

FCS152 Tutorial 4
Mathematical Induction

1. Use the Principle of Mathematical Induction to prove that:
 $3 \mid (n^3 + 3n^2 + 2n)$ for all $n \geq 1$.
2. Prove by induction that $1+5+5^2+5^3+5^4+\dots+5^n=(5^{n+1}-1)/4$.
3. Prove by induction that for intergers $n>4$, $2^n > n^2 + 2$
4. Use the mathematical induction to prove that if $S_0=a$ and $S_n=2S_{n-1}+b$, then $S_n=2^na+(2^n-1)b$ for every nonnegative integer n .
5. We begin solving a jigsaw puzzle by finding two pieces that match and fitting them together. Each subsequent step of the solution consists of fitting together two blocks made up of one or more pieces that have previously been assembled. Use strong mathematical induction to prove that the number of steps required to put together all n pieces of a jigsaw puzzle is $n-1$.