Radicals Review

Name: Key

Period:__________

Solve each of the following problems. Make sure to show your work.

1. Find the following product. $\left(\sqrt{18x^5y^7}\right)\left(\sqrt{6x^6y^3}\right)$

   $\sqrt{108x^{11}y^{10}} = \boxed{6x^5y^5\sqrt{3x}}$

2. The formula $P = 4\sqrt{A}$ relates the perimeter P, in units, of a square to its area A, in square units. What is the area of the square window shown to the right?

   $24 = 4\sqrt{A}$ $\boxed{A = 36\text{ ft}^2}$

   $6 = \sqrt{A}$

   $6^2 = A$

3. How do you know if you can multiply two radicals? Give an example of a situation where you can multiply two radicals and one where you can't.

   They have the same index

   CAN CAN'T

   give an example!

4. Rewrite the following in exponential form:

   a. $\sqrt[8]{x^4}$ $x^{4/8} = x^{1/2}$

   b. $\sqrt[9]{x^3}$ $x^{3/9} = x^{1/3}$

   c. $\sqrt[5]{r^4}$ $r^{4/5}$

   Rewrite the following in radical form:

   d. $x^{\frac{1}{8}}$ $\sqrt[8]{x}$

   e. $x^{\frac{3}{7}}$ $\sqrt[7]{x^3}$

   f. $x^{-\frac{2}{3}}$ $\frac{1}{\sqrt[3]{x^2}}$

5. Evaluate $(-27)^{\frac{1}{3}}$ and $-(27)^{\frac{1}{3}}$. What do you notice and why does this happen?

$(-27)^{1/3} = -3$

$-(27)^{1/3} = -(3) = -3$

They are equal because the index is odd.

6. What is the area of a rectangle with length $\sqrt{175} in.$ and width $\sqrt{63} in.$?

$A = lw$

$A = \sqrt{175} \cdot \sqrt{63} = \sqrt{11025} = 5(3)(7) = \boxed{105\ in^2}$

175 63

25 7 9 7

5 5 3 3

7. The area of a triangle is $14\ in^2$. The height is $(4+\sqrt{3}) in.$ What is the width?

$A = \frac{1}{2}bh$

$2A = bh$

$b = \frac{2A}{h}$

$b = \frac{2(14)}{4+\sqrt{3}} \cdot \frac{(4-\sqrt{3})}{(4-\sqrt{3})}$

$= \frac{112 - 28\sqrt{3}}{16-3}$

$= \boxed{\frac{112-28\sqrt{3}}{13}\ in}$

8. The formula $\frac{\pi d^2 v}{4} = Q$ models the diameter of a pipe where Q is the maximum flow of water in a pipe, and v is the velocity of water. What is the diameter of a pipe that allows a maximum flow of $30ft^3/min$ of water flowing at a velocity of $400ft/min$? Round your answer to the nearest tenth.

$\frac{\pi d^2 v}{4} = Q$

$\pi d^2 v = 4Q$

$d^2 = \frac{4Q}{\pi v}$

$d = \sqrt{\frac{4Q}{\pi v}}$

decimal answer $d = \sqrt{\frac{4(30)}{\pi(400)}}$

$= \sqrt{\frac{120}{400\pi}}$

$\boxed{d \approx 0.3\ ft}$

9. Add or subtract the following:

a. $6x\sqrt{7} + \sqrt{112x^2}$

8 14 $\boxed{xx}$

$= 6x\sqrt{7} + 4x\sqrt{7}$

$= \boxed{10x\sqrt{7}}$

b. $3\sqrt[4]{32} - 2\sqrt[4]{162}$

4 8   9 18

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

$= 6\sqrt[4]{2} - 6\sqrt[4]{2} = \boxed{0}$

c. $\sqrt{125} - 2\sqrt{20}$

5 25   5 4

$\boxed{5\ 5}$ $\boxed{2\ 2}$

$= 5\sqrt{5} - 2(2)\sqrt{5}$

$= 5\sqrt{5} - 4\sqrt{5} = \boxed{\sqrt{5}}$

d. $3\sqrt[3]{81} - 3\sqrt[3]{3}$

9 9

$= 3(3)\sqrt[3]{3} - 3\sqrt[3]{3}$

$9\sqrt[3]{3} - 3\sqrt[3]{3} = \boxed{6\sqrt[3]{3}}$

10. In the stained-glass window design, the side of each small square is 5 *in*. Find the perimeter of the window to the nearest tenth of an inch.

decimal

$5^2 + 5^2 = d^2$

$d = \sqrt{50} = 5\sqrt{2}$

$P = 10(5\sqrt{2}) = 50\sqrt{2}$

$\boxed{P = 70.7 \text{ in}}$

11. Multiply the following. Remember to simplify.

a. $(1 + 4\sqrt{10})(2 - \sqrt{10})$

$2 - \sqrt{10} + 8\sqrt{10} - 4(\sqrt{10})^2$

$2 + 7\sqrt{10} - 4(10)$

$2 + 7\sqrt{10} - 40 = \boxed{-38 + 7\sqrt{10}}$

b. $(3 + \sqrt{11})(4 - \sqrt{11})$

$12 - 3\sqrt{11} + 4\sqrt{11} - (\sqrt{11})^2$

$12 + \sqrt{11} - 11$

$\boxed{1 + \sqrt{11}}$

12. Solve the following remember to check for extraneous solutions.

{Numerator is even → use absolute values}

a. $\frac{3(x+1)^{\frac{2}{3}}}{3} = \frac{12}{3}$

$\left((x+1)^{2/3}\right)^{3/2} = (4)^{3/2}$

$|x+1| = 4^{3/2}$ $\quad |x+1| = \sqrt{4^3}$ OR $(\sqrt{4})^3$ $\quad |x+1| = 8$ $\quad x+1=8$ $\boxed{x=7}$ $\quad x+1=-8$ $\boxed{x=-9}$

b. $\sqrt{5x-1} + 3 = x$

$\quad -3 \quad -3$

$(\sqrt{5x-1})^2 = (x-3)^2$

$5x-1 = (x-3)(x-3)$ $\quad 5x-1 = x^2-6x+9$
$\quad -5x+1 \quad -5x+1$ $\quad 0 = x^2-11x+10$
$0 = (x-10)(x-1)$
$\boxed{x=10}$ $\quad x=1$ ex. sol.

13. Add the following fractions.

a. $\frac{5}{2-\sqrt{6}} + \frac{8}{2+\sqrt{6}}$ Need common denominator $(2-\sqrt{6})(2+\sqrt{6})$

$\frac{(2+\sqrt{6})}{(2+\sqrt{6})}\left(\frac{5}{2-\sqrt{6}}\right) + \frac{(2-\sqrt{6})}{(2-\sqrt{6})}\left(\frac{8}{2+\sqrt{6}}\right)$

$\frac{10+5\sqrt{6}}{4-(\sqrt{6})^2} + \frac{16-8\sqrt{6}}{4-(\sqrt{6})^2} = \frac{10+5\sqrt{6}+16-8\sqrt{6}}{-2} = \boxed{\frac{26-3\sqrt{6}}{-2}}$

b. $\frac{11}{\sqrt{7}+\sqrt{2}} + \frac{1}{\sqrt{7}-\sqrt{2}}$

$\frac{(\sqrt{7}-\sqrt{2})}{(\sqrt{7}-\sqrt{2})}\left(\frac{11}{\sqrt{7}+\sqrt{2}}\right) + \frac{(\sqrt{7}+\sqrt{2})}{(\sqrt{7}+\sqrt{2})}\left(\frac{1}{\sqrt{7}-\sqrt{2}}\right)$

$\frac{11\sqrt{7}-11\sqrt{2}}{(\sqrt{7})^2-(\sqrt{2})^2} + \frac{\sqrt{7}+\sqrt{2}}{(\sqrt{7})^2-(\sqrt{2})^2} = \frac{11\sqrt{7}-11\sqrt{2}+\sqrt{7}+\sqrt{2}}{5} = \boxed{\frac{12\sqrt{7}-10\sqrt{2}}{5}}$

$7-2 \qquad 7-2$