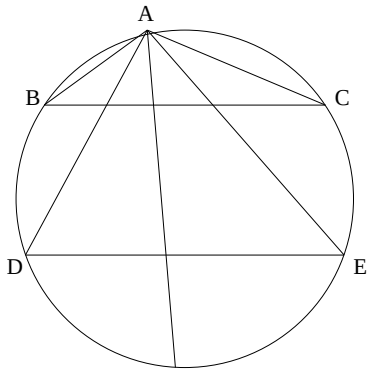
Your Original Problems!

1. On the silly TV show Survivor, two tribes compete against each other. The tribe that loses an immunity challenge must vote a member from their own tribe. At present, there are six people on each tribe. Tribe Samburu has three members that have grown especially close. As a result, the voting will be really predictable. The producer has decided to split Samburu and Boran into three different tribes of four, with one member of the "clique" in each. How many different tribes can be made? (*Elizabeth*)

2. A total of n students are enrolled in Math 2790 because they are very excited to hear all of the professor's exciting psychic predictions. (And plus, he's also a real hottie). At the start of the semester, they all make a guess at the professor's accuracy, e.g. 90% of predictions are correct. At the end of the semester, a list is posted with the names of the students in the decreasing order of how close they were to the professor's actual accuracy. Only names of people who underestimated the accuracy make the list. For example, if A and B were the only ones not to overestimate the professor's accuracy, the posted result is "A, B", then A had the better guess. Assuming that all guesses are distinct, how many posted results are possible? (*Alison*)

3. There has been an ongoing battle in Math 2790 since the very first class. Some people want to sit at the back of the class and in order to stop them Rich has removed some desks so that only five remain for our four "oppositional" students. Since Rich has done this, the students are pissed and they refuse to make it easy for him. Karin says she will not sit in desk 1,2, or 3. Elizabeth says that she would rather know who wins Survivor than sit in desk 2 or 3. Sable refuses to sit in desks 3 or 4, and Garrett says that he will never sit in desks 3, 4, or 5. John, who is always curious, says "Well, how many ways can we arrange all of you in these five desks"? (*Victoria*)

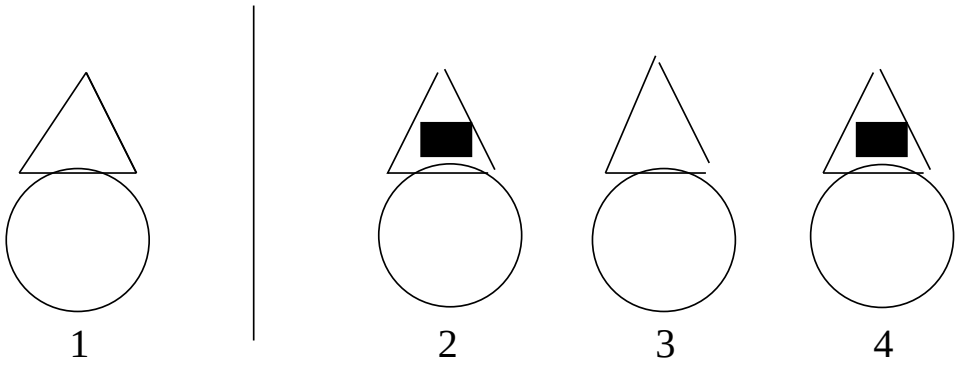
4. Suppose that two parallel chords form the bases of two triangles that share a vertex on the circumference of that circle. Prove that at this common vertex, both triangles share the same internal angle bisector (*Sable*).



5. (a) Richard went into McDonald's one day, and wondered what the largest number of Chicken McNuggets is that he could not exactly buy. What is this number? (Note: Chicken McNuggets are sold in packs of 4,6,9, and 20).

   (b) If Richard is afraid of people thinking him immature, and thus refuses to buy kids packs (4), what then is the largest number of McNuggets that he cannot buy? (*John*)

6. Four soldiers were captured by the enemy. They were put in a ditch, as shown. The enemy showed the soldiers two black hats and two white hats and put one on each soldier's head. They were told that if one of them could figure out which colour hat he was wearing, then all four soldiers would be released. Which soldier will be able to deduce which hat he is wearing, and what colour will his hat be? (*Riham*)



(Note: soldier 1 is looking to the right, and soldiers $2, 3, 4$ are looking to the left. There is a large brick wall separating soldiers 1 and 2.)

7. Three wise students are napping during one of Richard's boring lectures. He sees this and vindictively chalks their foreheads. Later, they wake (at the same time since class has *unfortunately* ended). And all three wise students see each other and burst out laughing. Yet all of a sudden, one student suddenly stops. Why? (*Vernon*)

8. Two chipmunks are sitting on a tree, chilling. One of them said something and the other one fell off from the tree. Why?

   Answer: Chipmunk A asked Chipmunk B, "Have you ever seen a *zed*bra before?" Chipmunk B laughed too hard and fell off the three.

   (Thanks, *Chris*)