

**Xu Jiagu**

*Former Professor of Mathematics, Fudan University, China*

**Vol. 8** | Mathematical  
Olympiad  
Series

# Lecture Notes on Mathematical Olympiad Courses

For Senior Section Vol. 2

# Contents

<b>Preface</b>	<b>v</b>
<b>Acknowledgments</b>	<b>vii</b>
<b>Abbreviations and Notations</b>	<b>ix</b>
<b>16 Mathematical Induction</b>	<b>1</b>
<b>17 Arithmetic Progressions and Geometric Progressions</b>	<b>11</b>
<b>18 Recursive Sequences</b>	<b>19</b>
<b>19 Summation of Various Sequences</b>	<b>29</b>
<b>20 Some Fundamental Theorems on Congruence</b>	<b>37</b>
<b>21 Chinese Remainder Theorem and Order of Integer</b>	<b>45</b>
<b>22 Diophantine Equations (III)</b>	<b>53</b>
<b>23 Pythagorean Triples and Pell's Equations</b>	<b>61</b>
<b>24 Quadratic Residues</b>	<b>69</b>
<b>25 Some Important Inequalities (I)</b>	<b>75</b>
<b>26 Some Important Inequalities (II)</b>	<b>85</b>
<b>27 Some Methods For Solving Inequalities</b>	<b>93</b>
<b>28 Some Basic Methods in Counting (I)</b>	<b>101</b>
<b>29 Some Basic Methods in Counting (II)</b>	<b>109</b>

<b>30</b>	<b>Introduction to Functional Equations</b>	<b>117</b>
	<b>Solutions to Testing Questions</b>	<b>125</b>
	<b>Appendices</b>	<b>259</b>
<b>A</b>	<b>Theorem on Second Order Recursive Sequences</b>	<b>261</b>
<b>B</b>	<b>Proofs of Theorems On Pell's Equation</b>	<b>263</b>
<b>C</b>	<b>Theorems On Quadratic Residues</b>	<b>267</b>
<b>D</b>	<b>Proofs of Some Important Inequalities</b>	<b>273</b>
<b>E</b>	<b>Note On Cauchy's Problem in Functional Equations</b>	<b>279</b>
	<b>Index</b>	<b>281</b>