Make Numbers

Pick a set of integers, a set of base integers, and a set of operations, and start your watch to see how many integers you can make from exactly one each of the base integers and the operations. Here are 0 through 50 using the base integers 1, 2, 3, 4 and +, –, *, exponentiation, parentheses:

$0 = 2 + 3 – 4 – 1$
$1 = 2 + 3 – 4*1$
$2 = 2 + 3 – 4 + 1$
$3 = 4 + 2 – 3*1$
$4 = 4 + 3 – 2 – 1$
$5 = 4 + 3 – 2*1$
$6 = 4 + 3 – 2 + 1$
$7 = 3*(4 – 1) – 2$
$8 = 4 + 3 + 2 – 1$
$9 = 4 + 3 + 2*1$
$10 = 4 + 3 + 2 + 1$
$11 = 2*4 + 3*1$
$12 = 2*4 + 3 + 1$
$13 = 3*4 + 2 – 1$
$14 = 3*4 + 2*1$
$15 = 3*4 + 2 + 1$
$16 = 4*(2 + 3 – 1)$
$17 = 3*(2 + 4) – 1$
$18 = 3*(2 + 4)*1$
$19 = 3*(2 + 4) + 1$
$20 = 4 *(2 + 3)*1$
$21 = 4*(2 + 3) + 1$
$22 = 2*(4*3 – 1)$
$23 = 4*3*2 – 1$
$24 = 4*3*2*1$
$25 = 4*3*2 + 1$
$26 = 2*(3*4 + 1)$
$27 = 3*(2*4 + 1)$
$28 = 4*(2*3 + 1)$
$29 = 32 – 4 + 1$
$30 = 2*3*(4 + 1)$
$31 = 34 – 2 – 1$
$32 = 2*4*(3 + 1)$
$33 = 34 – 2 + 1$
$34 = 31 + 4 – 1$
$35 = 32 + 4 – 1$
$36 = (1 + 2)*3*4$
$37 = 32 + 4 + 1$
$38 = 42 – 3 – 1$
$39 = 42 – 3*1$
$40 = 43 – 2 – 1$
$41 = 43 – 2*1$
$42 = 43 – 2 + 1$
$43 = 43 + 1^2$
$44 = 42 + 3 – 1$
$45 = 42 + 3*1$
$46 = 42 + 3 + 1$
$47 = 31 + 4^2$
$48 = 3*4^2*1$
$49 = 41 + 2^3$
$50 = 13*4 – 2$

A variation is to not allow two digits to be placed together to make a two digit number (done above only for some of the numbers 29 or larger); here are some:

$29 = (4 – 1)^3 + 2$
$31 = 2^3*4 – 1 = 4^3/2 – 1$
$33 = 2^3*4 + 1 = 4^3/2 + 1$
$35 = 3^2*4 – 1$
$37 = 3^2*4 + 1$
$40 = 2^3*(1 + 4)$
$47 = 3*4^2 – 1$
$49 = 3*4^2 + 1$