A more realistic roommate problem

	Front	Square	Long	Cable	Premium	Netflix	Dishes	Tidy	Yard
Alex	$250	$400	$350	$35	$ 5	$ 7	$10	$10	$20
Blair	$300	$200	$325	$10	$ 5	$ 3	$20	$15	$10
Charlie	$400	$600	$200	$25	$10	$10	$15	$ 5	$15
Cost	$1300 total			$50	$45	$12			
	1250			70	20	20	15	15	15

1362
1385

Assignment:

	Who got what room? Front	Square	Long	Who does each chore? Dishes	Tidy	Yard
Who	B	C	A	A	C	B

Which utilities do they get? Cable + Netflix

What is the total rent plus utilities?

1360 + 50 + 12 = 1362, $23 less than value

Payment:

	Room	Utilities	Chores	Total Value	Payment
Alex	350	35 + 7	-20+10+20	402	400
Blair	300	10 + 3	20+15-20	328	320
Charlie	600	25 + 10	15-10+15	655	642

} 1362

Perception:

	Room	Utilities	Chores	minus Payment	Net
according to Alex, Alex got:	350	35+7	-20+10+20	-400	$2 ☺
according to Alex, Blair got:	250	35+7	10+10-40	-320	-$48
according to Alex, Charlie got:	400	35+7	10-20+20	-642	-$190
according to Blair, Alex got:	325	10+3	-40+15+10	-400	-$77
according to Blair, Blair got:	300	10+3	20+15-20	-320	+$8 ☺
according to Blair, Charlie got:	200	10+3	20-30+10	-642	-$429
according to Charlie, Alex got:	200	25+10	-30+5+15	-400	-$185
according to Charlie, Blair got:	400	25+10	15+5-30	-320	$105 !!!
according to Charlie, Charlie got:	600	25+10	15-10+15	-642	$13

Envy: Who got the most according to Charlie?

Blair, by a lot, Charlie thinks Blair cheated.

Hints and explanation

Alex, Blair, and Charlie are drawing up their shared rent contract for a 3-bedroom house. It describes which room each person gets, what extra bills they will take on, who does what chores, and how much each person pays per month.

We want to (a) assign rooms to everyone, (b) figure out which bills are a good idea for them, (c) ask people to do chores, and (d) figure out the rent.

Our solution will be good if (1) everybody feels they are getting at least what they pay for, (2) nobody feels that somebody else is getting more than them.

How to read the chart:

	Room			Utilities			Chores		
	Front	Square	Long	Cable	Premium	Netflix	Dishes	Tidy	Yard
Alex	$250	$400	$350	$35	$ 5	$ 7	$10	$10	$20
Blair	$300	$200	$325	$10	$ 5	$ 3	$20	$15	$10
Charlie	$400	$600	$200	$25	$10	$10	$15	$ 5	$15
Cost	$1300 total			$50	$45	$12			

Room: This is what each person thinks each bedroom is worth. It is also maximum they are willing to pay for that room. The rent is $1300 total and does not depend on who gets what room.

Utilities: Here is what each person thinks an extra shared utility is worth. This is exactly the same number as the maximum they are willing to personally pay for it. Regular cable costs $50 per month and includes internet. Premium is another $45 (and only available if they get regular cable). Netflix is $12 per month (and only available if they get regular cable). If Alex, Blair, and Charlie decide to get a utility, they all get it, and the total cost is just the amount listed here ($50, $45, and $12).

Chores: This is what each person thinks their commitment is. They are willing to pay one person at most this much to do it for the group. They demand **everyone** pay them at at least this much for them to do it for the group. So Alex thinks dishes are a $10 per month chore means: Alex will pay either Blair or Charlie (but not both) $10 (or less) to do the dishes, but Alex would require $20 total (from Blair and Charlie) in order for Alex to be the official dishwasher.

Assignment: It is probably wise to assign rooms so that every person gets exactly one room, and so that the total value of the rooms (as perceived by their owners) is maximized. It is probably wise to only choose those utilities that are worth more total than they cost. It is probably wise to give the chore to the person who will do it for the cheapest, even if that means one person gets more than one chore.

Payment: How much does each person think they are getting themselves? That is the most they are willing to pay. Remember chores are funny: if they don't do they chore, they feel like they are getting money, but if they are the only one who does the chore they feel like they lost double that amount (and so will need to be paid). Utilities are a little funny: either everyone gets the utility or nobody, because either you pay for all of it or none of it. Make sure each person is asked to pay at most for what they think they are getting, and that the total amount paid covers both rent and the utilities chosen.

Perception: This is almost the same as payment, except you use someone else's value system instead of the owner's. The "net" column is the total value minus the amount they are paying for it. It basically means the extra, unexpected happiness.

Envy: When we ask Charlie who got the best deal, it better be Charlie, or we'll have trouble.