Alex, Blair, Charlie, and Devin won a Halloween group costume contest and got a fabulous prize: vampire teeth (two top teeth, two bottom teeth). The four friends feel they each earned the teeth equally, but are not happy with the idea of each getting one tooth or having to take turns using the teeth. They want one person to get the teeth, but that person should pay the others for their share of the teeth.

In other words, right now four people each own 25% of the teeth, but they want one person to own 100% of the teeth and to refund the other people for their 25%.

Main Question: Who should get the teeth and how much should they pay each person?

There is a snag: the friends don't agree on how much the teeth are worth. Alex thinks they are worth $10. Blair thinks they are worth $12. Charlie thinks they are worth $6. Devin thinks they are worth $4. These are all what the friends think 100% of teeth are worth.

Each friend currently owns 25% of the teeth. We can calculate the 25% price from the 100% price: Alex won't take less than $2.50 for their 25% of the teeth. Blair won't take less than $3 for their 25% of the teeth. Charlie won't take less than $1.50 for their 25% of the teeth. Devin won't take less than $1 for their 25% of the teeth.

Whoever gets the teeth will need to purchase the other 75% of the teeth from their friends. We can calculate the 75% price from the 100% price: Alex won't pay more than $7.50 total for the rest of the teeth. Blair won't pay more than $9.00 total for the rest of the teeth. Charlie won't pay more than $4.50 total for the rest of the teeth. Devin won't pay more than $3.00 total for the rest of the teeth.

	100% Teeth	25% Teeth	75% Teeth
Alex	$10	$2.50	$7.50
Blair	$12	$3.00	$9.00
Charlie	$6	$1.50	$4.50
Devin	$4	$1.00	$3.00
Average	$8	$2.00	$6.00

Main Question: Who should get the teeth, and who pays whom how much money?

Blair gets teeth and pays $9 - $1 = $8 for them ($1 discount ☺)

Alex gets $2.50 + $1 = $3.50 ⎫ $8 total, all $1 bonus ☺,☺,☺
C   gets $1.50 + $1 = $2.50 ⎬ ↑
D   gets $1.00 + $1 = $2.00 ⎭ (Money Paid = Money Received ☺

Give a second solution:

Alex gets the teeth and pays $7.50 - $0.50 = $7 ⎤ ← Money Paid = Money R ☺
B gets $3.00 + $0.50 = $3.50 ⎫
C gets $1.50 + $0.50 = $2.00 ⎬ $7 total, all $0.50 bonus
D gets $1.00 + $0.50 = $1.50 ⎭ ☺,☺,☺

Explain why you like one solution better than the other:

Blair will pay more for the teeth ($12 - $8 = $4 extra, $1 each)
than Alex ($10 - $8 = $2 extra, $0.50 each)

Another question: The four BFF roommates not only share the rent fairly, they also share boxes of breakfast cereal. However, relationships are strained currently as only three boxes of cereal included fabulous prizes. While the friends believe each friend should get 25% of the prizes, there are only three prizes, creating a bit of a difficulty.

	Sid toy	T-Rex toy	Tiana toy	Total	25% Total	75% Total
Alex	$0.00	$0.40	$1.00	$1.40	$0.35	$1.05
Blair	$0.60	$0.60	$0.80	$2.00	$0.50	$1.50
Charlie	$0.80	$0.80	$0.80	$2.40	$0.60	$1.80
Devin	$1.00	$1.00	$0.80	$2.80	$0.70	$2.10
Average	$0.60	$0.70	$0.85	$2.15	$0.53\frac{3}{4}$	$1.61\frac{1}{4}$

$1 + 1 + 1$
$- 0.60 - 0.70 - 0.85$
$.40 + .80 + .15$
$= 0.85 \text{ extra}$
About $0.20 each

Who should get which toy and who should pay whom how much?

Alex gets Tiana and pays $\quad 1.00(^3/_4) - 0.00(^1/_4) - 0.40(^1/_4) - 0.20 = 0.45$

Blair gets paid $\quad 0.60(^1/_4) + (0.60)(^1/_4) + 0.80(^1/_4) + 0.20 = 0.70 \}1.50$

Charlie gets paid $\quad 0.80(^1/_4) + 1.80(^1/_4) + 0.80(^1/_4) + 0.20 = 0.80$

Devin gets Sid and T-Rex and pays $1.00(^3/_4) + 1.00(^3/_4) - 0.80(^1/_4) - 0.25 = 1.05 \}1.50$

Money adds up. A,B,C get bonus $0.20, D gets $0.25 bonus. All ☺

Give a second solution:

Give everything to Devin. Devin Pays $2.10 - \frac{(2.80 - 2.15)}{4} \approx \$1.90$

Money adds up ($1.90 = $1.90)
and A,B,C gets $0.15 extra
D gets $0.20 extra

A gets $0.35 + \frac{(2.80 - 2.15)}{4} \approx \$0.50$
B gets $0.50 + " \approx \$0.65$
C gets $0.60 + " \approx \$0.75$
$1.90

Explain why you like one solution better:

First had more extra money ($0.85 total)

2nd) only had $2.80 - $2.15 = $0.65 extra.

Is "Devin gets the toys and pays Alex, Blair, and Charlie each $0.65" an ok solution?

Yes. Like the 2nd, but distributes the $0.65 weirdly

A gets $0.25 bonus $\quad$ D gets $0.15 discount
B gets $0.15 bonus
C gets $0.05 bonus

How can you improve it?

Either split the toys like in 1st, or even up the bonuses like in 2nd.