



ALGEBRA I ACTIVITY 6: INVESTIGATING LAWS OF EXPONENTS

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| <p>ACTIVITY OVERVIEW: In this activity we will</p> <ul style="list-style-type: none"> • Use the home screen to investigate calculations with exponents on numerical bases • Use the $\boxed{Y=}$ screen and the table to investigate simplifying expressions with exponents | |
| <p>On the home screen you can investigate calculations with exponents using numerical bases as shown on the screen above. However, with variable bases or expressions, the home screen can be limiting as shown here.</p> | |
| <p>To verify that a rule for working with exponents has been applied correctly, enter the unsimplified form into the $\boxed{Y=}$ register. Press $\boxed{Y=}\boxed{X,T,\theta,n}\boxed{MATH}\boxed{3}\boxed{X}\boxed{X,T,\theta,n}\boxed{x^2}$. Test whether x^6 is an equivalent expression. Down arrow to Y_2 and enter $\boxed{X,T,\theta,n}\boxed{\wedge}\boxed{6}$.</p> | |
| <p>Press $\boxed{2nd}\boxed{GRAPH}$ to view the table. Clearly the two expressions are not equal. The graphs can also be examined if desired.</p> | |
| <p>Edit Y_2 to $\boxed{X,T,\theta,n}\boxed{\wedge}\boxed{5}$.</p> | |

| <p>Press $\text{2nd}$$\text{GRAPH}$ to view the table. Since the values in both Y lists are equal, the two expressions are equal.</p> | <table border="1"> <thead> <tr> <th>X</th> <th>Y1</th> <th>Y2</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> <tr><td>2</td><td>32</td><td>32</td></tr> <tr><td>3</td><td>243</td><td>243</td></tr> <tr><td>4</td><td>1024</td><td>1024</td></tr> <tr><td>5</td><td>3125</td><td>3125</td></tr> <tr><td>6</td><td>7776</td><td>7776</td></tr> </tbody> </table> <p>X=0</p> | X | Y1 | Y2 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 32 | 32 | 3 | 243 | 243 | 4 | 1024 | 1024 | 5 | 3125 | 3125 | 6 | 7776 | 7776 |
|---|--|------|----|----|---|---|---|---|---|---|---|----|----|---|-----|-----|---|------|------|---|------|------|---|------|------|
| X | Y1 | Y2 | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 32 | 32 | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 243 | 243 | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 1024 | 1024 | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 3125 | 3125 | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 7776 | 7776 | | | | | | | | | | | | | | | | | | | | | | | |
| <p>What expression would be a simplified calculation for the one shown?</p> | <pre>(1+.02)^3*(1+.02)^4 1.148685668</pre> | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Use the Y= register and home screen to investigate other properties of working with exponents. Suggestions shown in the next few screens. Determine the equivalent expression, enter it into Y_2 and examine the table.</p> <p>Power to a power: Determine the equivalent expression, enter it into Y_2 and examine the table.</p> | <pre>Plot1 Plot2 Plot3 Y1=(X^3)^2 Y2= Y3= Y4= Y5= Y6= Y7=</pre> | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Division with exponents with like bases: Examine these calculations.</p> | <pre>(5^9)/(5^3) 15625 5^3 125 5^6 15625 █</pre> | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Determine the equivalent expression, enter it into Y_2 and examine the table.</p> | <pre>Plot1 Plot2 Plot3 Y1=(X^5)/(X^3) Y2=█ Y3= Y4= Y5= Y6= Y7=</pre> | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Zero as an exponent: Examine these calculations.</p> | <pre>2^3/2^3 1 2^0 1 █</pre> | | | | | | | | | | | | | | | | | | | | | | | | |

Determine the equivalent expression, enter it into Y_2 and examine the table.

| Plot1 | Plot2 | Plot3 |
|-------------------|-------|-------|
| $Y_1 = X^3 / X^3$ | | |
| $Y_2 =$ | | |
| $Y_3 =$ | | |
| $Y_4 =$ | | |
| $Y_5 =$ | | |
| $Y_6 =$ | | |
| $Y_7 =$ | | |

Side note: Why does this expression return an error when $x=0$? What does this say about the expression 0^0 ?

| X | Y1 | Y2 |
|---|------|------|
| 0 | ERR: | ERR: |
| 1 | 1 | 1 |
| 2 | 1 | 1 |
| 3 | 1 | 1 |
| 4 | 1 | 1 |
| 5 | 1 | 1 |
| 6 | 1 | 1 |

X=0

Negative exponents: Examine these calculations.

| | |
|----------|--------|
| 2^{-5} | |
| $1/2^5$ | .03125 |
| ■ | .03125 |

Examine these calculations.

| | |
|------------|----|
| $5/2^{-3}$ | |
| $5*2^3$ | 40 |
| | 40 |

Determine the equivalent expression, enter it into Y_2 and examine the table.

| Plot1 | Plot2 | Plot3 |
|---------------|-------|-------|
| $Y_1 = 1/X^3$ | | |
| $Y_2 =$ | | |
| $Y_3 =$ | | |
| $Y_4 =$ | | |
| $Y_5 =$ | | |
| $Y_6 =$ | | |
| $Y_7 =$ | | |

| X | Y1 | Y2 |
|---|--------|--------|
| 0 | ERR: | ERR: |
| 1 | 1 | 1 |
| 2 | .125 | .125 |
| 3 | .03704 | .03704 |
| 4 | .01563 | .01563 |
| 5 | .008 | .008 |
| 6 | .00463 | .00463 |

X=0

