

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Radical and Rational Exponents

Assume every variable is positive. Preserve the written numerator and denominator when rewriting; simplify exact perfect powers completely.

Write each expression in exponential form

1. $\sqrt{8 \cdot x}$

2. $\frac{1}{\left({}^4\sqrt{3 \cdot n} \right)^4}$

3. $\left({}^5\sqrt{3} \right)^3$

4. $\frac{1}{\left({}^6\sqrt{2} \right)^6}$

Write each expression in radical form

5. $\left(11 \right)^{\frac{4}{2}}$

6. $\left(5 \cdot n \right)^{\frac{-6}{4}}$

7. $\left(4 \cdot a \right)^{\frac{2}{6}}$

8. $\left(9 \right)^{\frac{-1}{3}}$

Simplify

9. $\left(256 \cdot m^8 \right)^{\frac{6}{4}}$

10. $\left(59049 \right)^{\frac{-5}{5}}$

11. $\left(1000 \right)^{\frac{4}{3}}$

12. $\left(117649 \cdot a^{18} \right)^{\frac{-2}{6}}$

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Radical and Rational Exponents

Worked answer key

Assume every variable is positive. Preserve the written numerator and denominator when rewriting; simplify exact perfect powers completely.

Write each expression in exponential form

1. $\sqrt{8 \cdot x}$

A qth root is the power $1/q$.

Keep the written exponent $1/2$; its reduced exact value is $1/2$.

$$(8 \cdot x)^{\frac{1}{2}}$$

2. $\frac{1}{\left(\sqrt[4]{3 \cdot n}\right)^4}$

A qth root is the power $1/q$.

A reciprocal makes the exponent negative. Keep the written exponent $-4/4$; its reduced exact value is $-1/1$.

$$(3 \cdot n)^{\frac{-4}{4}}$$

3. $\left(\sqrt[5]{3}\right)^3$

A qth root is the power $1/q$.

Keep the written exponent $3/5$; its reduced exact value is $3/5$.

$$(3)^{\frac{3}{5}}$$

4. $\frac{1}{\left(\sqrt[6]{2}\right)^6}$

A qth root is the power $1/q$.

A reciprocal makes the exponent negative. Keep the written exponent $-6/6$; its reduced exact value is $-1/1$.

$$(2)^{\frac{-6}{6}}$$

Write each expression in radical form

5. $(11)^{\frac{4}{2}}$

The denominator is the root index; the numerator is the outside power.

Use the written 2th root and power 4, even when the fraction reduces.

$$\left(\sqrt{11}\right)^4$$

6. $(5 \cdot n)^{\frac{-6}{4}}$

The denominator is the root index; the numerator is the outside power.

Place the radical power in the denominator because the exponent is negative. Use the written 4th root and power 6, even when the fraction reduces.

$$\frac{1}{\left(\sqrt[4]{5 \cdot n}\right)^6}$$

7. $(4 \cdot a)^{\frac{2}{6}}$

The denominator is the root index; the numerator is the outside power.

Use the written 6th root and power 2, even when the fraction reduces.

$$\left(\sqrt[6]{4 \cdot a}\right)^2$$

8. $(9)^{\frac{-1}{3}}$

The denominator is the root index; the numerator is the outside power.

Place the radical power in the denominator because the exponent is negative. Use the written 3th root and power 1, even when the fraction reduces.

$$\frac{1}{\sqrt[3]{9}}$$

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Radical and Rational Exponents

Worked answer key

Assume every variable is positive. Preserve the written numerator and denominator when rewriting; simplify exact perfect powers completely.

Simplify

9. $(256 \cdot m^8)^{\frac{6}{4}}$

Take the exact 4th root, then raise the result to the 6th power.

$$4 \cdot m^2$$

$$4096 \cdot m^{12}$$

The exponent is positive, so the powered result stays in the numerator.

$$4096 \cdot m^{12}$$

10. $(59049)^{\frac{-5}{5}}$

Take the exact 5th root, then raise the result to the 5th power.

$$9$$

$$59049$$

Finally take the reciprocal for the negative exponent.

$$\frac{1}{59049}$$

11. $(1000)^{\frac{4}{3}}$

Take the exact 3th root, then raise the result to the 4th power.

$$10$$

$$10000$$

The exponent is positive, so the powered result stays in the numerator.

$$10000$$

12. $(117649 \cdot a^{18})^{\frac{-2}{6}}$

Take the exact 6th root, then raise the result to the 2th power.

$$7 \cdot a^3$$

$$49 \cdot a^6$$

Finally take the reciprocal for the negative exponent.

$$\frac{1}{49 \cdot a^6}$$