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YEAR 12 – MATHS EXT. 1

REVIEW TOPIC (SP1)

MATHEMATICAL INDUCTION

PAST EXAMINATION QUESTIONS:

HSC 99

(5) (a) Prove by induction that, for all integers $n \geq 1$, **3**

$$(n+1)(n+2)...(2n-1)2n = 2^n\left[1\times 3\times ...\times (2n-1)\right].$$

HSC 98

(3) (a) Use the method of mathematical induction to prove that

$4^n + 14$ is a multiple of 6 for $n \geq 1$.

HSC 94

(3) (c) Prove by mathematical induction that $n^3 + 2n$ is divisible by 3, for all positive integers n.

HSC 93

(5) (a) For $n=1,2,3,...$, let $S_n=1^2+2^2+...+n^2$.

(i) Use mathematical induction to prove that, for $n=1,2,3,...$,

$$S_n=\frac{1}{6}n(n+1)(2n+1).$$

(ii) By using the result of (i) ***estimate*** the least n such that $S_n \geq 10^9$.

$\boxed{n = 1442}$