Financial Literacy

How will we know if we have been successful in the teaching of Mathematics Literacy?

In large part the test must surely lie in whether or not the graduates are more effective: self managing individuals; contributing workers, and critical citizens.

While Mathematical Literacy is much broader than financial literacy – one hope of the Mathematical Literacy programme would be to have individuals making wiser financial decisions. Not everybody does: as we follow the news we read and hear about:

- The wealthy and the poor alike getting caught out by pyramid schemes.
- Workers going on strike demanding higher wages while the economy is at its weakest in many years and all around them people are losing their jobs.
- Cars, homes and other possessions being repossessed because people cannot make their loan repayments.
- People playing the Lotto in the hope of instant wealth.
- People who have not saved enough for their old age.

Millionaires hit by fraud scheme

Investors from as far abroad as the United States, Britain, Israel, Canada and the United Arab Emirates have lost millions of dollars which they invested in Barry Tannenbaum's pyramid scheme.

Twenty-two millionaires from the Western Cape are among the 400-odd South African investors who lost money in the collapsed scheme.

… The 22 Western Cape millionaires are estimated to have invested about R64.5m in the scheme, which promised enormous dividends.

www.fin24.com (17 June 2009)

Would these things happen if people were more Mathematically Literate?

The challenge, as I see it, is not so much to teach formulae and/or methods but to help students explore the parameters at play in the different scenarios and in so doing to develop an understanding of the impact of these parameters on the situations.

Cell phones and spreadsheets can play a very powerful role in such investigations. In the activities that follow we will be doing just that – using cell phones and spreadsheets to explore a number of situations.

Many financial situations, in particular loans and investments, can be explored using a simple "balance sheet" with the structure below.

% interest (p/a):	*rate at which interest is calculated – expressed as an annual percentage of the balance*

Period (date)	Interest	Instalment	Balance
	-	-	*opening balance*
Period 1	*calculated using previous balance and interest rate*	*payment/investment added to the account*	*previous balance + interest + installment*
Period 2			
Period 3			
Period 4			

- Interest rate: the cost of borrowed money expressed as a percentage
  - Note if interest is calculated quarterly or monthly then the rate is simply the annual interest rate divide by the number of times that interest is calculated in the year.
- Opening balance: the amount at the start:
  - In the case of a loan this will be the loan amount mostly expressed using a negative sign to indicate money owing.
  - In the case of an investment this will typically be zero or it may be some positive value – an initial saving.
- Interest: at the end/start of each period; interest is calculated based on the balance in the account at the end of the previous period:
  - In the case of a loan this interest represents the fee paid by the borrower to the lender (most often the bank) for the use of the borrowed money.
  - In the case of an investment this interest still represents the fee paid by the "borrower" – this time the bank – to the "lender" (investor) for the use of the borrowed money
- Instalment: an amount added to the account during each period
  - In the case of a loan this amount is intended to reduce the loan
  - In the case of an investment this amount increases the value of the investment/saving

This "balance sheet" can easily be set up on a spreadsheet or by means of a table on a piece of paper. The advantage of using a spreadsheet is that it allows the user to easily and quickly explore the impact of changing the parameters in the problem and hence studying their effect.

Investigation 1: Buying a car – at least three options

There are at least three different payment options implied by the advertisement above:

- Paying cash
- Paying as per the deal described in the advertisement
    - Use the balance sheet to investigate how the "balloon value" is determined.
    - Show how the total cost has been determined.
    - Consider the different options for paying the final balloon value
- Paying a larger monthly instalment and avoiding a balloon payment
    - Use the balance sheet to investigate how large this monthly payment should be.
    - Determine the amount using either the loan factor table on the next page or the loan calculator on your cell phone.

Compare each of the options in terms of its advantages and disadvantages.

		Number of years												
		2	3	4	5	6	7	8	9	10	15	20	25	30
Interest rate (p/a)	5%	43,87	29,97	23,03	18,87	16,10	14,13	12,66	11,52	10,61	7,91	6,60	5,85	5,37
	5,50%	44,10	30,20	23,26	19,10	16,34	14,37	12,90	11,76	10,85	8,17	6,88	6,14	5,68
	6%	44,32	30,42	23,49	19,33	16,57	14,61	13,14	12,01	11,10	8,44	7,16	6,44	6,00
	6,50%	44,55	30,65	23,71	19,57	16,81	14,85	13,39	12,25	11,35	8,71	7,46	6,75	6,32
	7%	44,77	30,88	23,95	19,80	17,05	15,09	13,63	12,51	11,61	8,99	7,75	7,07	6,65
	7,50%	45,00	31,11	24,18	20,04	17,29	15,34	13,88	12,76	11,87	9,27	8,06	7,39	6,99
	8%	45,23	31,34	24,41	20,28	17,53	15,59	14,14	13,02	12,13	9,56	8,36	7,72	7,34
	8,50%	45,46	31,57	24,65	20,52	17,78	15,84	14,39	13,28	12,40	9,85	8,68	8,05	7,69
	9%	45,68	31,80	24,89	20,76	18,03	16,09	14,65	13,54	12,67	10,14	9,00	8,39	8,05
	9,50%	45,91	32,03	25,12	21,00	18,27	16,34	14,91	13,81	12,94	10,44	9,32	8,74	8,41
	10%	46,14	32,27	25,36	21,25	18,53	16,60	15,17	14,08	13,22	10,75	9,65	9,09	8,78
	10,50%	46,38	32,50	25,60	21,49	18,78	16,86	15,44	14,35	13,49	11,05	9,98	9,44	9,15
	11%	46,61	32,74	25,85	21,74	19,03	17,12	15,71	14,63	13,78	11,37	10,32	9,80	9,52
	11,50%	46,84	32,98	26,09	21,99	19,29	17,39	15,98	14,90	14,06	11,68	10,66	10,16	9,90
	12%	47,07	33,21	26,33	22,24	19,55	17,65	16,25	15,18	14,35	12,00	11,01	10,53	10,29
	12,50%	47,31	33,45	26,58	22,50	19,81	17,92	16,53	15,47	14,64	12,33	11,36	10,90	10,67
	13%	47,54	33,69	26,83	22,75	20,07	18,19	16,81	15,75	14,93	12,65	11,72	11,28	11,06
	13,50%	47,78	33,94	27,08	23,01	20,34	18,46	17,09	16,04	15,23	12,98	12,07	11,66	11,45
	14%	48,01	34,18	27,33	23,27	20,61	18,74	17,37	16,33	15,53	13,32	12,44	12,04	11,85
	15%	48,25	34,42	27,58	23,53	20,87	19,02	17,66	16,63	15,83	13,66	12,80	12,42	12,25
	15,00%	48,49	34,67	27,83	23,79	21,15	19,30	17,95	16,92	16,13	14,00	13,17	12,81	12,64
	16%	48,72	34,91	28,08	24,05	21,42	19,58	18,24	17,22	16,44	14,34	13,54	13,20	13,05

Monthly repayment per R1 000,00 borrowed

NOTES:.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Investigation 2: Changes in home loan interest rate and period

At times when the economy goes through tough times people struggle to meet the monthly instalment obligations on their home loans. Rather repossessing the home, the bank will sometimes explore increasing the loan repayment period and thereby decreasing the monthly instalment.

- Use the balance sheet to investigate:
    - The impact of changes in the interest rate on monthly payments and total loan repayment value.
    - The impact of changes in the loan period on monthly payments and total loan repayment value.

NOTES: .....

.....

.....

.....

.....

.....

.....

Investigation 3: Saving for retirement

Although retirement may seem a distant notion for some, for others it is a more immediate reality. However, as this investigation will reveal, you cannot start preparing for your retirement too early!

Consider the following scenario:

- You are 25 years old.
- You plan to work till you are 65 and then to retire.
- Once you retire you will need money for your daily expenses.
- You hope/expect to live to be at least 75 years old.

What fraction of your monthly salary should you put into savings as you plan for your retirement?

- Use the balance sheet to investigate the impact of the following on your retirement plan:
    - The difference between the average inflation rate over the period and the interest rate that you can secure for your savings.
    - The age at which you start saving for retirement and the age at which you want to retire.
    - The percentage (fraction) of your monthly net salary that you save.

NOTES: .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

% interest (p/a):	

Period (date)	Interest	Instalment	Balance

% interest (p/a):	

Period (date)	Interest	Instalment	Balance