

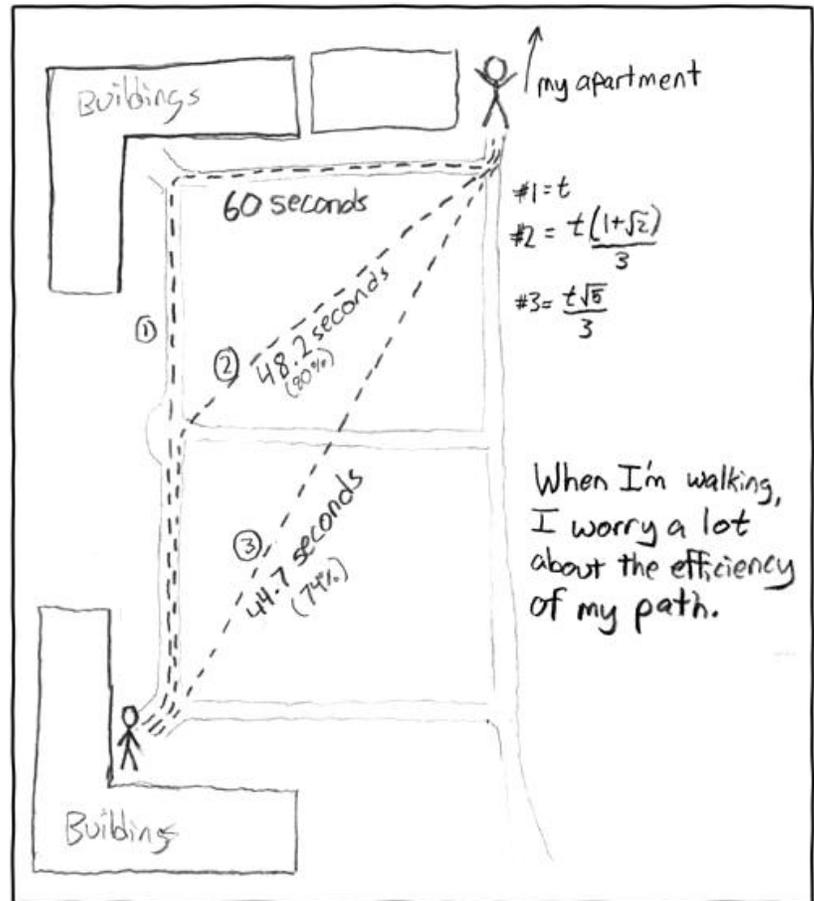
Saving the Grass – One Walkway at a Time

Cornell's Ithaca campus awes visitors with its unique natural surrounds and atmosphere, including gorges, creeks, plantations, orchards, and quadrangles. As pretty as they may be, the quadrangles are also well-known for having inadequate walkways for students running to class across campus. As a result, “unofficial walkways” appear, worn into the grass.

The administration decided to completely redesign the Arts Quad walkways (though the buildings, the statues, and the big old trees will have to stay in place). Your team has been asked to help with the master plan.

The XKCD cartoon (on the right) illustrates a possible analysis from the point of view of a particular student.

Ideally, in addition to pedestrian traffic and maintenance costs, your model should account for the limited ability of grass to withstand constant traffic; the appeal of the quad to prospective and attending students; and the active lobbying efforts of the group of avid Frisbee players.



The maintenance cost of walkways is proportional to their total length (e.g., paving, snow-clearing in the winter). The landscaping-maintenance cost depends on the number of contiguous lawns, their geometry, and on the total area of “unofficial walkways” (where the grass has to be periodically re-seeded).

Design a new plan for the Arts Quad based on the following principles:

- in general, it's preferable to minimize the total length of all walkways and maximize the areas of contiguous lawns;
- no walkway-abiding pedestrian should have to lengthen his route through the Quad by more than 15% (compared to a straight line);
- an average person might abandon the official walkways if he has a chance to save more than 10% of the total length of his path;
- two different types of grass are available (one of them more resilient than the other and capable of withstanding 1.5 times higher foot traffic, but also two times more expensive).

Your plan should include a map showing the Arts Quad, (before and after), together with the anticipated wear and tear on the grass, and the recommendations for choosing a type of grass for seeding each part of the Quad.

In addition to a detailed description of your model, methods and results, provide a non-technical “letter to the editor” (for publication in the Cornell Daily Sun) summarizing your recommendations and advocating for change, if appropriate.