Towing Icebergs, Falling Dominoes and other Adventures in Applied Mathematics. Robert B. Banks. Princeton University Press, 41 William Street, Princeton, New Jersey 08540. 1998. Price: $ 29.95. 328 pp.

This is a nice, well-written and well-produced book that demonstrates how fairly elementary mathematics can be used to usefully analyse many interesting phenomena which arise in various human activities. I would place the mathematical level of the book at the 12th standard or first year college level, although the author does not hesitate on occasions to display what might be called 'advanced mathematics'. Thus although most of the book deals with simple integrals and first order, ordinary differential equations, elliptic integrals are introduced and effectively used when needed. Less understandable is the sudden introduction, in the chapter on water waves and falling dominoes, of the one-dimensional wave equation, a partial differential equation, although mercifully it is not solved. Paradoxically, it is after this chapter, towards the end of the book, on page 291 that we find a reminder that dH/dt is the slope of the $H(t)$ curve. But these are minor quibbles.

There are twenty-four chapters in the book each typically 12 or 13 pages long, just the right length not to bore you. Although one could collect the chapters into sections, for example into those dealing with growth, those dealing with projectiles, etc. the chapters are really independent of one another. This makes the book a very good reference especially for pre-college and college students. Here is a sample of the topics covered: the simple (exponential) growth equation and its applications in animal reproduction and the calculation of the federal debt; the logistic equation and growth control; terminal velocity and parachutes; the mathematics of projectiles and impact; the melting of ice and 'economic energy'; the delay differential equation and its application to the fortunes of American football clubs; the mechanics of towers, bridges and arches; and, best of all, the mechanics of various sports such as golf, baseball, ski-jumping and running. In my opinion, the book is an adventure in applied mechanics rather than in applied mathematics.

A brief outline of the title problems. The author considers the novel idea of towing icebergs from Antartica to other parts of the world to be used, on melting, as good sources of fresh water. What should be the route on a spherical earth, how fast should the towing ship move so that water lost by melting is minimized, what power will the ship have to expend? Dominoes are small, oblong pieces marked with pips used in a game of the same name. A domino can be made to stand on one of its smaller sides but if it is gently pushed will fall over. Imagine standing many such dominoes in this manner but arranged, one next to the other equally spaced, so that if one falls it will disturb the next. If the first domino is disturbed it will start a wave motion that will bring down the whole lot of dominoes (remember the 'dominoes theory' of the 1960s?). What will be the speed of the wave and how long will it take for all the dominoes to fall?

This book is not a textbook and that is its great strength. The author does not teach you new methods or clever tricks to solve mathematical problems. Rather he takes up the more difficult challenge: how can we model in simple but effective ways the problems that face us in every-day life? He also does something that is very rarely done, namely carrying through the calculations so that realistic numbers are obtained for the quantities of interest. This part of the task is normally considered to be boring; but if this is not done we usually learn little other than to pass exams. Thus with the author we learn that the energy in an average hurricane is more than that of a 20 megaton hydrogen bomb; that a logarithmic equation describes the profile of the Eiffel tower; that the economic strength of a nation is reasonably given by $(\text{population})^{1/3}(\text{GDP})^{2/3}$; that the range for a golf ball with an initial velocity of 60 m/s at 12° to the horizontal and with a spin of 4000 rpm is about 131 m; and that Carl Lewis' kinetic energy when he sprinted across the finish line in the 1987 Olympics was about that of a 10 inch steel ball falling from a height of 25 ft. As a sports buff the most interesting chapters for me were the ones on sports where there is a wealth of fascinating and useful information.

The book is not without faults. For starters there is the problem of the author's humour; but this is, I admit, a subjective matter. More serious is the use of both metric and the British system of units. My daughter would certainly wonder why an animal, the slug, is used in the quantification of force. Since the author so greatly emphasizes numerical magnitudes, the units do play a role. Another matter from the Indian point of view is the lack of any discussion of our favourite games soccer, hockey and cricket. We would be greatly interested to learn the mechanics of the curving free kick, of the scoop and of reverse swing. Well, . . . shouldn't one of us write such a book with matters such as these that interest us?

Conscientious teachers will find this book a useful source of material and problems, many of which are explicitly stated. Of course, it is students who will benefit from it the most, but most of us too need to refer occasionally to a book such as this with all the useful infomation that it contains. I should also mention that the book contains an excellent and up-to-date set of references. This is a good book that should be in all libraries, not just those in schools and colleges.

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