



Problem of the Week

Problem B and Solution

Games People Play

Problem

Clive and Jill are putting their money together to buy a new GameStation VII. Each of them borrows \$200 from their parents to help cover the cost. In order to encourage their children to repay the money quickly, each of their parents are charging them an extra fee on the last day of each month when there is still money owed. Clive's parents are charging him \$10 extra each month, and Jill's parents are charging her \$12 extra each month.



- (a) Clive has decided to pay his parents \$50 on the first day of each month until his loan is repaid, and Jill is paying her parents \$60 on the first day of each month until her loan is repaid. Complete the given tables to determine how long they take to repay their loans.

For Clive:

Month	Payment (\$)	Money Owed (\$)	Extra Fee (\$)
1	50	$200 - 50 = 150$	10
2	50	$150 + 10 - 50 = 110$	10
3			
4			
5			

For Jill:

Month	Payment (\$)	Money Owed (\$)	Extra Fee (\$)
1	60	$200 - 60 = 140$	12
2	60	$140 + 12 - 60 = 92$	12
3			
4			
5			

- (b) Who paid their parents more in total?
- (c) Is there a monthly payment for Clive which would pay off his loan at the same time as Jill?



Solution

- (a) The completed tables are shown. Clive paid off his loan in Month 5, while Jill paid off her loan in Month 4.

For Clive:

Month	Payment (\$)	Money Owed (\$)	Extra Fee (\$)
1	50	$200 - 50 = 150$	10
2	50	$150 + 10 - 50 = 110$	10
3	50	$110 + 10 - 50 = 70$	10
4	50	$70 + 10 - 50 = 30$	10
5	40	$30 + 10 - 40 = 0$	0

For Jill:

Month	Payment (\$)	Money Owed (\$)	Extra Fee (\$)
1	60	$200 - 60 = 140$	12
2	60	$140 + 12 - 60 = 92$	12
3	60	$92 + 12 - 60 = 44$	12
4	56	$44 + 12 - 56 = 0$	0

- (b) Both Clive and Jill repaid the \$200. In addition, Clive paid $4 \times \$10 = \40 in extra fees, while Jill paid only $3 \times \$12 = \36 in extra fees. So Clive paid his parents more in total.
- (c) At the end of Month 4, Clive still owed \$30, before adding the extra fee. So if Clive could pay a total of \$30 more in the first 4 months, then he could repay the loan in Month 4, like Jill. Since $\$30 \div 4 = \7.50 , if Clive paid $\$50 + \$7.50 = \$57.50$ each month, then he could repay the loan in Month 4. The table below shows how this would look.

Month	Payment (\$)	Money Owed (\$)	Extra Fee (\$)
1	57.50	$200 - 57.50 = 142.50$	10
2	57.50	$142.50 + 10 - 57.50 = 95$	10
3	57.50	$95 + 10 - 57.50 = 47.50$	10
4	57.50	$47.50 + 10 - 57.50 = 0$	0

Note that \$57.50 is the smallest monthly payment that allows Clive to pay off the loan in Month 4. However, other monthly payments are also possible.

To determine the largest monthly payment that has Clive pay off the loan in Month 4, we would want to have almost all of the loan paid off at the end of Month 3, and so we'd want \$0.01 left after the first 3 payments. Thus, at this point Clive would have paid $\$200.00 - \$0.01 = \$199.99$ of the balance, plus the extra fees from Months 1 and 2, for a total of $\$199.99 + \$20.00 = \$219.99$. Since Clive paid a total of \$219.99 in 3 months, then he paid $\$219.99 \div 3 = \73.33 each month. The table below shows how this would work.

Month	Payment (\$)	Money Owed (\$)	Extra Fee (\$)
1	73.33	$200 - 73.33 = 126.67$	10
2	73.33	$126.67 + 10 - 73.33 = 63.34$	10
3	73.33	$63.34 + 10 - 73.33 = 0.01$	10
4	10.01	$0.01 + 10 - 10.01 = 0$	0