

1. Consider the following:

$$1 + 2 = 3$$

$$4 + 5 + 6 = 7 + 8$$

$$9 + 10 + 11 + 12 = 13 + 14 + 15$$

$$16 + 17 + 18 + 19 + 20 = 21 + 22 + 23 + 24$$

Find a general formula following this pattern and prove that it is true.

2. Evaluate the sum $\sum_{i=1}^n \frac{i}{(i+1)!}$ for $n \in \{1, 2, 3, 4, 5\}$. Find a general formula following this pattern and prove that it is true using induction.