

Challenges of the Week Spring Semester 1999-2000

Challenge of the Week # 1 - January 14 to January 21: The membership of the Legal Clothing Society (LCS) consists exclusively of lawyers and tailors. All of the lawyers who are members of the LCS always lie. All of the tailors who are members of the LCS always tell the truth. At a typical meeting of the LCS the members sit in a circle, each introduces themselves, and then says either "The person sitting on my left always lies" or "The person sitting on my left always tells the truth."

- 1. At the first meeting of the LCS all the members present say "The person sitting on my left always tells the truth". What can you say about the members that attended this meeting?*
- 2. At the second meeting of the LCS all the members present say "The person sitting on my left always lies". What can you say about the members that attended this meeting?*

In each case justify your answer.

Challenge of the Week # 2 - January 21 to January 28: One hundred people stand in a circle, each looks towards the center. No two of the people are of the same height. Everyone says about his or her two neighbors, right and left, if they are taller or shorter than he or she is. There are 13 people who say that both of their neighbors are shorter. There are N people who say that their right-hand neighbor is taller and their left-hand neighbor is shorter. There are M people who say their right-hand neighbor is shorter and their left-hand neighbor is taller. Find N and M if the ratio M/N is an integer greater than 1 and less than M .

Challenge of the Week # 3 - January 28 to February 4: At a large campus meeting there are m times n people, all of whom are of a different height. The people are arranged in n rows of m people each. From each row, the tallest person is selected. From each column, the shortest person is selected. Next, the shortest of the selected tallest people, call her Mary, is chosen. Finally, the tallest of the selected shortest people, who is different than Mary, is chosen. Suppose John is this person. Who is taller, John or Mary?

Challenge of the Week # 4 - February 4 to February 10: The first challenge this semester, for January 14, 2000 to January 21, 2000, dealt with the Legal Clothing Society (LCS) whose members are either lawyers (who always lie) and tailors (who always tell the truth). For the statement and solution to this problem see the Challenge of the Week homepage

<http://www.ux1.eiu.edu/~cfdbm/chalweek/summary.htm>

The LCS just had its third meeting and the secretary, the vice-president and the president (who are all different) led the meeting. The secretary began and after his remarks he noted that there were an even number of members present and an even number of them were lawyers. The vice-president went second and when she finished, she noted there were an odd number of members present and an odd number of them were tailors. The president concluded the meeting with the remark that there were 37 members present.

Determine the occupation of each of the officers. Justify your answers.

Challenge of the Week # 5 - February 16 to February 25 : Four soccer teams — A, B, C, and D — were all to play each other once. After some — or perhaps all — of the games had been played, a total of 18 goals had been scored and B had 2 more than each of the other 3 teams. B also had 3 times as many goals scored against it as D had, and A had the same number of goals against it as for it. C had fewer goals scored against it than any of the other teams. There were no shutouts, and in no two games were the scores exactly the same. One game was a tie. Find the scores in all the games that were played.

Challenge of the Week # 6 - February 25 to March 3 : If a chicken and a half can lay an egg and a half in a day and a half, how many dozen eggs can 3 dozen chickens and 2 roosters lay in a week?

Challenge of the Week # 7 - March 3 to March 10 : Person A rows on a river x miles with the current and then returns rowing x miles against the current. Person B rows $2x$ miles on a calm lake where there is no current. If the rowing strength of the two persons is the same, does person A always take longer to complete the trip, or does person B always take longer, or do the distance and the rowing speed determine who takes longer? Justify your answer.

Challenge of the Week # 8 - March 24 to March 31 : Five adults met regularly to play cards: a widower, his son, his son's wife, his daughter, and his daughter's husband. They sit around a table in the shape of a regular hexagon. On one occasion, the scorekeeper was the only one who sat between a man and a woman; neither woman sat next to her husband; and the oldest man sat next to the empty chair. Who was the scorekeeper on that occasion? Justify your answer

Challenge of the Week # 9 - March 31 to April 7 : Be careful with your answers - you know what the first day of April is.

- 1. There are flies in the room. One fly touches the ceiling, one fly touches the floor, and each of the walls is touched by at least one fly. What is the smallest number of flies that can be in the room?*
- 2. Sam bought a cake of soap in the shape of a rectangular parallelepiped. Each day Sam used the same amount of soap. Sam took the new cake of soap and went on vacation. Upon returning home the dimensions of the soap were half what they were originally and there was just enough soap for one more day. How long was Sam's vacation?*
- 3. It is easy to find an integer divisible by 2, 3, 4, and 5. It is easy to find an integer divisible by 2, 3, 4, 5, 6, and 7. Does there exist an integer divisible by any whole number?*
- 4. I just about understood what was said, but I couldn't hear one word. "My mother and father have been married a long time and have had many children. I have three more brothers than I have sisters and my sister, Sue, has zzzz more brothers than she has sisters." What was the word I couldn't understand?*

Challenge of the Week # 10 - April 7 to April 14 : Find as many points, P , as you can on the earth which satisfy the following: If you start at P , go 10 kilometers South, then 10 kilometers East, and finally 10 kilometers North, you end up at P . The award will go the person(s) submitting the largest set of points.

Challenge of the Week # 11 - April 14 to April 21: Two reports were recently issued at a certain midwestern university. In the first it was noted that the average starting salary for a female graduate with a particular major had doubled from when the average was computed for 1990 graduates to when the average was computed for 2000 graduates. It was also noted that the average starting salary for a male graduate with the same major had doubled between 1990 and 2000. The other report noted that the average starting salary for all graduates with this particular major was actually less in 2000 than it was in 1990!

How is this possible, or was a mistake made? Justify your answer.