

# Post Pandemic, Social Media Pedagogy: Math with TI Calculator Menu Programs

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## Abstract

Laments from teachers of all stripes are growing. Looking out from behind the podium one can constantly see a sea of bored, confused, seemingly moribund students staring at their I-phones, maybe still wearing Covid masks. Between the pandemic and social media and traditional *sage on a stage* teaching teachers reside: a kind of prehistoric fish out of any known water. In this article we propose a solution using in novel and controversial ways TI-84 CE calculators. The idea is to show how to animate students via increased teacher-student and student-student interactions. It is field tested: life does come back into the classroom with the techniques I give in this article: get an easy A using your cool calculator, filling in a shell provided by the teacher.

## Introduction

Ideally the reader of this article will be possessed of an edition of Blitzer's *Thinking Mathematically* [1]. In addition readers should have a TI84-CE calculator; a manual that comes with older calculators (or pdfs with newer) can help, if forthcoming calculator details are to scant; Jeff McCalla's Dummies book for this newest TI83 family calculator is unusually good for a Dummies book [2].

Here's the idea: we are going to do Blitzer's chapter 8 on personal finance using a pre-created menu driven program residing on one of these calculators. Not-to-worry, the reader, presumably a teacher using such a book and

calculator, does not need to be an expert on personal finance or the topics covered in this chapter, nor does she need to be ace on the calculator and able to write programs. The essential shell program is to be provided as a download; also, a youtube video will show the author using the program to do all 15 problems from a typical multiple choice TestGen generated test on this chapter.

The going should be easy and fun. The reader should think of themselves as a student and simulate how the sequence of activities specified would work in their classroom.

## TI-84 CE Features

In the classroom, provided all students have a TI-84 Plus or, better, a TI-84 Plus CE calculator, the teacher can upload to a student's calculator a *group* (like a zip file) of programs and the student can then *ungroup* (unzip) these programs and then run AMID7ALL. This program gives a nested sequence of menus that solve all problems on a midterm. This uploading is achieved using the send and receive features located off of the *mem* key, the memory key. A mini-usb to mini-usb cord is also necessary for these calculator to calculator transfers. If more than one such cord is available, students can interact with other students and get all calculators loaded up with the program fast. These cords are packaged with new TI-84 Plus CE calculators. A youtube video shows this activity.

As my calculator is not available to readers this calculator to calculator mode doesn't work, but using Connect, a free TI download, you can upload the group file AMIDTRM7 to your computer and thence to your calculator. The steps are documented in the McCalla book (Chapters 18 and 19), as well as in a youtube video: first the file is located at [LinkToGroupFile](#) and the video showing how to use connect to place this file on a physical calculator and ungroup it is here: [LinkToYoutubeVideo](#).

## The Midterm Test

Blitzer's chapter 8 on personal finance has eight sections. These sections vary from the very easy section 8.1 on ratios to very hard 8.2 on taxes and credit cards 8.8. There are sections on the standard simple and compound interest,

8.3 and 8.4, as well as annuities 8.5, mortgages 8.6 (amortization tables are harder) and 8.7 on financing cars. Formulas abound in this chapter.

Download the midterm covering this material.

The goal is to start with a shell of the menu driven program; that is students are required during class to fill in the programs necessary to take the test. That's the content of the chapter 8 presentation: students follow along as the teacher puts the code into the various programs that are called to do each problem: [https://youtu.be/1DUU\\_1mvHlg](https://youtu.be/1DUU_1mvHlg). My experience has been that students do pay attention, they do attempt to get the code into their calculators, they do help each other, and they do stay after class and interact with the teacher (the program debugger). Most importantly the do get a sense of accomplishment and delight when they finally get their calculators to do problems.

## Controversy

Here's where the controversial part of the pedagogy comes in: the calculator program allows the student to absolutely get 100 % on the midterm, if they can watch a video and practice taking a midterm with their calculator after its loaded with their programs. Two practice midterms are available that are identical (save for varying numbers, such as interest rates, number of years for mortgage problems). The programs work with general problems. Is this somehow cheating or, at least, very untraditional?

I am bias, perhaps. I say this is a good idea. The student it is true doesn't master theory, why the formulas work, but they do become familiar with concepts and how to interact with technology and, here's the big one, they do come to understand that preparation for tests and tasks is essential; they feel empowered; some for the first time in a math class feel that they are in control of their math destiny. Many students tell me that they never have gotten an A in math; I sense that they now have a positive – I can do it – attitude towards math. In contrast, math classes traditionally taught can be a traumatic experience and essentially self erase – bad!

## Conclusion

The most cruel take on this pedagogical tool (TI menu shells filled in by students) is to say that teaching math amounts to a typing test. Students mindlessly mimic the teachers keystrokes on their calculators, hit the run button and they pass, maybe ace tests. This candidly speaking does happen: students hand me their calculator and say what do I do now; they don't comprehend that the only point in making a calculator program is to use it (to run it) in order to do a problem. But eventually they do make the connection; they do understand new keystrokes (TI button pushes) that they need to do. I'm not really sure they get the idea of a mortgage and interest rates and how they all inter-relate and can determine the characteristic of the mortgage bill they might get for the next 30 years post house purchase, but (main point) they might get it better than if they had gotten a failing grade by pretending to listen to that sage on a stage talking away for a term while they texted. They, without a doubt it can be said, have comprehended enough to get arbitrary problems correct using their calculator. They have, granted subliminally, learned to rely on technology and to do the hard work of getting technology to do as much as it can because it will always be faster and more accurate than any pencil, eraser, and paper kind of work they might be capable of.

There are some positive side effects that I do observe. Some students do see the big picture and a light bulb goes off and they get creative with these programs and tweak what the teacher gives them and even, a few times a term, make their own, original programs and even become programmers and mathematicians.

With a reference to track systems of previous decades in high school, some just do copy the teacher (C students, track 1), some copy the teacher and do get the bigger picture enough to be able to program their calculator without guidance (B students, track 2), and some get everything enough to make their own original programs and maybe make design changes, tweak things (A students, track 3). I've seen all of these types and have concluded that this method yields the best that can be done with where each student is. Isn't that enough! at least until the world of the classroom (else) gets normal again. It might be a wait.

## References

- [1] Blitzer, R. F. (2023). *Thinking Mathematically*, 8th ed., Hoboken: Pearson.
- [2] McCalla, J. (2022). *TI-84 Plus CE Graphing Calculator for Dummies*, 3rd ed. Hoboken: John Wiley.