrt{3^2 5^2 a^4 b^8}\sqrt{b} = 3 \cdot 5a^2b^4\sqrt{b} = 15a^2b^4\sqrt{b}$

Example 4

$\sqrt{5x}(\sqrt{5x} - \sqrt{25y}) = \sqrt{5^2x^2} - \sqrt{5^3xy} =$
$\sqrt{5^2x^2} - \sqrt{5^2}\sqrt{5xy} = 5x - 5\sqrt{5xy}$

Example 6

$(2\sqrt{x} + 7)(2\sqrt{x} - 7) = 4\sqrt{x^2} - 7^2 = 4x - 49$

Example 8

$(3\sqrt{x} - \sqrt{y})(5\sqrt{x} - 2\sqrt{y}) =$
$15\sqrt{x^2} - 6\sqrt{xy} - 5\sqrt{xy} + 2\sqrt{y^2} =$
$15\sqrt{x^2} - 11\sqrt{xy} + 2\sqrt{y^2} =$
$15x - 11\sqrt{xy} + 2y$

Example 10

$\frac{\sqrt{15x^6y^7}}{\sqrt{3x^7y^9}} = \sqrt{\frac{15x^6y^7}{3x^7y^9}} = \sqrt{\frac{5}{xy^2}} =$
$\frac{\sqrt{5}}{y\sqrt{x}} = \frac{\sqrt{5}}{y\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} = \frac{\sqrt{5x}}{xy}$

Example 12

$\frac{\sqrt{y}}{\sqrt{y}+3} = \frac{\sqrt{y}}{\sqrt{y}+3} \cdot \frac{\sqrt{y}-3}{\sqrt{y}-3} = \frac{y - 3\sqrt{y}}{y - 9}$

Example 14

$\frac{\sqrt{27x^3} - 3\sqrt{12x}}{\sqrt{3x}} = \frac{\sqrt{27x^3}}{\sqrt{3x}} - \frac{3\sqrt{12x}}{\sqrt{3x}} = \sqrt{\frac{27x^3}{3x}} - 3\sqrt{\frac{12x}{3x}} =$
$\sqrt{9x^2} - 3\sqrt{4} = \sqrt{3^2x^2} - 3\sqrt{2^2} = 3x - 3 \cdot 2 = 3x - 6$

Pages 399–400

1. 5 **3.** 6 **5.** x **7.** x^3y^2 **9.** $3ab^6\sqrt{2a}$ **11.** $12a^4b\sqrt{b}$ **13.** $2 - \sqrt{6}$ **15.** $x - \sqrt{xy}$
17. $5\sqrt{2} - \sqrt{5x}$ **19.** $4 - 2\sqrt{10}$ **21.** $x - 6\sqrt{x} + 9$ **23.** $3a - 3\sqrt{ab}$ **25.** $10abc$
27. $15x - 22y\sqrt{x} + 8y^2$ **29.** $x - y$ **31.** $10x + 13\sqrt{xy} + 4y$ **33.** 4 **35.** 7 **37.** 3 **39.** $x\sqrt{5}$ **41.** $\frac{a^2}{7}$
43. $\frac{\sqrt{3}}{3}$ **45.** $\frac{3\sqrt{x}}{x}$ **47.** $\frac{2\sqrt{y}}{xy}$ **49.** $\frac{2\sqrt{3x}}{3y}$ **51.** $-\frac{\sqrt{2}+3}{7}$ **53.** $\frac{15 - 3\sqrt{5}}{20}$ **55.** $\frac{x\sqrt{y} + y\sqrt{x}}{x - y}$ **57.** -5 **59.** $\frac{7}{4}$
61. $-x^2$

SECTION 4

Pages 401–402

Example 2

$\sqrt{4x} + 3 = 7$
$\sqrt{4x} = 4$
$(\sqrt{4x})^2 = 4^2$
$4x = 16$
$x = 4$

The solution is 4.

Check: $\sqrt{4x} + 3 = 7$
$\sqrt{4 \cdot 4} + 3 = 7$
$\sqrt{4^2} + 3 = 7$
$4 + 3 = 7$
$7 = 7$

Example 4

$\sqrt{3x - 2} - 5 = 0$
$\sqrt{3x - 2} = 5$
$(\sqrt{3x - 2})^2 = 5^2$
$3x - 2 = 25$
$3x = 27$
$x = 9$

The solution is 9.

Check: $\sqrt{3x - 2} - 5 = 0$
$\sqrt{3 \cdot 9 - 2} - 5 = 0$
$\sqrt{27 - 2} - 5 = 0$
$\sqrt{25} - 5 = 0$
$\sqrt{5^2} - 5 = 0$
$5 - 5 = 0$
$0 = 0$

Example 6

Strategy

To find the length of the pendulum, replace T in the equation with the given value and solve for L.

Solution

$$T = 2\pi\sqrt{\frac{L}{32}}$$
$$2.5 = 2(3.14)\sqrt{\frac{L}{32}}$$
$$2.5 = 6.28\sqrt{\frac{L}{32}}$$
$$\frac{2.5}{6.28} = \sqrt{\frac{L}{32}}$$
$$\left(\frac{2.5}{6.28}\right)^2 = \left(\sqrt{\frac{L}{32}}\right)^2$$
$$\frac{6.25}{39.4384} = \frac{L}{32}$$
$$(32)\left(\frac{6.25}{39.4384}\right) = (32)\left(\frac{L}{32}\right)$$
$$\frac{200}{39.4384} = L$$
$$5.07 \approx L$$

The length of the pendulum is 5.07 ft.

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1. The solution is 25. **3.** The solution is 144. **5.** The solution is 5. **7.** The solution is 16. **9.** The solution is 8. **11.** The equation has no solution. **13.** The solution is 6. **15.** The solution is 24. **17.** The solution is -1. **19.** The solution is $-\frac{2}{5}$. **21.** The solution is $\frac{4}{3}$. **23.** The solution is 15. **25.** The solution is 5. **27.** The solution is 1. **29.** The solution is 1.

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1. The number is 5. **3.** The height of the periscope must be 12.76 ft above the water. **5.** The object fell 64 ft. **7.** The height of the bridge is 36 ft. **9.** The length of the pendulum is 3.25 ft.

REVIEW/TESTS
Pages 405–406

1.1a $3\sqrt{5}$ **1.1b** $5\sqrt{3}$ **1.1c** 11.180 **1.2a** $11x^4y$ **1.2b** $6x^3y\sqrt{2x}$ **1.2c** $4a^2b^5\sqrt{2ab}$ **2.1a** $5\sqrt{y}$ **2.1b** $-5\sqrt{2}$ **2.1c** $21\sqrt{2y} - 12\sqrt{2x}$ **2.1d** $-2xy\sqrt{3xy} - 3xy\sqrt{xy}$ **3.1a** $4x^2y^2\sqrt{5y}$ **3.1b** $6x^2y\sqrt{y}$ **3.1c** $a - \sqrt{ab}$ **3.1d** $y + 2\sqrt{y} - 15$ **3.2a** 9 **3.2b** $7ab\sqrt{a}$ **3.2c** $\sqrt{3} + 1$ **3.2d** $x - 4$ **4.1a** The solution is 11. **4.1b** The solution is 25. **4.2a** The larger integer is 51. **4.2b** The length of the pendulum is 7.30 ft.

Pages 407–408

1.1a c **1.1b** a **1.1c** c **1.2a** d **1.2b** a **1.2c** c **2.1a** d **2.1b** a **2.1c** a **2.1d** d **3.1a** d **3.1b** b **3.1c** b **3.1d** c **3.2a** d **3.2b** b **3.2c** d **3.2d** a **4.1a** d **4.1b** c **4.2a** d **4.2b** b