Proof by Mathematical Induction

T³ Teachers Teaching with Technology™
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Name : _____

7   8   9   10   **11**   12

TI-84PlusCE™   Assessment   Student   30 min

Question: 1.

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

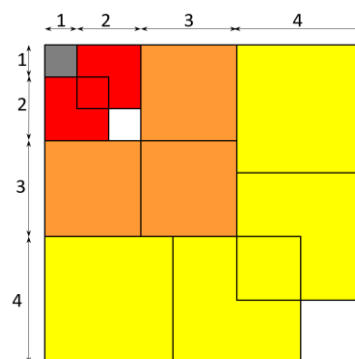1 mark

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ii)   Square the sum of the first 10 whole numbers and comment on the result: $\left(1+2+3+\ldots10\right)^2$

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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Question: 2.

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

2 marks

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ii)   Express: $\left(4+5+6+\ldots20\right)^2$ 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

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

2 marks

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

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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