Financial Literacy Support Lesson

Thinking Classroom Version

The TVM Solver or the Finance Solver application is used to simplify compound interest calculations so students can focus on investigating the effects of changing interest rates, time or compounding frequency.

In this version of the lesson plan, the lesson is much less scaffolded. Guiding questions are replaced by a single task, meant to elicit exploration and thinking by students. Ideally time is spent on the Thinking Classroom approach before this lesson is attempted.

Strand F: Financial Literacy	**Expectations:** F1.3
Learnings Goals: Use the TVM Solver application (on TI-84 CE) or the Finance Solver (on TI-Nspires) to explore the effect of different interest rates, time or compounding frequencies on the amount owed (Future Value) for a loan with compound interest	
Success Criteria: Understand and describe the relationship between interest rate, time, compounding frequency and amount owed at the end of a loan.	
Lesson Summary: Students, working in groups, use the Finance Solver (Nspire) or TVM Solver (TI-84 CE) application to determine the effect of different interest rates, borrowing times and compounding frequencies on the cost of borrowing money. **(Suggested Time:) 75 minutes**	
Prior Knowledge: Familiarity with using the TI-84 CE or TI-Nspire technology will be an asset. Class development of Thinking Classroom norms should be developed before a lesson of this nature is attempted.	
Materials List: ● TI-Nspire handheld, or TI-84 CE handheld and/or emulator software ● PDF Reference for TI-Nspire technology or PDF Reference for TI-84 CE technology ● A Screencast video showing how to calculate Future Value with the Finance Solver (TI-Nspire) or a screencast video showing how to calculate Future Value with the TVM Solver (TI-84 CE). *This video (<5 min) could be assigned for homework before the lesson is done in class.*	

Minds On [10 min]:
- Students could be asked the following question: **What would you like to buy which would cost about $1000?** Ideas could be written on the board and visible to all. [5 min]
- The teacher could ask what they could do if they really needed to purchase this right away, and did not have the money for it yet, hopefully eliciting the idea of borrowing the money and repaying it with interest.
- Ask these questions: **If you borrow the money, how much should you pay back? What does that depend on?**

Action [40 min]:
- The teacher should **discuss the meaning of compounding** and, if available, use the TI-Nspire Teacher Edition software or the TI-Smartview emulator software to **demonstrate how to use the Finance Solver or TVM solver applications**. Consider showing the short video which shows how to use the Finance Solver app, or make it available in case students want to watch it on demand
- The Thinking Classroom Reference could be used as a guide for this initial discussion, rather than providing a copy for students. The task is purposely not included on this Reference file in case a copy is given to students

and the teacher wishes to **provide the task orally**. [Research shows](#) that this can promote discussion by students, rather than time spent decoding text.

- **The task: How do different interest rates, lengths of borrowing time and compounding frequency affect the cost of borrowing money?**
- Using **Visibly Random Grouping**, students are placed in groups of about 3. Each student should have a TI-Nspire or TI-84 CE, but grouping will allow discussion and comparison of ideas when working through the task.
- Provide groups with **vertical non-permanent surfaces** and time to discuss and explore.
- Hint to students that working groups might want to organize their results in a table or tables, to help make the effects clear.

Consolidation [25 min]:

- Look for evidence on VNPS of groups answering the task, for each of the variables, Interest rate, term length and compound frequency. Highlight these relationships.
  - Higher interest rates will cause a higher cost of borrowing
  - More time to repay a loan will lead to higher cost of borrowing
  - Compounding more frequently will lead to a slightly higher cost of borrowing

- Students should be given an opportunity to record notes. Consider giving them the [Notes to Future Self Template](#) near the end of this document.

- **CRRP -** Interest is viewed differently by different cultures. Think about how it is viewed by the cultures predominant among your students.
  For example in Islamic Finance, Muslims do not put value on money, it is just a medium of trade and exchange. Consequently Muslims do not charge or pay interest directly. In a case like the loan in this investigation, rather than borrowing money and repaying it with interest, a faithful muslim might find a lender who could purchase the item for them, and make arrangements for a repayment (or payments) at a pre-arranged amount and time. Essentially, the financer buys the item at one price and the other person buys the item at a later time at a different agreed upon price.
  Here is an article on sharia-compliant finance:
  https://www.theguardian.com/money/2013/oct/29/islamic-finance-sharia-compliant-money-interest

  Charging or paying Interest is a form of *Riba* to Muslims in Sharia law and is discouraged or forbidden. Learn more about this at https://en.wikipedia.org/wiki/Riba or chat with a live Muslim at www.ask-a-muslim.com

  This provides an opportunity for a discussion of the ways interest can be used in predatory ways to further entrench inequality of wealth (systemic ways the rich get richer).

- **That's Life! consolidation activity** *(formative assessment)*. One option is to roll a die twice, and for students to record this value in the boxes on their activity page - That's Life! Students use the value of these two rolls to determine the Present value of their loan, the interest rate and compounding frequency, and the length of time required to pay off their loan.
  If you don't have dice handy, students could use the **randInt(1,6)** command on an Nspire calculator page or the **Prob Sim** app on a TI-84 CE to simulate rolling a single 6-sided die.

Notes to Future Self

Vocabulary	Big Ideas/Concepts

Procedures	Examples

Answers - That's Life Consolidation Activity

Answer grid for various die rolls:

	2nd roll 1 $N=\frac{1}{12}$	2nd roll 2 $N=\frac{2}{12}$	2nd roll 3 $N=\frac{3}{12}$	2nd roll 4 $N=\frac{4}{12}$	2nd roll 5 $N=\frac{5}{12}$	2nd roll 6 $N=\frac{6}{12}$
1st roll 1 PV=$900 I = 15% CpY = 52	FV = $911.30	FV = $922.75	FV = $934.34	FV = $946.08	FV = $957.96	FV = $969.99
1st roll 2 PV=$800 I = 15% CpY = 52	FV = $810.05	FV = $820.22	FV = $830.52	FV = $840.96	FV = $851.52	FV = $862.21
1st roll 3 PV=$700 I = 10% CpY = 24	FV = $705.85	FV = $711.74	FV = $717.68	FV = $723.68	FV = $729.72	FV = $735.81
1st roll 4 PV=$600 I = 10% CpY = 24	FV = $605.01	FV = $610.06	FV = $615.16	FV = $620.29	FV = $625.47	FV = $630.70
1st roll 5 PV=$500 I = 7% CpY = 12	FV = $502.92	FV = $505.85	FV = $508.80	FV = $511.77	FV = $514.75	FV = $517.76
1st roll 6 PV=$400 I = 7% CpY = 12	FV = $402.33	FV = $404.68	FV = $407.04	FV = $409.42	FV = $411.80	FV = $414.21