

A-level Further Maths A21

Induction

A theorem thought to be true for all values of the positive integer n , can be proved by showing that:-

- (i) If it is true for $n=k$, then it is also true for $n=k+1$.
- and
- (ii) It is true for some small value of n such as $n=1$ (or perhaps $n=2$ or $n=3$)

If you prove both (i) and (ii) then you have shown that the theorem is true at the start (usually $n=1$) and it is true for $n=1+1$ and $n=2+1$ and $n=3+1$ and so on for all integer values of n following on after the valid starting value (usually $n=1$).

Example 1 Use the method of mathematical induction to prove:-

$$\sum_{r=1}^n r^3 = \frac{1}{4}n^2(n+1)^2$$

where n is a positive integer.

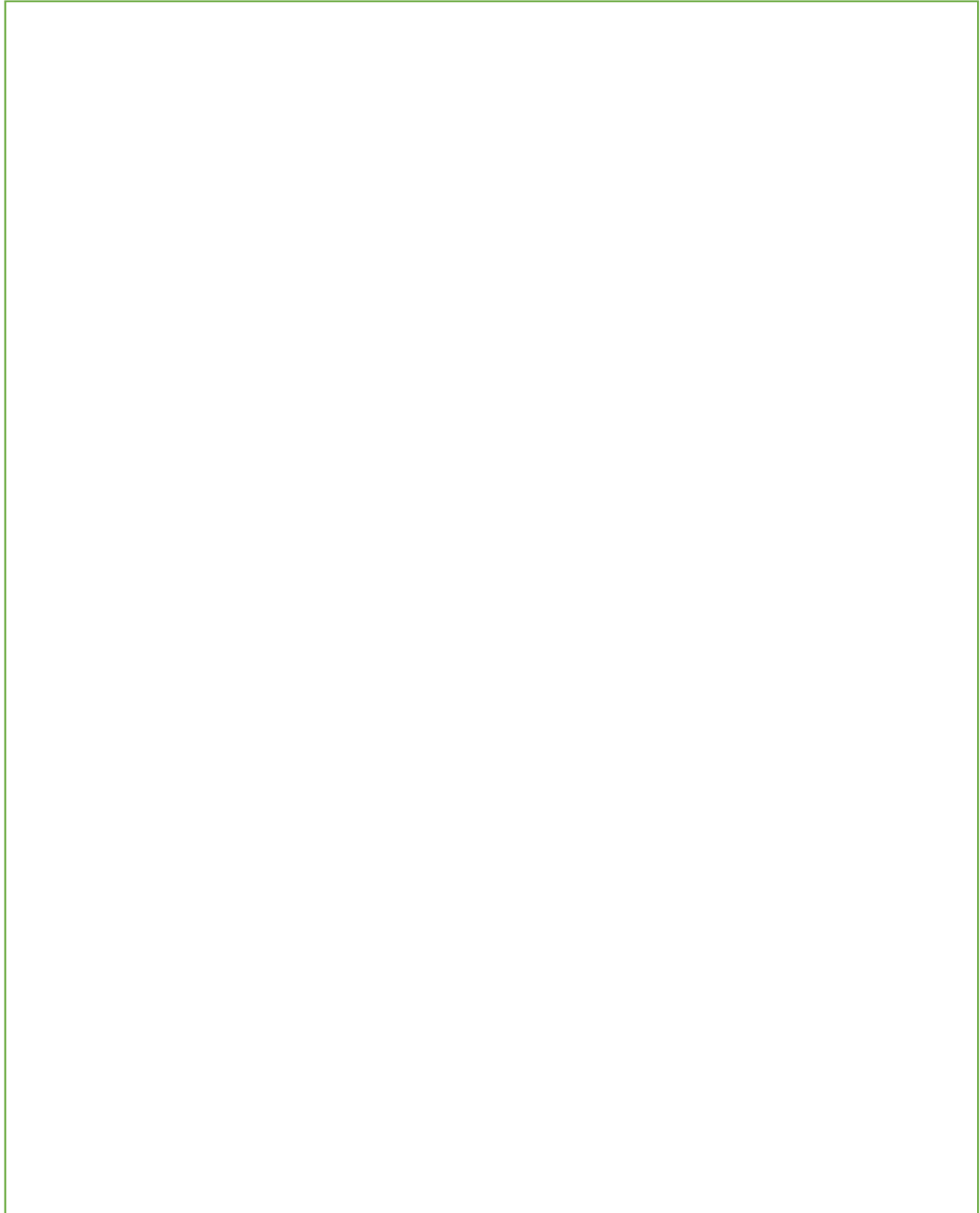
Proof

Example 2 Use the method of mathematical induction to prove that the expression:-

$$3^{2n} + 7$$

Is divisible by 8 for all positive integers n.

Proof (Method 1)



**See other method too

Proof (Method 2)



Example Given that n is an integer, which is greater than 3, show that

$$n! > 2^n$$

Proof

