

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Solving Rational Exponent Equations

Solve over the real numbers. Give all solutions and check each one in the original equation.

1. $4 \cdot b^{\frac{-1}{3}} + 53 = 69$

7. $-5 \cdot (-2 \cdot s + 17)^{\frac{2}{3}} + 71 = 51$

2. $-25 = -1 \cdot r^{\frac{2}{3}}$

8. $5 = s^{\frac{1}{6}}$

3. $16 = (2 \cdot m)^{\frac{2}{3}}$

9. $(x + 7)^{\frac{1}{6}} = 3$

4. $-5 \cdot (2 \cdot y - 7)^{\frac{1}{6}} - 61 = -76$

10. $\frac{-43746}{3125} = 4 \cdot p^{\frac{-5}{6}} - 14$

5. $5 = r^{\frac{-1}{3}}$

11. $-1 \cdot x^{\frac{4}{3}} = -625$

6. $n^{\frac{-1}{3}} - 19 = -14$

12. $16 = (-2 \cdot z)^{\frac{4}{3}}$

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Solving Rational Exponent Equations

Worked answer key

Solve over the real numbers. Give all solutions and check each one in the original equation.

1. $4 \cdot b^{\frac{-1}{3}} + 53 = 69$

Isolate the power: $(69 - 53) / 4 = 16 / 4 = 4$.

The reduced exponent is $-1/3$. Its negative power excludes a zero base.

Take the reciprocal first: $1 / 4 = 1/4$. Take the exact 1st root, then raise to the 3th power.

Base candidate: $1/64$.

Solve $1b + 0 = (1/64)$ to get $b = 1/64$.

Check $b = 1/64$: the original left side is 69, equal to 69.

Solution set: $\{1/64\}$.

$$b \in \left\{ \frac{1}{64} \right\}$$

2. $-25 = -1 \cdot r^{\frac{2}{3}}$

Isolate the power: $(-25 - 0) / -1 = -25 / -1 = 25$.

The reduced exponent is $2/3$. Its odd root allows either base sign.

Take the exact 2nd root, then raise to the 3th power.

Base candidates: $-125, 125$.

Solve $1r + 0 = -125$ to get $r = -125$.

Solve $1r + 0 = 125$ to get $r = 125$.

Check $r = -125$: the original left side is -25 , equal to -25 .

Check $r = 125$: the original left side is -25 , equal to -25 .

Solution set: $\{-125, 125\}$.

$$r \in \{-125, 125\}$$

3. $16 = (2 \cdot m)^{\frac{2}{3}}$

Isolate the power: $(16 - 0) / 1 = 16 / 1 = 16$.

The reduced exponent is $2/3$. Its odd root allows either base sign.

Take the exact 2nd root, then raise to the 3th power.

Base candidates: $-64, 64$.

Solve $2m + 0 = -64$ to get $m = -32$.

Solve $2m + 0 = 64$ to get $m = 32$.

Check $m = -32$: the original left side is 16, equal to 16.

Check $m = 32$: the original left side is 16, equal to 16.

Solution set: $\{-32, 32\}$.

$$m \in \{-32, 32\}$$

4. $-5 \cdot (2 \cdot y - 7)^{\frac{1}{6}} - 61 = -76$

Isolate the power: $(-76 - -61) / -5 = -15 / -5 = 3$.

The reduced exponent is $1/6$. Its even root requires the base to be nonnegative.

Take the exact 1st root, then raise to the 6th power.

Base candidate: 729.

Solve $2y + -7 = 729$ to get $y = 368$.

Check $y = 368$: the original left side is -76 , equal to -76 .

Solution set: $\{368\}$.

$$y \in \{368\}$$

5. $5 = r^{\frac{-1}{3}}$

Isolate the power: $(5 - 0) / 1 = 5 / 1 = 5$.

The reduced exponent is $-1/3$. Its negative power excludes a zero base.

Take the reciprocal first: $1 / 5 = 1/5$. Take the exact 1st root, then raise to the 3th power.

Base candidate: $1/125$.

Solve $1r + 0 = (1/125)$ to get $r = 1/125$.

Check $r = 1/125$: the original left side is 5, equal to 5.

Solution set: $\{1/125\}$.

$$r \in \left\{ \frac{1}{125} \right\}$$

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Solving Rational Exponent Equations

Worked answer key

Solve over the real numbers. Give all solutions and check each one in the original equation.

6.
$$n^{\frac{-1}{3}} - 19 = -14$$

Isolate the power: $(-14 - -19) / 1 = 5 / 1 = 5$.

The reduced exponent is $-1/3$. Its negative power excludes a zero base.

Take the reciprocal first: $1 / 5 = 1/5$. Take the exact 1st root, then raise to the 3th power.

Base candidate: $1/125$.

Solve $1n + 0 = (1/125)$ to get $n = 1/125$.

Check $n = 1/125$: the original left side is -14 , equal to -14 .

Solution set: $\{1/125\}$.

$$n \in \left\{ \frac{1}{125} \right\}$$

7.
$$-5 \cdot \left(-2s + 17 \right)^{\frac{2}{3}} + 71 = 51$$

Isolate the power: $(51 - 71) / -5 = -20 / -5 = 4$.

The reduced exponent is $2/3$. Its odd root allows either base sign.

Take the exact 2nd root, then raise to the 3th power.

Base candidates: $-8, 8$.

Solve $-2s + 17 = 8$ to get $s = 9/2$.

Solve $-2s + 17 = -8$ to get $s = 25/2$.

Check $s = 9/2$: the original left side is 51 , equal to 51 .

Check $s = 25/2$: the original left side is 51 , equal to 51 .

Solution set: $\{9/2, 25/2\}$.

$$s \in \left\{ \frac{9}{2}, \frac{25}{2} \right\}$$

8.
$$5 = s^{\frac{1}{6}}$$

Isolate the power: $(5 - 0) / 1 = 5 / 1 = 5$.

The reduced exponent is $1/6$. Its even root requires the base to be nonnegative.

Take the exact 1st root, then raise to the 6th power.

Base candidate: 15625 .

Solve $1s + 0 = 15625$ to get $s = 15625$.

Check $s = 15625$: the original left side is 5 , equal to 5 .

Solution set: $\{15625\}$.

$$s \in \{15625\}$$

9.
$$(x + 7)^{\frac{1}{6}} = 3$$

Isolate the power: $(3 - 0) / 1 = 3 / 1 = 3$.

The reduced exponent is $1/6$. Its even root requires the base to be nonnegative.

Take the exact 1st root, then raise to the 6th power.

Base candidate: 729 .

Solve $1x + 7 = 729$ to get $x = 722$.

Check $x = 722$: the original left side is 3 , equal to 3 .

Solution set: $\{722\}$.

$$x \in \{722\}$$

10.
$$\frac{-43746}{3125} = 4 \cdot p^{\frac{-5}{6}} - 14$$

Isolate the power: $((-43746/3125) - -14) / 4 = (4/3125) / 4 = 1/3125$.

The reduced exponent is $-5/6$. Its even root requires the base to be positive.

Take the reciprocal first: $1 / (1/3125) = 3125$. Take the exact 5th root, then raise to the 6th power.

Base candidate: 15625 .

Solve $1p + 0 = 15625$ to get $p = 15625$.

Check $p = 15625$: the original left side is $-43746/3125$, equal to $-43746/3125$.

Solution set: $\{15625\}$.

$$p \in \{15625\}$$

Solving Rational Exponent Equations

Worked answer key

Solve over the real numbers. Give all solutions and check each one in the original equation.

11. $-1 \cdot x^{\frac{4}{3}} = -625$

Isolate the power: $(-625 - 0) / -1 = -625 / -1 = 625$.

The reduced exponent is $4/3$. Its odd root allows either base sign.

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

Base candidates: -125, 125.

Solve $1x + 0 = -125$ to get $x = -125$.

Solve $1x + 0 = 125$ to get $x = 125$.

Check $x = -125$: the original left side is -625, equal to -625.

Check $x = 125$: the original left side is -625, equal to -625.

Solution set: $\{-125, 125\}$.

$x \in \{-125, 125\}$

12. $16 = (-2 \cdot z)^{\frac{4}{3}}$

Isolate the power: $(16 - 0) / 1 = 16 / 1 = 16$.

The reduced exponent is $4/3$. Its odd root allows either base sign.

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

Base candidates: -8, 8.

Solve $-2z + 0 = 8$ to get $z = -4$.

Solve $-2z + 0 = -8$ to get $z = 4$.

Check $z = -4$: the original left side is 16, equal to 16.

Check $z = 4$: the original left side is 16, equal to 16.

Solution set: $\{-4, 4\}$.

$z \in \{-4, 4\}$