



Zero and Negative Exponents

Fill in the following tables starting from **right moving left**. You may use your calculator where necessary, but convert all decimals to fractions.

(Remember: to enter 2^{-3} into your calculator : **Plug in: $2^{\wedge} - 3$, Hit ENTER, then MATH, ENTER**)

2^{-4}	2^{-3}	2^{-2}	2^{-1}	2^0	2^1	2^2	2^3	2^4
$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8	16

3^{-4}	3^{-3}	3^{-2}	3^{-1}	3^0	3^1	3^2	3^3	3^4
$\frac{1}{81}$	$\frac{1}{27}$	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9	27	81

4^{-4}	4^{-3}	4^{-2}	4^{-1}	4^0	4^1	4^2	4^3	4^4
$\frac{1}{256}$	$\frac{1}{64}$	$\frac{1}{16}$	$\frac{1}{4}$	1	4	16	64	256

Use the tables above to determine the following two definitions:

$$a^0 = 1$$

$$a^{-n} = \frac{1}{a^n}$$

Notice: when we “crossed the line, we changed the sign”. What would you predict the following definition would be?

$$\frac{1}{a^{-n}} = a^n$$

Try it out!

1) $1000^0 = 1$

2) $\frac{1}{4^0} = \frac{1}{1} = 1$

3) $6^0 \cdot 6 = 1 \cdot 6 = 6$

4) $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

OR

$$6^{0+1} = 6^1 = 6$$

5) $55^{-1} = \frac{1}{55^1} = \frac{1}{55}$

6) $x^{-9} = \frac{1}{x^9}$

7) $\frac{1}{8^{-2}} = 8^2 = 64$

8) $\frac{1}{x^{-7}} = x^7$

11) $\frac{x}{x^{-2}} = x^{1-(-2)} = x^3$

12) $\frac{y^{-5}}{y} = \frac{1}{y^{1-(-5)}} = \frac{1}{y^6}$

13) $\frac{a^{-5}b}{b^{-2}} = \frac{b}{a^{-2-(-5)}} = \frac{b}{a^3}$