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

**Zero Exponent Law:**  (where *a* ≠ 0)

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

|  |  |  |
| --- | --- | --- |
| *Power* | *Repeated Multiplication* | *Standard Form* |
| 35 |  |  |
| 34 |  |  |
| 33 |  |  |
| 32 |  |  |
| 31 |  |  |
|  | N/A |  |

Ex. 1: Evaluate.

1. 40 (b) (-4)0 (c) -40  (d)

Ex. 2: Complete this table containing powers of ten by following the patterns you see.

|  |  |  |
| --- | --- | --- |
| *Number in Words* | *Standard Form* | *Power* |
| 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 |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Powers of ten are important in **scientific notation**, a shorthand way of representing very large or small numbers. A number in scientific notation has the form , where and the exponent *n* is an integer.

Ex. 3: Represent the following quantities in scientific notation.

1. 10 000 000 000 (b) 3 000 000 (c) 43 000 000

(d) 835 000 (e) 0.000 000 01 (f) 0.000 000 000 432

Ex. 4: Write each quantity in standard form.

1. The population of the world is about
2. The distance from the Sun to the nearest star (Proxima Centauri) is km
3. The diameter of the smallest known virus is mm
4. The mass of a dust particle is g