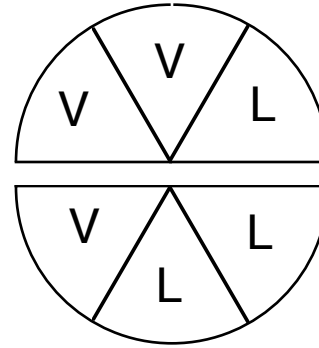Fair Division Practice Quiz:

[1] Continuous division problem by lone chooser method.
Ann, Bob and Cindy decide to split a $36 cake between them.
The cake is half vanilla and half lemon. Ann will divide
the cake into what she regards as two pieces of equal
value. Bob will pick one of the two pieces and Ann
gets the piece Bob did not pick. Then Ann will divide
her piece into three pieces of what she regards as equal
value. Bob will split his piece into three pieces of
what he regards as equal value. Then Cindy gets to pick
one of Ann's three pieces and one of Bob's three pieces.
Thus everybody ends up with two pieces of cake.

Ann likes vanilla and lemon equally and splits the cake as shown
(one piece is two thirds vanilla and one third lemon, and the other piece is two thirds lemon and
one third vanilla).

Assume Bob loves vanilla but hates lemon, while Cindy loves lemon but hates vanilla.

(a) Which of the two pieces shown will Bob pick?

(b) For simplicity, assume Bob divides his piece into three contiguous sectors. How would Bob
divide his piece in that case?

(c) Assume Ann divides her piece into three contiguous sectors. How would she do it?

(d) Which piece would Cindy pick from Ann and which piece from Bob?

(e) Fill in the table showing how much each of the three sees their three portions are worth. Indicate
who envies whom.

	Ann's portion	Bob's portion	Cindy's portion
Values as Ann sees them			
Values as Bob sees them			
Values as Cindy sees them			

[2] Repeat the problem using the lone divider method, assuming Bob is the lone divider. Assume Bob divides the cake into 3 pieces as follows: one piece is one of the vanilla wedges, another piece is another of the vanilla weddes, and the third piece is the third vanilla wedge plus all of the lemon. Let Ann be the first chooser and let Cindy be the second chooser. Explain what Ann and Cindy would do, what portions everyone gets and determine the value each person assigns to everyone's portions and whether anyone envies anyone else. As before, Ann likes vanilla and lemon equally, Bob loves vanilla but hates lemon, and Cindy loves lemon but hates vanilla.
(a) Which pieces are acceptable to Ann? Which are acceptable to Cindy?

(b) Explain what portions Ann and Cindy get, and what Bob gets.

(c) Fill in the table showing how much each of the three sees their three portions are worth. Indicate who envies whom.

	Ann's portion	Bob's portion	Cindy's portion
Values as Ann sees them			
Values as Bob sees them			
Values as Cindy sees them			

[3] Discrete division problem (sealed bids method): Judy, Cathy and Sharon want to divide among them a piano and a lamp. Here is how they bid:

	Judy	Cathy	Sharon
piano	$9000	$3600	$4500
lamp	$360	$900	$450

Determine who got which item and how much money each person got.