**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block \_\_\_\_\_\_**

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| **Square Root**  | For any real numbers *a* and *b*, if *a*2 = *b*, then *a* is a square root of *b*. |
| ***n*th root** | For any real numbers *a* and *b*, and any positive integer *n*, if *an* = *b*, then *a* is an *n* th root of *b*. |
| **Real *n* th Roots of *b*,**$$\sqrt[n]{b}, -\sqrt[n]{b}$$ | 1. If *n* is even and *b* > 0, then *b* has one positive real root and one real negative root.2. If *n* is odd and *b* > 0, then *b* has one positive real root.3. If *n* is even and *b* < 0, then *b* has no real roots.4. If *n* is odd and *b* < 0, then *b* has one negative real root. |

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| ***Example 1* Simplify** $\sqrt{49z^{8}}$**.** $ \sqrt{49z^{8}}=\sqrt{\left(7z^{4}\right)^{2}}=7z^{2}$*z*4 must be positive, so there is no need to take the absolute value. | ***Example 2* Simplify** $-\sqrt[3]{(2a-1)^{6}}$ **.** $-\sqrt[3]{(2a-1)^{6}}=-\sqrt[3]{\left[(2a-1)^{2}\right]^{3}}=-\left(2a-1\right)^{2}$  |

*Exercises: Simplify.*

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| **1.**$ \sqrt{81}$ | **2.**$ \sqrt[3]{-343}$ | **3.**$ \sqrt{144p^{6}}$ |
| **4.**$ \pm \sqrt{4a^{10}}$ | **5.**$ $ $\sqrt[5]{243p^{10}}$ | **6.**$ -\sqrt[3]{m^{6}n^{9}}$ |
| **7.**$ \sqrt[3]{-b^{12}}$ | **8.**$ \sqrt{16a^{10}b^{8}}$ | **9.**$ \sqrt{121x^{6}}$ |
| **10.**$ \sqrt{(4k)^{4}}$ | **11.**$ \pm \sqrt{169r^{4}}$ | **12.**$ -\sqrt[3]{-27p^{6}}$ |
| **13.**$ -\sqrt{625y^{2}z^{4}}$ | **14.**$ \sqrt{36q^{34}}$ | **15.**$ $ $\sqrt{100x^{2}y^{4}z^{6}}$ |

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| **16.** $ \sqrt[5]{243x^{10}}$ | **17.** $ \sqrt{14a^{2}}$ | **18.** $ \sqrt{-\left(14a\right)^{2}}$ |
| **19.** $ \sqrt{\frac{16m^{2}}{25}}$ | **20.** $ \sqrt[3]{-64r^{2}w^{15}}$ | **21.** $ \sqrt{(2x)^{8}}$ |
| **22.** $\sqrt[3]{216p^{3}q^{9}}$ | **23.** $\sqrt{676x^{4}y^{6}}$ | **24.** $ \sqrt[3]{-27x^{9}y^{12}}$ |
| **25.** $\sqrt[5]{-32x^{5}y^{10}}$ | **26.** $ \sqrt[6]{(m+4)^{6}}$ | **27.** $\sqrt[3]{(2x+1)^{3}}$ |
| **28.** $\sqrt[4]{(x-5)^{8}}$ | **29.** $ \sqrt[3]{343d^{6}}$ | **30.** $\sqrt{x^{2}+10x+25}$ |

### *Rationalizing the Denominator*

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| --- | --- |
| **31.**  | **32.**  |
| **33.**  | **34.**  |