

# Proof by Mathematical Induction



Name : \_\_\_\_\_



TI-Nspire™



Assessment



Student



30 min

7 8 9 10 **11** 12

## Question: 1.

i) Determine the sum of the first 10 cubic numbers:  $1^3 + 2^3 + 3^3 + \dots + 10^3$ .

1 mark

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ii) Square the sum of the first 10 whole numbers and comment on the result:  $(1 + 2 + 3 + \dots + 10)^2$

2 marks

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iii) Explain how the diagram shown here relates to part (i) and (ii) above.

3 marks

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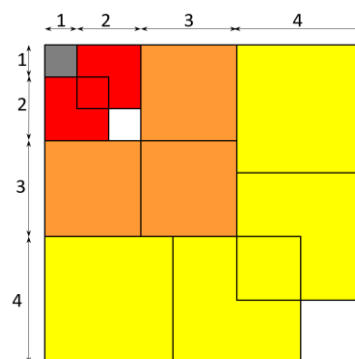
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## Question: 2.

i) Express  $\sum_{x=3}^7 x^3$  in expanded form and hence evaluate the result.

2 marks

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ii) Express:  $(4 + 5 + 6 + \dots + 20)^2$  using sigma  $\sum$  notation and hence evaluate the result.

2 marks

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**Question: 3.**

i) Complete the following table of values:

2 marks

$n$	1	2	3	4	5	6	7	8	9	10
$\sum_{x=1}^n x^3$	1	9	36							
$\sum_{x=1}^n x$										
$\left(\sum_{x=1}^n x\right)^2$	1	9								

ii) Determine a rule for  $\sum_{x=1}^n x^3$ , express your answer in factorised form.

2 marks

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iii) Determine a rule for  $\sum_{x=1}^n x$ , expressing the rule in factorised form.

2 marks

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iv) Use your results from part (ii) and (iii) to show that  $\left(\sum_{x=1}^n x\right)^2 = \sum_{x=1}^n n^3$ 

2 marks

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**Question: 4.**Use mathematical induction to prove the formula for the sum of the first  $n^3$  whole numbers.

6 marks

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