TOPIC: FACTORIALS

Factorials

◆ **Factorials** are just another operation, where you multiply all _____ numbers from a specific number down to 1.

► Sequences, series, combinatorics, & probability all use factorials, represented with __

$$4! = 4 \cdot \_\_ \cdot \_\_ \cdot 1$$

EXAMPLE Calculate the factorials in the table below.

Factorials	
Number	**Factorial**
0	$0! =$ ⟶ _____
1	$1! =$ ⟶ _____
2	$2! =$ ⟶ $\_\_ \cdot \_\_ =$ _____
3	$3! =$ ⟶ $\_\_ \cdot \_\_ \cdot \_\_ =$ _____
4	$4! =$ ⟶ $\_\_ \cdot 3 \cdot 2 \cdot 1 =$ _____
5	$5! = \_\_ \cdot 4 \cdot 3 \cdot 2 \cdot 1 =$ _____
6	$6! = \_\_ \cdot$ $=$ _____

◆ Each factorial = _____ factorial multiplied by new number: $n! = n \cdot (\_\_\_\_\_)!$

► This can be used to easily simplify factorial expressions.

EXAMPLE Evaluate the expression. *Hint: Use the formula above.*

(A) $4 \cdot 3!$

(B) $\frac{100!}{99!}$

(C) $(1 - 1)!$

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PRACTICE Evaluate each expression.

$(\boldsymbol{A})$ $\dfrac{12}{4!}$

$(\boldsymbol{B})$ $\dfrac{9!}{7!}$

$(\boldsymbol{C})$ $\dfrac{16!}{12! \cdot 4!}$

EXAMPLE List the first five terms of the sequence with the given general term below.

$$a_n = \frac{n!}{2}$$