



# Chases and Escapes: The Mathematics of Pursuit and Evasion (Princeton Puzzlers)

By Paul J. Nahin

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We all played tag when we were kids. What most of us don't realize is that this simple chase game is in fact an application of pursuit theory, and that the same principles of games like tag, dodgeball, and hide-and-seek are also at play in military strategy, high-seas chases by the Coast Guard, and even romantic pursuits. In *Chases and Escapes*, Paul Nahin gives us the first complete history of this fascinating area of mathematics, from its classical analytical beginnings to the present day.

Drawing on game theory, geometry, linear algebra, target-tracking algorithms, and much more, Nahin also offers an array of challenging puzzles with their historical background and broader applications. *Chases and Escapes* includes solutions to all problems and provides computer programs that readers can use for their own cutting-edge analysis.

Now with a gripping new preface on how the Enola Gay escaped the shock wave from the atomic bomb dropped on Hiroshima, this book will appeal to anyone interested in the mathematics that underlie pursuit and evasion.

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**Bibliography**

- Rank: #1451999 in Books
- Brand: Brand: Princeton University Press
- Published on: 2012-07-22
- Original language: English
- Number of items: 1
- Dimensions: 8.50" h x .60" w x 5.51" l, .60 pounds
- Binding: Paperback
- 272 pages

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## **Editorial Review**

### **Review**

"In the 18th century, mathematicians began to tease apart how best to track down and intercept prey, inspired by pirate ships bearing down on merchant vessels. The mathematics is by no means trivial, and quickly becomes fiendish if the merchant ship takes evasive action. This is just one of the colorful problems in Paul Nahin's fascinating history of the mathematics of pursuit, in which he guides us masterfully through the maths itself--think lions and Christians, submarines and torpedoes, and the curvaceous flight of fighter aircraft."--*New Scientist*

"This is a highly readable book that offers several colorful applications of differential equations and good examples of non-trivial integrals for calculus students. It would be a good source of examples for the classroom and or a starting point for an independent project."--**Bill Satzer, MAA Review**

"This book contains a well-written, well-organized collection of solutions to twenty-one challenging calculus and differential equation problems that concern pursuit and evasion as well as the historical background of each problem type."--*Mathematics Teacher*

"I am sure that this book will appeal to everyone who is interested in mathematics and game theory. Excellent work."--**Prabhat Kumar Mahanti, Zentralblatt Math**

"*Chases and Escapes* is a wonderful collection of interesting and classic pursuit and evasion problems. . . . If you are interested in in dogs chasing ducks, pirates chasing merchants, and submarines hiding, then this book is for you."--*Mathematics Teacher*

### **From the Back Cover**

"Nahin provides beautiful applications of calculus, differential equations, and game theory. If you are pursuing an enjoyable collection of mathematical problems and the stories behind them, then your search ends here."--**Arthur Benjamin, Harvey Mudd College**

"I know of no better way to grasp the basic concepts of calculus than to study pursuit-and-escape problems. Paul Nahin has made a superb survey of the vast field of such problems, from Zeno's paradox of Achilles and the tortoise through the famous four bugs that once made the cover of *Scientific American*. Not only does he make clear the required differential equations, but he traces each problem's colorful history. No book on the topic could be more definitive or a greater pleasure to read."--**Martin Gardner**

"*Chases and Escapes* is a superb treatment of the solutions to a variety of pursuit-evasion problems, some classic and others more contemporary. The content is accessible to undergraduates in mathematics or the physical sciences, with lots of supporting detail included. The author's lively writing style makes for enjoyable reading."--**David M. Burton, University of New Hampshire**

"This is a well-written and novel book that is comprehensively researched and enthusiastically presented. Nahin offers a very good mixture of elegant math and lively historical interludes. I wasn't aware the topic had such a rich history and wide scope."--**Desmond Higham, University of Strathclyde**

About the Author

**Paul J. Nahin** is the best-selling author of many popular math books, including *Mrs. Perkins's Electric Quilt*, *Digital Dice*, *Dr. Euler's Fabulous Formula*, *When Least Is Best*, and *An Imaginary Tale* (all Princeton). He is professor emeritus of electrical engineering at the University of New Hampshire.

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