Rational Exponent Investigation

Use a calculator. See definitions on last page

1. Compare these sets of perfect squares affected by a square root or fractional exponent.

$9^{1/2} =$	$16^{1/2} =$	$25^{1/2} =$
$\sqrt{9} =$	$\sqrt{16} =$	$\sqrt{25} =$

If you applied a fractional exponent of ½ and the square root sign to another set of perfect square numbers, what do you expect the result to be?

Test two more sets of perfect square numbers and apply the fractional exponent of ½ and the square root sign to them.

$\quad^{1/2} =$	$\quad^{1/2} =$
$\sqrt{\quad} =$	$\sqrt{\quad} =$

Rational Exponent Investigation

(Definitions can be found on the last page) Page 2

2. Compare these sets of whole numbers affected by a square root or fractional exponent.

$8^{1/2} =$	$10^{1/2} =$	$15^{1/2} =$
$\sqrt{8} =$	$\sqrt{10} =$	$\sqrt{15} =$

If you applied a fractional exponent of ½ and the square root sign to another set of whole numbers, what do you expect the result to be?

Test two more sets of whole numbers and apply the fractional exponent of ½ and the square root sign to them.

$\quad^{1/2} =$	$\quad^{1/2} =$
$\sqrt{\quad} =$	$\sqrt{\quad} =$

3. What pattern do you see emerging from #1 and #2?

<u>Rational Exponent Investigation</u>

(Definitions can be found on the last page) Page 3

4. Explain the pattern as a general mathematical rule, using the terms $x^{1/2}$ and $\sqrt{x}$.

5. Based on the pattern discovered in #3 above, test different sets of whole number bases using **different** unit fractional exponents (suggested: ⅓, ¼, ⅕, etc.) and **different radical indexes other than 2.** You will need to use a separate page.

6. Can you create a general mathematical rule using $x^{1/n}$ and $\sqrt[n]{x}$ based on #5?

7. Based on the pattern discovered in #3 above, test different sets of whole number bases using **different** fractional exponents not using unit fractions (suggested: ⅔, ¾, ⅖, ⅗, etc.) and **different radical indexes other than 2.** You will need to use a separate page.

8. Can you create a general mathematical rule? Use *m* as the numerator of the fractional exponent and *n* as the denominator of the fractional exponent.

<u>Rational Exponent Investigation</u>

(Definitions can be found on the last page) Page 4

Definitions:

<u>Fractional Exponents</u> - an exponent which is a fraction

<u>Numerator</u> - the top portion of a fraction

<u>Denominator</u> - the bottom portion of a fraction

<u>Radical Sign</u> - $\sqrt{\ }$

<u>Index</u> - $\sqrt[?]{\ }$ the value of the question mark, which is always a Natural number. Example: in $\sqrt[5]{\ }$ the index is 5.