

IMPORTANT CHANGE TO CONTEST RULES FOR MCM/ICM 2012:

Teams (Student or Advisor) are now required to submit an electronic copy (summary sheet and solution) of their solution paper by email to solutions@comap.com. Your email MUST be received at COMAP by the submission deadline of 8:00 PM EST, February 13, 2012. Teams are free to choose between MCM Problem A, MCM Problem B or ICM Problem C.

COMAP Mirror Site: For more in:

<http://www.comap.com/undergraduate/contests/mcm/>

[MCM: The Mathematical Contest in Modeling](#)

[ICM: The Interdisciplinary Contest in Modeling](#)

2012 Contest Problems**MCM PROBLEMS****PROBLEM A: The Leaves of a Tree**

"How much do the leaves on a tree weigh?" How might one estimate the actual weight of the leaves (or for that matter any other parts of the tree)? How might one classify leaves? Build a mathematical model to describe and classify leaves. Consider and answer the following:

- Why do leaves have the various shapes that they have?
- Do the shapes “minimize” overlapping individual shadows that are cast, so as to maximize exposure? Does the distribution of leaves within the “volume” of the tree and its branches effect the shape?
- Speaking of profiles, is leaf shape (general characteristics) related to tree profile/branching structure?
- How would you estimate the leaf mass of a tree? Is there a correlation between the leaf mass and the size characteristics of the tree (height, mass, volume defined by the profile)?

In addition to your one page summary sheet prepare a one page letter to an editor of a scientific journal outlining your key findings.

PROBLEM B: Camping along the Big Long River

Visitors to the Big Long River (225 miles) can enjoy scenic views and exciting white water rapids. The river is inaccessible to hikers, so the only way to enjoy it is to take a river trip that requires several days of camping. River trips all start at First Launch and exit the river at Final Exit, 225 miles downstream. Passengers take either oar- powered rubber rafts, which travel on average 4 mph or motorized boats, which travel on average 8 mph. The trips range from 6 to 18 nights of camping on the river, start to finish.. The government agency responsible for managing this river wants every trip to enjoy a wilderness experience, with minimal contact with other groups of boats on the river. Currently, X trips travel down the Big Long River each year during a six month period (the rest of the year it is too cold for river trips). There are Y camp sites on the Big Long River, distributed fairly uniformly throughout the river corridor. Given the rise in popularity of river rafting, the park managers have been asked to allow more trips to travel down the river. They want to determine how they might

schedule an optimal mix of trips, of varying duration (measured in nights on the river) and propulsion (motor or oar) that will utilize the campsites in the best way possible. In other words, how many more boat trips could be added to the Big Long River's rafting season? The river managers have hired you to advise them on ways in which to develop the best schedule and on ways in which to determine the carrying capacity of the river, remembering that no two sets of campers can occupy the same site at the same time. In addition to your one page summary sheet, prepare a one page memo to the managers of the river describing your key findings.

ICM PROBLEM

PROBLEM C: Modeling for Crime Busting

Click the title below to download a ZIP file containing the 2012 ICM Problem.

Your ICM submission should consist of a 1 page Summary Sheet and your solution cannot exceed 20 pages for a maximum of 21 pages.

[Modeling for Crime Busting](#)

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