Algebra – Patterns of Exponents / Negative Exponents

Write this out with student(s). Follow order of numbers on left hand side, start writing with ①

③ **continue pattern** $3^3 = 27 = 3^2 \quad 3 = 9 \quad 3$

$\div$ **3**

② **then go up** ▲ $3^2 = 9 = 3 \quad 3$

$\div$ **3**

① **START** → $3^1 = 3$

$\div$ **3**

④ **then go down** ▼ $3^0 = 1$

* if student doesn't know this rule, let

them discover it by seeing how

#'s $\div$ 3 going down … or $\times \frac{1}{3}$

$\div$ **3**   … so $\frac{3}{3} = 1$

⑤ **continue pattern** $3^{-1} = \frac{1}{3}$ * pattern from the top: 3, 2, 1, 0 … now -1

… so $1 \div 3$ or $\frac{1}{3}$

⑥ **let them fill in**

the rest $3^{-2} = \frac{1}{3} \quad \frac{1}{3} = \frac{1}{9} = \frac{1}{3^2}$ now it is $\frac{1}{3} \div 3$ or $\frac{1}{3} \quad \frac{1}{3}$

⑦ **stop at** $3^{-3} = \frac{1}{9} \quad \frac{1}{3} = \frac{1}{27} = \frac{1}{3^3}$

⑧ **finally, generalize** $3^{-n} = \frac{1}{3^n}$ **or, better yet** $a^{-n} = \frac{1}{a^n}$

Practice. Add another full pattern for 2 where student fills in whole thing from +4 t -4. Then mixed practice. Like those below. Finally, add in algebraic examples.

$4^{-2} =$ $\qquad$ $4^{-3} =$

$5^{-2} =$ $\qquad$ $5^{-3} =$

$10^{-3} =$ $\qquad$ $10^{-4} =$