Math 105—Project 3
The Optimal Put Shot

by Gavin LaRose (glarose@NebrWesleyan.edu), Nebraska Wesleyan University, January 1998

Medres, Inc.

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13 April 1998

Independent Mathematical Contractors, Inc.
Suite 2, Strawmarket Business Plaza
Lonlinc, SK 04685

Dear IMC:

Medres, Inc., a world-leader in applied medical research, has recently completed the purchase of a small hospital here in Lonlinc. As it happens, this hospital has a sports medicine and research division that is concerned with the development of athletes to their full potential, and it is on this matter that we are contacting your company.

One of the clients of this division is a shot-putter at a local college who is intent on improving their performance and is therefore interested in an analysis of the aspects of their shot-putting style. Critical to the distance to which a shot may be "put" is, of course, the force that may be exerted in the extension of the putter's arm from fully contracted to fully extended (figure 1). Using values as measured in weight training, this force may be given as a function of the angle θ at which they release the shot, as shown in table 1.

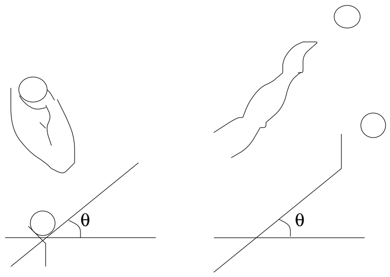

Figure 1: Shot put

θ	$0°$	$45°$	$90°$
F	285	245	200

Table 1: Force exerted by shot-putter as a function of release angle

Given this force, the release velocity of the shot may be found from Newton's law to be approximately $v_R = 0.85\sqrt{\frac{2A}{m} \cdot F}$, where A is the extended length of the putter's arm and m the mass of the shot. (The vertical and horizontal components of this velocity are then $v_R \sin\theta$ and $v_R \cos\theta$.)

The answer that we need for the shot-putter is therefore at what angle the shot should be released to maximize the distance that the shot is put. We look forward to receiving your analysis of this problem, the final 3–5 page report for which should be submitted by the **4**th of **May**. As is our policy, we have arranged that a qualified if eccentric mathematician in the area, the estimable Dr. Gavin LaRose, be available to answer any questions you may have in the course of your work. Please note that you must contact him as a team with some indication of your progress by the **16**th of **April** and again by the **24**th of **April**. Failure to meet any of these deadlines will be grounds for partial or complete reduction in your compensation for the project. Dr. LaRose is also able to provide you with example reports should these facilitate your report writing.

We look forward to hearing from you.

Sincerely,

Cever Etkoop, M.D.
President, Medres, Inc.

ce:glr