KEY

Math 20-1

## Lxx – Worksheet – 5.1 Working with Radicals

**Pg 278 #2:** Express each radical as a mixed radical in simplest form.

| $\sqrt{56}$ | $3\sqrt{75}$ | $\sqrt[3]{24}$ | $\sqrt{c^3d^2}, c \geq 0, d \geq 0$ |
|---|---|---|---|
| 56<br>2 28<br>2 14<br>2 7<br>$\sqrt{2^2 \cdot 2 \cdot 7}$<br>$2\sqrt{14}$ | $3\sqrt{3 \cdot 5^2}$<br>$3 \cdot 5 \cdot \sqrt{3}$<br>$15\sqrt{3}$ | 24<br>2 12<br>2 6<br>2 3<br>$\sqrt[3]{2^3 \cdot 3}$<br>$2\sqrt[3]{3}$ | $\sqrt{c^2 \cdot c \cdot d^2}$<br>$cd\sqrt{c}$ where $c \geq 0$, $d \geq 0$ |

**Pg 278 #4:** Complete the table. State the values of the variable for which the radical represents a real number.

| Mixed Radical Form | Entire Radical Form | Values of the Variable |
|---|---|---|
| $3n\sqrt{5}$ | $\sqrt{45n^2}$ | No restrictions. (Textbook says $n \geq 0$). |
| $-6\sqrt[3]{2}$ | $\sqrt[3]{-432}$ | No restrictions. |
| $\frac{1}{2a}\sqrt[3]{7a}$ | $\sqrt[3]{\frac{7}{8a^2}}$ | $a \neq 0$ |
| $4x\sqrt[3]{2x}$ | $\sqrt[3]{128x^4}$ | No restrictions. |

$\sqrt{(3n)^2} \cdot \sqrt{5}$

$\sqrt{9n^2} \cdot \sqrt{5}$

$\sqrt{45n^2}$

432
2 216
2 108
2 54
2 27
3 9
3 3

$\sqrt[3]{-432}$

$\sqrt[3]{-2^3 \cdot 2 \cdot 3^3}$

$2 \cdot 3 \cdot \sqrt[3]{-2}$

$6\sqrt[3]{-2}$ or $-6\sqrt[3]{2}$

$\sqrt[3]{\left(\frac{1}{2a}\right)^3} \cdot \sqrt[3]{\frac{7a}{1}}$

$\sqrt[3]{\frac{1}{8a^3}} \cdot \sqrt[3]{\frac{7a}{1}}$

$\sqrt[3]{\frac{7a}{8a^3}} = \sqrt[3]{\frac{7}{8a^2}}$

128
2 64
2 32
2 16
2 8
2 4
2 2

$\sqrt[3]{128x^4}$

$\sqrt[3]{2^3 \cdot 2^3 \cdot 2 \cdot x^3 \cdot x}$

$2 \cdot 2 \cdot x \cdot \sqrt[3]{2x}$

$4x\sqrt[3]{2x}$

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**Pg 278 #5ab:** Express each pair of terms as like radicals. Explain your strategy.

$\boxed{15\sqrt{5}}$ and $8\sqrt{125}$

$8\sqrt{5^2 \cdot 5}$

$8 \cdot 5\sqrt{5}$

$\boxed{40\sqrt{5}}$

125
5 25
5 5

Strategy: Convert both to mixed radicals.

$8\sqrt{112z^8}$ and $48\sqrt{7z^4}$

$8\sqrt{2^2 \cdot 2^2 \cdot 7 \cdot z^2 \cdot z^2 \cdot z^2 \cdot z^2}$

$8 \cdot 2 \cdot 2 \cdot z \cdot z \cdot z \cdot z\sqrt{7}$

$\boxed{32z^4\sqrt{7}}$

$48\sqrt{7 \cdot z^2 \cdot z^2}$

$48 \cdot z \cdot z\sqrt{7}$

$\boxed{48z^2\sqrt{7}}$

112
2 56
2 28
2 14
2 7

Strategy: Convert both to mixed radicals.

**Pg 278 #5cd:** Express each pair of terms as like radicals. Explain your strategy.

$\boxed{-35\sqrt[4]{w^2}}$ and $3\sqrt[4]{81w^{10}}$

81
9 9
3 3 3 3

$3\sqrt[4]{3^4 \cdot w^4 \cdot w^4 \cdot w^2}$

$3 \cdot 3 \cdot w \cdot w \cdot \sqrt[4]{w^2}$

$\boxed{9w^2\sqrt[4]{w^2}}$

Strategy: Convert both to mixed radicals.

$\boxed{6\sqrt[3]{2}}$ and $6\sqrt[3]{54}$

$6\sqrt[3]{2 \cdot 3^3}$

$6 \cdot 3 \cdot \sqrt[3]{2}$

$\boxed{18\sqrt[3]{2}}$

54
2 27
3 9
3 3

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**Pg 278 #6ab:** Order each set of numbers from least to greatest.

$3\sqrt{6}$ , $10$ , $7\sqrt{2}$

$\sim 7.35$ $\quad 10 \quad$ $\sim 9.90$

$3\sqrt{6},\ 7\sqrt{2},\ 10$

$-2\sqrt{3}$ , $-4$ , $-3\sqrt{2}$ , $-2\sqrt{\frac{7}{2}}$

$-3.46 \quad -4 \quad -4.24 \quad -3.74$

$-3\sqrt{2}\ ,\ -4\ ,\ -2\sqrt{\frac{7}{2}}\ ,\ -2\sqrt{3}$

**Pg 278 #8ad:** Simplify each expression.

$-\sqrt{5} + 9\sqrt{5} - 4\sqrt{5}$

$-1\sqrt{5} + 9\sqrt{5} - 4\sqrt{5}$

$4\sqrt{5}$

$-\sqrt{6} + \frac{9}{2}\sqrt{10} - \frac{5}{2}\sqrt{10} + \frac{1}{3}\sqrt{6}$

$-1\sqrt{6} + \frac{1}{3}\sqrt{6} + \frac{9}{2}\sqrt{10} - \frac{5}{2}\sqrt{10}$

$-\frac{2}{3}\sqrt{6} + 2\sqrt{10}$

**Pg 278 #9ab:** Simplify each expression.

$3\sqrt{75} - \sqrt{27}$

$3\sqrt{3\cdot 5^2} - 1\sqrt{3\cdot 3^2}$

$3\cdot 5\sqrt{3} - 1\cdot 3\sqrt{3}$

$15\sqrt{3} - 3\sqrt{3}$

$12\sqrt{3}$

$2\sqrt{18} + 9\sqrt{7} - \sqrt{63}$

$2\sqrt{2\cdot 3^2} + 9\sqrt{7} - 1\sqrt{3^2\cdot 7}$

$2\cdot 3\sqrt{2} + 9\sqrt{7} - 1\cdot 3\sqrt{7}$

$6\sqrt{2} + 9\sqrt{7} - 3\sqrt{7}$

$6\sqrt{2} + 6\sqrt{7}$

63

3 21

3 7

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375
25 15
5 5 3 5

99
9 11
3 3

**Pg 278 #9cd:** Simplify each expression.

45
5 9
3 3

80
8 10
2 4 2 5
2 2

$$-8\sqrt{45} + 5.1 - \sqrt{80} + 17.4$$

$-8\sqrt{3^2 \cdot 5} + 5.1 - 1\sqrt{2^2 \cdot 2^2 \cdot 5} + 17.4$

$-8 \cdot 3\sqrt{5} + 5.1 - 1 \cdot 2 \cdot 2\sqrt{5} + 17.4$

$-24\sqrt{5} + 5.1 - 4\sqrt{5} + 17.4$

$-28\sqrt{5} + 22.5$

$$\frac{2}{3}\sqrt[3]{81} + \frac{\sqrt[3]{375}}{4} - 4\sqrt{99} + 5\sqrt{11}$$

$\frac{2}{3}\sqrt[3]{3^3 \cdot 3} + \frac{1}{4}\sqrt[3]{3 \cdot 5^3} - 4\sqrt{3^2 \cdot 11} + 5\sqrt{11}$

$\frac{2}{3} \cdot 3\sqrt[3]{3} + \frac{1}{4} \cdot 5\sqrt[3]{3} - 4 \cdot 3\sqrt{11} + 5\sqrt{11}$

$2\sqrt[3]{3} + \frac{5}{4}\sqrt[3]{3} - 12\sqrt{11} + 5\sqrt{11}$

$\frac{13}{4}\sqrt[3]{3} - 7\sqrt{11}$

**Pg 278 #14:** The speed, *s*, in meters per second, of a tsunami is related to the depth, *d*, in meters, of the water through which it travels. This relationship can be modelled with the formula $s = \sqrt{10d}, d \geq 0$. A tsunami has a depth of 12m. What is the speed as a mixed radical and an approximation to the nearest meter per second?

120
12 10
2 6 2 5
2 3

$s = \sqrt{10d}$

$s = \sqrt{10 \cdot 12}$

$s = \sqrt{120}$

$s = \sqrt{2^2 \cdot 2 \cdot 3 \cdot 5}$

$s = 2\sqrt{2 \cdot 3 \cdot 5}$

$s = 2\sqrt{30}$ m/s

$s \approx 10.95$ m/s or $\approx 11$ m/s

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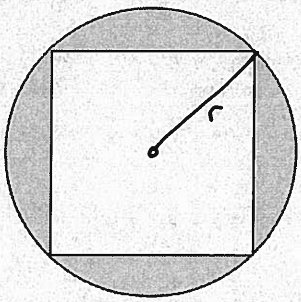
**Pg 278 #15:** A square is inscribed in a circle. The area of the circle is $38\pi$ m².




$A_{circle} = 38\pi \text{ m}^2$

$A = \pi r^2$

$38\pi = \pi r^2$

$38 = r^2$

$r = \sqrt{38}$

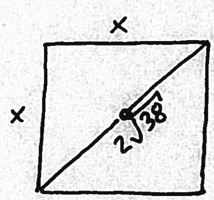
a) What is the exact length of the diagonal of the square?

b) Determine the exact perimeter of the square.

(A) Diameter $= 2r$

$= 2\sqrt{38}$

(B)




$a^2 + b^2 = c^2$

$x^2 + x^2 = (2\sqrt{38})^2$

$2x^2 = 4(38)$

$x^2 = 76$

$x = \sqrt{76}$

$= \sqrt{2^2 \cdot 19}$

$= 2\sqrt{19}$

76

2 38

2 19

Perimeter $= 4x$

$= 4(2\sqrt{19})$

$= 8\sqrt{19}$ m