

KEY

Name: _____

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UNIT 3 - Review 3.1 - Radical Expressions

Directions: Perform any operations indicated, then make sure your answer is fully simplified. Also, make sure all denominators are rationalized properly and fully simplified!

<p>1.) $\sqrt{15} \cdot \sqrt{3}$</p> $\sqrt{45}$ $\sqrt{9 \cdot 5} \rightarrow \boxed{3\sqrt{5}}$	<p>2.) $\sqrt[3]{36} \cdot \sqrt[3]{6}$</p> $\sqrt[3]{216} = \boxed{6}$
<p>3.) $\sqrt{32x^6y^5}$</p> $\sqrt{16 \cdot 2}$ $\boxed{4x^3y^2\sqrt{2y}}$	<p>4.) $\sqrt[3]{375x^7y^9}$</p> $\sqrt[3]{125 \cdot 3}$ $\boxed{5x^2y^3\sqrt[3]{3x}}$
<p>5.) $-3\sqrt{18} \cdot 2\sqrt{24}$</p> $-6\sqrt{432}$ $-6\sqrt{144 \cdot 3}$ $-6 \cdot 12\sqrt{3}$ $\boxed{-72\sqrt{3}}$	<p>6.) $\sqrt[3]{-200x} \cdot \sqrt[3]{5x^5}$</p> $\sqrt[3]{-1000x^6}$ $\boxed{-10x^2}$
<p>7.) $\sqrt{6m^3n^3} \cdot \sqrt{12m^4n}$</p> $\sqrt{72m^7n^4}$ $\sqrt{36 \cdot 2}$ $\boxed{6m^3n^2\sqrt{2m}}$	<p>8.) $\frac{\sqrt{480m^4}}{\sqrt{5m}} = \sqrt{96m^3}$</p> $\sqrt{16 \cdot 6}$ $\boxed{4m\sqrt{6m}}$

$$9.) -2\sqrt[3]{12x^5y} \cdot 3\sqrt[3]{9x^4y^5}$$

$$-6\sqrt[3]{108x^9y^6}$$

$$-6\sqrt[3]{27 \cdot 4}$$

$$-6 \cdot 3\sqrt[3]{4}$$

$$\boxed{-18x^3y^2\sqrt[3]{4}}$$

$$10.) \frac{\sqrt[3]{160x^4y^{13}}}{\sqrt[3]{4x^2y^3}} = \sqrt[3]{40x^2y^{10}}$$

$$\sqrt[3]{8.5}$$

$$\boxed{2y^3\sqrt[3]{5x^2y}}$$

$$11.) \frac{10}{\sqrt{2x}} \cdot \frac{\sqrt{2x}}{\sqrt{2x}}$$

$$\frac{10\sqrt{2x}}{2x} = \boxed{\frac{5\sqrt{2x}}{x}}$$

$$12.) \frac{12}{\sqrt[3]{3m^2}} \cdot \frac{\sqrt[3]{9m}}{\sqrt[3]{9m}}$$

$$\frac{12\sqrt[3]{9m}}{3m} = \boxed{\frac{4\sqrt[3]{9m}}{m}}$$

13.) Given that the base of a triangle is $\sqrt{6}$ cm and the area is $\sqrt{14}$ cm². Find the height.

$$\sqrt{14} = \frac{1}{2}\sqrt{6} \cdot h$$

$$2\sqrt{14} = \sqrt{6} \cdot h$$

$$\frac{2\sqrt{14}}{\sqrt{6}} = h$$

$$\frac{2\sqrt{7}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{2\sqrt{21}}{3} \text{ cm}}$$

14.)

$$\frac{\sqrt[3]{12a^3b^3c^{10}}}{\sqrt[3]{10a^2b^3c^3}}$$

$$\frac{\sqrt[3]{6b^2c^7}}{\sqrt[3]{5a}} \cdot \frac{\sqrt[3]{25a^2}}{\sqrt[3]{25a^2}}$$

$$\frac{\sqrt[3]{150a^2b^2c^7}}{5a}$$

5a

$$\boxed{\frac{c\sqrt[3]{150a^2b^2c^2}}{5a}}$$

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UNIT 3 - Review 3.2 --- Solving Radical Equations

Directions: Complete each problem and simplify all answers completely. Also, do not forget units on word problems. Finally, you must show work to get full credit for the problem!

1.) Solve.

$$3\sqrt{x} + 3 = 21$$

$$3\sqrt{x} = 18$$

$$\sqrt{x} = 6$$

$$x = 36$$

2.) Solve.

$$\sqrt[3]{x+3} - 5 = 1$$

$$\sqrt[3]{x+3} = 6$$

$$x+3 = 216$$

$$x = 213$$

3.) Solve.

$$5 + 2\sqrt{2x-3} = 23$$

$$2\sqrt{2x-3} = 18$$

$$\sqrt{2x-3} = 9$$

$$2x-3 = 81$$

$$2x = 84$$

$$x = 42$$

4.) Solve.

$$-4\sqrt[3]{x+5} - 6 = -18$$

$$-4\sqrt[3]{x+5} = -12$$

$$\sqrt[3]{x+5} = 3$$

$$x+5 = 27$$

$$x = 22$$

5.) Solve.

$$2(x+3)^{\frac{1}{2}} - 5 = 7$$

$$2\sqrt{x+3} = 12$$

$$\sqrt{x+3} = 6$$

$$x+3 = 36$$

$$x = 33$$

6.) Solve.

$$-4(x-5)^{\frac{3}{2}} + 8 = -24$$

$$-4\sqrt{(x-5)^3} = -32$$

$$\sqrt{(x-5)^3} = 8$$

$$(x-5)^3 = 64$$

$$x-5 = 4$$

$$x = 9$$

7.) Solve.

$$6 + 2(x + 11)^{\frac{2}{3}} = 24$$

$$2 \sqrt[3]{(x+11)^2} = 18$$

$$\sqrt[3]{(x+11)^2} = 9$$

$$(x+11)^2 = 729$$

$$x+11 = 27$$

$$x+11 = -27$$

$$x = 16$$

$$x = -38$$

8.) Solve.

$$(2x - 4)^{\frac{3}{4}} - 7 = 1$$

$$\sqrt[4]{(2x-4)^3} = 8$$

$$(2x-4)^3 = 4096$$

$$2x-4 = 16$$

$$2x = 20$$

$$x = 10$$

9.) Solve.

$$x - 2 = \sqrt{4x - 8}$$

$$x^2 - 4x + 4 = 4x - 8$$

$$x^2 - 8x + 12 = 0$$

$$(x-6)(x-2) = 0$$

$$x = 6$$

$$x = 2$$

10.) Solve.

$$\sqrt{86 - 7x} = x - 6$$

$$86 - 7x = x^2 - 12x + 36$$

$$0 = x^2 - 5x - 50$$

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

$$x = 10$$

$$x = -5$$

11.) Solve.

$$-3 + \sqrt{4x + 12} = x$$

$$\sqrt{4x + 12} = x + 3$$

$$4x + 12 = x^2 + 6x + 9$$

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

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

$$\boxed{x = -3} \quad \boxed{x = 1}$$

12.) Solve.

$$2 = \sqrt{2x + 3} - x$$

$$x + 2 = \sqrt{2x + 3}$$

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

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

$$(x + 1)(x + 1) = 0$$

$$\boxed{x = -1}$$

13.) Solve.

The power P , in watts, that a circular solar cell produces and the radius of the cell, r in centimeters are related by the equation $r = \sqrt{\frac{P}{0.02\pi}}$. About how much power (P) is produced by a cell with a radius (r) of 10 cm? Round to the nearest hundredth.

$$10 = \sqrt{\frac{P}{0.02\pi}}$$

$$100 = \frac{P}{0.02\pi}$$

$$\boxed{P = 6.28 \text{ watts}}$$

14.) Solve.

A spherical water tank holds 5000 ft³ of water. What is the diameter of the tank to the nearest tenth of a foot?

(Hint: $V = \frac{\pi}{6}d^3$)

$$5000 = \frac{\pi}{6}d^3$$

$$30000 = \pi d^3$$

$$\sqrt[3]{\frac{30000}{\pi}} = \sqrt[3]{d^3}$$

$$\boxed{d = 21.2 \text{ Ft}}$$

15.) Solve.

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

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

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

$$x - 3 = 2\sqrt{x}$$

$$x^2 - 6x + 9 = 4x$$

$$x^2 - 10x + 9 = 0$$

$$(x-9)(x-1) = 0$$

$$x = 9$$

✓

~~$$x = 1$$~~

16.) Solve.

$$\sqrt{3x+1} = \sqrt{x+1} + 2$$

$$3x+1 = x+1 + 4\sqrt{x+1} + 4$$

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

$$(x-2)^2 = (2\sqrt{x+1})^2$$

$$x^2 - 4x + 4 = 4(x+1)$$

$$x^2 - 4x + 4 = 4x + 4$$

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

$$x(x-8) = 0$$

~~$$x = 0$$~~

$$x = 8$$

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UNIT 3 - Review 3.3 - Complex Quadratic Roots

<p>1.) Evaluate i^{39}</p> $i^{36} \cdot i^3$ $1 \cdot -i = \boxed{-i}$	<p>2.) Evaluate i^{45}</p> $i^{44} \cdot i^1$ $1 \cdot i = \boxed{i}$	<p>3.) Simplify $\sqrt{-108}$</p> $i\sqrt{36 \cdot 3}$ $\boxed{6i\sqrt{3}}$
<p>4.) Simplify $\sqrt{-12} \cdot \sqrt{-3}$</p> $i\sqrt{12} \cdot i\sqrt{3}$ $i^2\sqrt{36}$ $\boxed{-6}$	<p>5.) Simplify $\sqrt{-72} + \sqrt{-32}$</p> $i\sqrt{36 \cdot 2} + i\sqrt{16 \cdot 2}$ $6i\sqrt{2} + 4i\sqrt{2}$ $\boxed{10i\sqrt{2}}$	<p>6.) Simplify $(19 - 4i) + (3 - 7i)$</p> $\boxed{22 - 11i}$
<p>7.) Simplify $(-2 + 3i) - (7 - 8i)$</p> $-2 + 3i - 7 + 8i$ $\boxed{-9 + 11i}$	<p>8.) Simplify $3i(2 + 5i)$</p> $6i + 15i^2$ $\boxed{-15 + 6i}$	<p>9.) Simplify $(-2 + 5i)(7 - 6i)$</p> $-14 + 12i + 35i - 30i^2$ $\boxed{16 + 47i}$
<p>10.) Simplify $\frac{10}{12i}$</p> $\frac{5}{6i} \cdot \frac{i}{i}$ $\frac{5i}{6i^2}$ $\boxed{-\frac{5i}{6}}$	<p>11.) Simplify $\frac{8}{3 + 4i} \cdot \frac{3 - 4i}{3 - 4i}$</p> $\frac{24 - 32i}{9 - 16i^2}$ $\boxed{\frac{24 - 32i}{25}}$	<p>12.) Simplify $\frac{7 + i}{6 - 5i} \cdot \frac{6 + 5i}{6 + 5i}$</p> $\frac{42 + 35i + 6i + 5i^2}{36 - 25i^2}$ $\boxed{\frac{37 + 41i}{61}}$

$$\text{Quadratic Formula: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

#s 13 – 18: Solve the following quadratic equations through any method. Solutions must be fully simplified.

13.) Solve.

$$-8x = -x^2 - 15$$

$$x^2 - 8x + 15 = 0$$

$$(x-5)(x-3) = 0$$

$$x = 5 \quad x = 3$$

14.) Solve.

$$2x^2 = 150$$

$$x^2 = 75$$

$$x = \pm \sqrt{75}$$

$$x = \pm 5\sqrt{3}$$

15.) Solve.

$$3x^2 - x - 24 = 0$$

$$x = \frac{1 \pm \sqrt{(-1)^2 - 4(3)(-24)}}{2(3)}$$

$$x = \frac{1 \pm \sqrt{289}}{6}$$

$$x = 3$$

$$x = \frac{1 \pm 17}{6}$$

$$x = -\frac{8}{3}$$

16.) Solve.

$$5 + x = -x^2$$

$$x^2 + x + 5 = 0$$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(1)(5)}}{2(1)}$$

$$x = \frac{1 \pm \sqrt{-19}}{2}$$

$$x = \frac{1 \pm i\sqrt{19}}{2}$$

17.) Solve.

$$x^2 - 2x = -10$$

$$x^2 - 2x + 10 = 0$$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(10)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{-36}}{2} = \frac{2 \pm 6i}{2}$$

$$x = 1 \pm 3i$$

18.) Solve.

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

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

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(5)(5)}}{2(5)}$$

$$x = \frac{2 \pm \sqrt{-96}}{10} = \frac{2 \pm 4i\sqrt{6}}{10}$$

$$x = \frac{1 \pm 2i\sqrt{6}}{5}$$

#19 – 21: Predict how many and what type of solutions each quadratic equation will have. Find the discriminant first.

<p>19.) $x^2 - 2x + 6 = 0$</p> $(-2)^2 - 4(1)(6)$ <p>Discriminant: <u>-20</u></p> <p>How many and what type of solutions? <u>two complex solutions</u></p>	<p>20.) $8x^2 = -4x + 3$</p> $8x^2 + 4x - 3 = 0$ $(4)^2 - 4(8)(-3)$ <p>Discriminant: <u>112</u></p> <p>How many and what type of solutions? <u>two real solutions</u></p>	<p>21.) $x^2 - 10x = -25$</p> $x^2 - 10x + 25 = 0$ $(-10)^2 - 4(25)(1)$ <p>Discriminant: <u>0</u></p> <p>How many and what type of solutions? <u>one real solution.</u></p>
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<p>22.) The quadratic equation below models the height of a ball, h, in feet above the ground after t seconds of being thrown upwards. Will the ball ever reach a height of 23 feet? <i>Show all of your work.</i></p> $h = -16t^2 + 32t + 9$ $23 = -16t^2 + 32t + 9$ $0 = -16t^2 + 32t - 14$ $(32)^2 - 4(-16)(-14)$ <p>128</p> <p><u>Yes</u></p>	<p>23.) Emily and Brandon own a small workshop that produces bike helmets. Their accountant says that their yearly profits are given by the following function below, where x is the number of helmets produced and P is the profit. Their goal is to profit \$40,000, is this possible? <i>Show all of your work.</i></p> $P = -.003x^2 + 12x + 27760$ $40000 = -.003x^2 + 12x + 27760$ $0 = -.003x^2 + 12x - 12240$ $(12)^2 - 4(-.003)(-12240)$ <p>-2.88</p> <p><u>No</u></p>
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#'s 24 - 29: Given the solutions (roots) of a quadratic equation, write the quadratic equation in standard form.

24.) 7 and -4

$$x=7 \quad x=-4$$

$$(x-7)(x+4)=0$$

$$x^2 - 3x - 28 = 0$$

25.) $-\frac{6}{5}$ and 2

$$x = -\frac{6}{5} \quad x = 2$$

$$(5x+6)(x-2)=0$$

$\frac{-10x}{6x}$

$$5x^2 - 4x - 12 = 0$$

26.) $8i$ and $-8i$

$$(x-8i)(x+8i)=0$$

$$x^2 - 64i^2 = 0$$

$$x^2 + 64 = 0$$

27.) $-3i\sqrt{5}$ and $3i\sqrt{5}$

$$(x+3i\sqrt{5})(x-3i\sqrt{5})=0$$

$$x^2 - 9i^2 \cdot 5 = 0$$

$$x^2 + 45 = 0$$

28.) $\frac{-5 \pm i\sqrt{47}}{6}$

$$(5)^2 - 4(3)c = -47$$

$$25 - 12c = -47$$

$$-12c = -72$$

$$c = 6$$

$$2a = 6$$

$$a = 3$$

$$-b = -5$$

$$b = 5$$

$$3x^2 + 5x + 6 = 0$$

29.) $\frac{4 \pm 2i\sqrt{10}}{7}$

$$-40 = (-4)^2 - 4\left(\frac{7}{2}\right)c$$

$$-40 = 16 - 14c$$

$$-56 = -14c$$

$$c = 4$$

$$2a = 7$$

$$a = \frac{7}{2}$$

$$-b = 4$$

$$b = -4$$

$$\frac{7}{2}x^2 - 4x + 4 = 0$$

$$7x^2 - 8x + 8 = 0$$