

Examples on Mathematical Induction: Divisibility 2

Created by Mr. Francis Hung

Last updated: September 1, 2021

1970 CE (English) Syllabus B Paper 2 Q5(a)

1. By mathematical induction, show that $n(n + 1)$ is divisible by 2 for all $n \in \mathbb{N}$.

1. $n = 1$. $1(1 + 1) = 2$ which is clearly divisible by 2.

Suppose $k(k + 1) = 2m$ for some $k \in \mathbb{N}$, where m is an integer.

$$\begin{aligned}(k + 1)(k + 2) &= (k + 1)k + (k + 1) \cdot 2 \\ &= 2m + 2(k + 1) \\ &= 2(m + k + 1)\end{aligned}$$

$m + k + 1$ is an integer

$\therefore (k + 1)(k + 2)$ is divisible by 2.

If it is true for $n = k$, then it is also true for $n = k + 1$.

By the principle of mathematical induction, $n(n + 1)$ is divisible by 2 for all $n \in \mathbb{N}$.