

Possible induction problems:

1) Prove that

$$(2)(6)(10)(14)\cdots(4n-2) = \frac{(2n)!}{n!}$$

for all  $n \in \mathbb{N}$ .

2) Prove that  $5^{2n} - 3^n$  is a multiple of 11 for every  $n \in \mathbb{N}$ .

3) Prove that  $2^n \leq n!$  for all  $n \geq 4$ .

4) Prove that

$$\left(1 - \frac{1}{2^2}\right) \left(1 - \frac{1}{3^2}\right) \left(1 - \frac{1}{4^2}\right) \cdots \left(1 - \frac{1}{n^2}\right) = \frac{n+1}{2n}$$

for all  $n \in \mathbb{N} \setminus \{1\}$ .