**2.2 – The Zero Exponent Law and Powers of Ten**

INVESTIGATE

1. Choose a number between 1 and 10 as your base: \_\_\_\_\_\_\_\_\_\_\_\_
2. Use the exponents 5, 4, 3, 2, 1, 0 to complete the table below, writing the power, the power as repeated multiplication and in standard form.

|  |  |  |  |
| --- | --- | --- | --- |
| *Exponent* | *Power* | *Repeated Multiplication* | *Standard Form* |
| 5 |  |  |  |
| 4 |  |  |  |
| 3 |  |  |  |
| 2 |  |  |  |
| 1 |  |  |  |
|  |  | N/A |  |

1. Describe any pattern you see:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Continue the patterns to complete the last entry in the table above.
2. Compare the result of the "standard form" in the last entry with a partner that chose a different base. What do you notice? What can you conclude about any number to the power of zero?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

This table shows decreasing powers of 10. Notice the patterns in the table.

|  |  |  |
| --- | --- | --- |
| *Number in Words* | *Standard Form* | *Power* |
| One billion | 1 000 000 000 | 109 |
| One hundred million | 100 000 000 | 108 |
| Ten million | 10 000 000 | 107 |
| One million | 1 000 000 | 106 |
| One hundred thousand | 100 000 | 105 |
| Ten thousand | 10 000 | 104 |
| One thousand | 1 000 | 103 |
| One hundred | 100 | 102 |
| Ten | 10 | 101 |
| One | 1 |  |

**Zero Exponent Law:**  $a^{0}=1$ (where *a* ≠ 0)

We can make sense of the Zero Exponent Law by looking at patterns in decreasing powers of the same base:

Ex. 1: Evaluate.

1. 40 (b) (-4)0 (c) -40  (d) $ \left(\frac{-3243 × 41}{254}\right)^{0}$

Ex. 2: Write the following using powers of 10.

1. 10 000 (b) 1 (c) 3 000 000

 (d) 43 000 000 (e) 835 000