What Beginning Algebra Students Can Do With A TI-92

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Introduction

The first purpose of the session is to assure participants that beginning algebra students can learn to use the TI-92 skillfully and that they are motivated to do so.
New technologies enable new curriculums. The discussion of calculator skills will be conducted in the context of some non-traditional approaches to beginning algebra.

The format of the session will model an algebra classroom in which the TI-92 is available and its use is encouraged. Three examples are summarized here.

Background

The presentation is based on five years experience with using a technology-intensive approach to teach students who were beginning or resuming beginning algebra in ninth or tenth grade. Outcomes achieved using this approach will be compared and contrasted with outcomes being achieved in more traditional courses. Both positive results and indicators for improved instruction will be summarized.

Session

The introductory activity serves two purposes. Participants who have not used the functions described can learn to use the tool better. The context of the activity introduces a REAL situation that students can explore with the calculator before they have been required to acquire all the individual paper-pencil skills necessary to complete the exploration. The variables are related by function rules. This allows the student to examine multiple representations of the function using the table, graph and CAS capability of the TI-92. When these representations are in place on the calculator, they will be used to explore further questions about the picnic.

Activity 1.

A market research firm has determined that 3,000 people would attend the Fourth of July concert if it were free. For every one-dollar increase in ticket price, three-hundred people would decide not to come.

1. Define the attendance function from the Home screen.
   F4, 1 *Define* a(p)=3000-300x

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2. Construct a table for a(p) beginning with p=0 and using $1 price changes.
   a. To set table increments: ♦T
      tblstart 0 (down arrow)
      Δtbl 1 (down arrow)

   b. To table a(p): F4, 3 *Table* a(p),p

3. Look at the graph of a(p)
   a. To set graph window: ♦E (values suggested by table)

xmin	0
x max	12
xscl	1
y min	-100
y max	3000
yscl	100
xres	2

   b. To draw the graph: F4, 2 *Graph* a(p),p

4. Using the CAS
   a. To use Solve for the answer to the question below.

What is the most you can charge for a ticket and have an audience of at least 1000?

F2, 1 *Solve(*a(p)≥1000,p) {≥:CHAR,Math,E}

   b. To evaluate the function to answer the question below.

If the promoter charges $5.00, how many people will attend the concert?

From Home screen: Type a(5) and then enter.

Activity 2.

Participants will explore a quadratic function that was generated with meaningful numbers. Examining the tables and graphs of the original linear function and the resulting quadratic function, the defining characteristics of these two function families can be observed.

A market research firm has determined that attendance at the concert will depend on the price charged for tickets, with the function rule:

a(p)=3000-300p

Using this rule and the ticket price, p, promoters can predict their revenue by the rule:

r(p) = p(3000-300p) = 3000p - 300p^2

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It is especially interesting to approach traditional questions such the ones below, using the graph and table.

1. Find the revenue to the nearest dollar if the price charged for each ticket is $5.

2. What ticket price(s) will give revenue of $7000?

3. What ticket price(s) will give revenue of at least $5000?

4. What ticket price gives the maximum revenue? What is that revenue?

Extension questions could estimate expenses and expand the exploration to profit.

Activity 3.

A data collection activity will be conducted. Each participant will throw a tennis ball as hard and as vertical as possible while the time the ball is in the air is timed and recorded. The height at which the ball is released is measured.

Following the collection of data, the general quadratic rule: $h(t) = -16t^2+v_0t+h_0$ will be completed using individual data. A useable estimate of initial velocity will be obtained. The resulting rule, unique to each participant, will be explored using the TI-92.
(This activity was shared with presenter by Ann Brunning, Glenbrook South High School.)

Discussion

Traditional methods of teaching algebra are not working for many students. There are many legitimate dilemmas and concerns when an effective algebra curriculum is being developed. This is especially true when the appropriate and effective use of technology is being considered. The following points are the personal observations of the presenter and will be addressed throughout the presentation. Participant questions and discussion are welcome.

Students in a technology-intensive course are retained in higher numbers and are more successful than those in traditional courses.

Students in a technology-intensive course are engaged in greater numbers and for more of the class time than those in traditional courses.

Students in a technology-intensive course develop paper-pencil skills equivalent to those developed by many students in traditional classes even though much less time is spent on practicing and developing them.

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Students in a technology-intensive course develop strategies for solving problems with technology while students in traditional classes do not.

Students can USE the concepts of algebra and see the potential value of algebra before they have been required to acquire all the individual paper-pencil skills necessary to complete the exploration.

Students in a technology-intensive course may perceive that their success is dependent on the calculator and lack confidence in their ability to transfer their concept knowledge to more traditional settings.

Students in a technolgy-intensive course may choose a calculator function because it has the easiest syntax for them to remember or because the results are most easily interpreted.

Students in a technology-intensive course that emphasizes explorations of real world situations may have difficulty correctly interpreting the calculator results as it relates to the situation.