

Name _____

January 1 FUNDAY

New Year's Funday: 2023 Challenge

This mathematical challenge involves the year **2023!** The challenge is to see how many expressions with a value from 0 through 23 that you can come up, using each of the digits 2, 0, 2, and 3 **exactly once**.



For example, each expression below has a value of 0.

Examples: $\sqrt{2^2} \times 0 \times 3$ $\frac{2}{2} - 3^0$

Write an expression for each value in the table by using the digits 2, 0, 2, 3 in each expression **exactly once**. Use the operations +, −, ×, ÷, ^ (power), √ (square root), along with grouping symbols. Some values in the table may not be possible.

Expression	Value	Expression	Value
	0		12
	1		13
	2		14
	3		15
	4		16
	5		17
	6		18
	7		19
	8		20
	9		21
	10		22
	11		23

Sample Solutions for New Year's Funday: 2023 Challenge

Correlations

CCSS: 6.EE.2.c, 6.EE.1, 8.EE.2, MP3 (Construct Viable Arguments and Critique the Reasoning of Others), MP4 (Reason Abstractly and Quantitatively), MP6 (Attend to Precision).

Topics: Order of operations.

Sample Solutions In the table below, you will find sample expressions, using the digits in the year 2023 *exactly once*, whose values equal the numbers 0 – 23. Other expressions are possible.

Expression	Value	Expression	Value
$0(2 + 2 + 3)$	0	$2 \cdot 2 \cdot 3 + 0$	12
$(2 + 2 + 3)^0$	1	$\frac{20}{2} + 3$	13
$\sqrt{2^2} - 3 \cdot 0$	2	$20 - 2 \cdot 3$	14
$2^2 - 3^0$	3	$20 - (2 + 3)$	15
$2^2 - 0^3$	4	$\frac{32}{2} + 0$	16
$(2 + 3) - 0^2$	5	$\frac{30}{2} + 2$	17
$(2 \cdot 3) - 0^2$	6	$2 \cdot (3^2) + 0$	18
$(2 \cdot 3) + 2^0$	7	$22 - 3 + 0$	19
$2^3 + 0^2$	8	$20^{(3-2)}$	20
$2^3 + 2^0$	9	$22 - 3^0$	21
$3^2 + 2^0$	10	$\frac{0}{3} + 22$	22
$3^2 + 2 + 0$	11	$22 + 3^0$	23