## 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.*

$(A)$ $4 \cdot 3!$

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

$(C)$ $(1-1)!$

## TOPIC: FACTORIALS

**PRACTICE** Evaluate each expression.

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

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

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

**EXAMPLE** Evaluate the expression.

$$\frac{13! + 12!}{11!}$$

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

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