

Problem of the Week #17

Assigned: 10 February 2011, 1300

Due: 17 February 2011, 1300

The aqueduct

A miner hires an engineer to build a canal from his mines to a nearby major waterway. The canal must pass over a gorge, so the engineer designs a supported aqueduct (i.e., a water bridge) to span the defile. The supported portion of the aqueduct has a trapezoidal cross section with a 50 ft width at the base. The water depth is strictly regulated by a system of locks so that it is always between 14 and 15 ft deep. When the depth is 15 feet, the width of the surface of the canal is 70 feet. The length of the supported span is 200 feet.

The engineer designs an incredible support structure that can support a total load of 6,000 tons on the span.

The miner intends to use 90' x 40' barges with rectangular cross-sections to move his product on the canal.

What is the maximum gross weight for such a barge to safely traverse the aqueduct? Justify your answer.

Email solutions to Christopher.marks@usma.edu with subject line: POTW.

Solutions can be emailed in the form of: an email (plain text) no attachment, a word document, a mathematica file, an excel workbook, or a scanned adobe file of your work.

If none of these options work for you, you may drop a hardcopy off at my office TH239C, just annotate the time of submission.