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

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

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

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

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

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

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

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

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

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

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

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}.

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

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}.

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

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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}.

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

7.

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

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}.

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

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.

$$\left(x + 7\right)^{\frac{1}{6}} = 3$$

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}.

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

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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.

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}.

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