MA111: Contemporary mathematics

Alex and Blair split a 2-bedroom apartment for \$550 per month so that each was paying \$50 less than they expected, given how great their rooms were.

	Master	Other
Alex	\$350	\$325
Blair	\$315	\$300
Total	\$550 total	

Who gets it?	Alex	Blair
Rent	\$300	\$250

Why does Alex think Blair got the better deal?

Can you fix it?

[Alex should think Alex got a good deal. Alex should think Alex got a better deal than Blair (or the same). Vice Versa for Blair. Rent should be paid in full.]

Schedule:

- Exam 3 is in class, Thu Nov 13th, 2014

Today we examine the inevitable betrayal.

While we pass out the worksheet

Alex thinks Alex got a \$350 room for only \$300 rent – \$50 extra ☺

Blair thinks Blair got a \$300 room for only \$250 rent – \$50 extra ☺

Alex thinks Blair got a \$325 room for only \$250 rent – \$75 extra. . .

- It is not a problem that they disagree, the problem is:

  Alex thinks Blair got \$75 off when Alex only got \$50 off

- This is called **envy**.

  Alex got \$50 more than Alex deserved, yay! ☺

  But Blair got even MORE. Jerky jerk face. ☹

- Can we actually make both people happy?

Important concepts

- Assignment problem: each person gets one thing;

  maximize total happiness and then use money to even things up.

  hard, but you guys are good at it

- Shared experience problem: should the group do it?

  is the total benefit to the group more than the total cost?

  if so, divide the cost according to how much people enjoy it

- Indivisible items currently shared: who should get the object

  Give each object to whoever wants it most

  Those people pay everyone else for their portion

Details after you decide who gets what

1. Everybody pays the maximum they said they would into a shared pile of money

2. The pile is used to pay everyone (the minimum possible if there is a choice)

3. The leftover money is split between everyone, either equally or proportional to how much they paid in

Details for shared object

- Shared object is basically the same

  in #1 the only ones who pay are the ones who get an object – they pay full price

  in #2 everyone gets $1/n$ of their price back – even the one who got the objects

  step #3 is totally the same

- Many people combine steps #1 and #2:

  with 4 people, each person who gets an object pays 75% to the shared pile, and the three people who didn't get it take 25% back.

  Even though 25% + 25% + 25% = 75%, the "25% of what" are smaller than the "75% of what", so there is money leftover for step #3.

Exit quiz

- Alex and Blair are trying to decide whether to get Premium Cable
- It costs $45 per month extra for the premium package
- Alex thinks it would be worth $40 per month
- Blair thinks it would be worth $20 per month
- Together they think it is worth $60 per month, so $45 is super-cheap!
- How much should each one pay to avoid **envy**, pay the bills, and make each person feel like they got a good deal?