

LEC 2025 Session 1B: Recursion in General Mathematics

Problem 1: Comparing methods of depreciation

A company purchases an asset for \$34,000. For taxation purposes, there are two permissible options for calculating the declining value of the asset after n years. The recurrence relations that model these options are $u_0 = 34000$, $u_{n+1} = u_n - 3600$ and $v_0 = 34000$, $v_{n+1} = 0.85 \times v_n$.

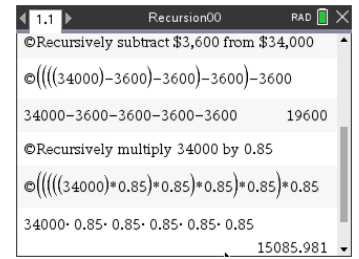
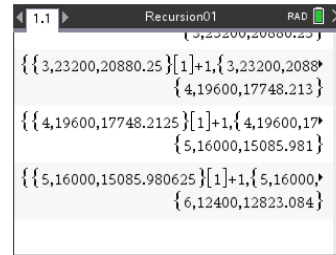
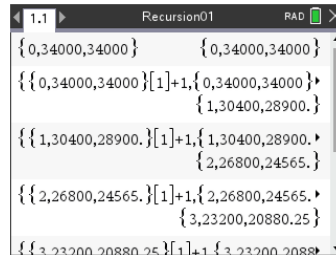
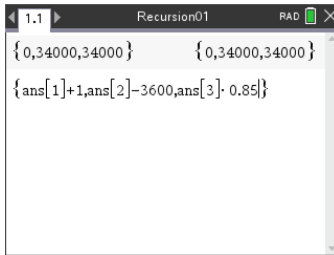
(a) Use a recursive process in the Calculator application to generate a sequence with rule:

(i) $u_0 = 34000$, $u_{n+1} = u_n - 3600$, $n = \{0, 1, \dots, 10\}$ (option 1).

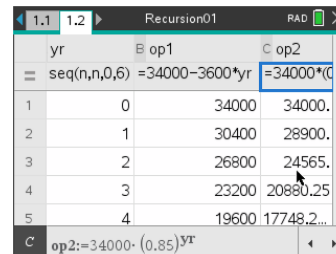
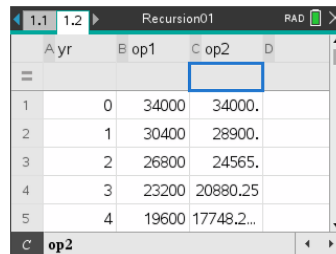
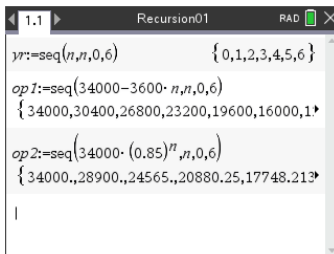
(ii) $v_0 = 34000$, $v_{n+1} = 0.85 \times v_n$, $n = \{0, 1, \dots, 10\}$ (option 2).

(b) Compare the value of the asset after 6 years for the two options (to the nearest dollar).

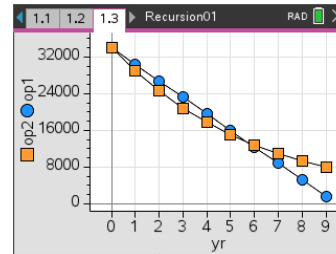
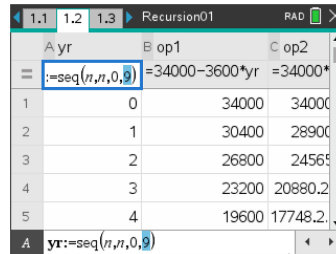
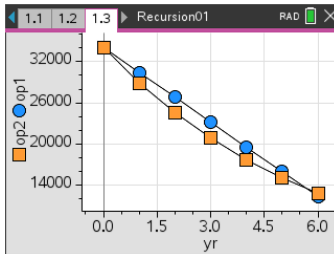
Calculator app



Sequences, lists and spreadsheets



Plotting the change of value over time

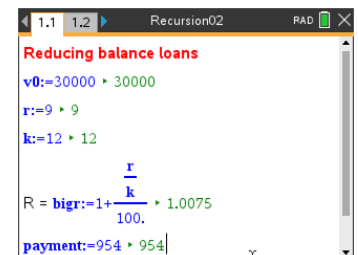


Problem 2: Creating an amortisation table

Laila borrows \$30,000 to buy a car. The interest rate is 9% p.a., compounded monthly.

She is required to make minimum monthly repayments of \$954 per month for 3 years.

Use a table to investigate the monthly amortisation schedule, showing the payment made, the amount of interest paid, the reduction in the principal and the balance of the loan.



A	tper	B	pmt	C	intr	D	pred	E	val
=									
1	0	0	0	0	0	30000			
2	1	954	225.	729.	29271.				
3									
4									
5									

A	tper	B	pmt	C	intr	D	pred	E	val
=									
34	33	954	28.08...	925.9...	2819.27...				
35	34	954	21.14...	932.8...	1886.42...				
36	35	954	14.14...	939.8...	946.570...				
37	36	954	7.099...	946.9...	-0.3300...				
38									

A	tper	B	pmt	C	intr	D	pred	E	val
=									
sum(pred)						30000.33			
sum(intr)						4343.6699			
sum(pmt)						34344			
sum(pmt)-sum(intr)						30000.33			

Problem 3: Tracking transition values

There are two airline companies flying between *Letsgo* and *Arewethereyet*: *Company A* and *Company B*.

Passengers are surveyed after a flight and it is found that 40% of *Company A*'s passengers indicate they will fly with *Company A* next time they fly and 30% of *Company B*'s passengers indicate that they will fly with *Company B* next time they fly.

On the day the survey is taken, *Company A* has 300 passengers and *Company B* has 500 passengers.

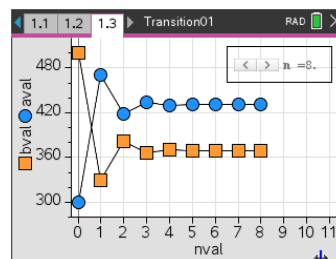
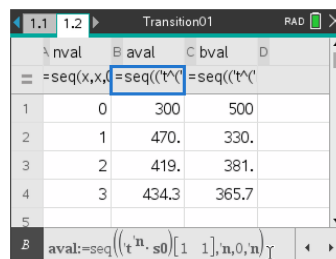
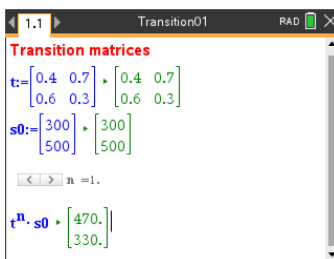
(a) Construct the transition matrix T .

(b) Write down the initial state matrix S_0 .

(c) Find (i) S_1 , (ii) S_2 , (iii) S_3 , (iv) S_4 .

(d) What values do the number of passengers with each airline seem to be approaching?

If A , the number who fly with *Company A*, and B , the number who fly with *Company B*, have reached steady state values, multiplying by the transition matrix will not change them.



Reference: VCE General Mathematics Teacher Resource Book for TI-Nspire CX II CAS graphing calculator.