THE NATION'S NEWSPAPER

Math TODAY Teacher Edition

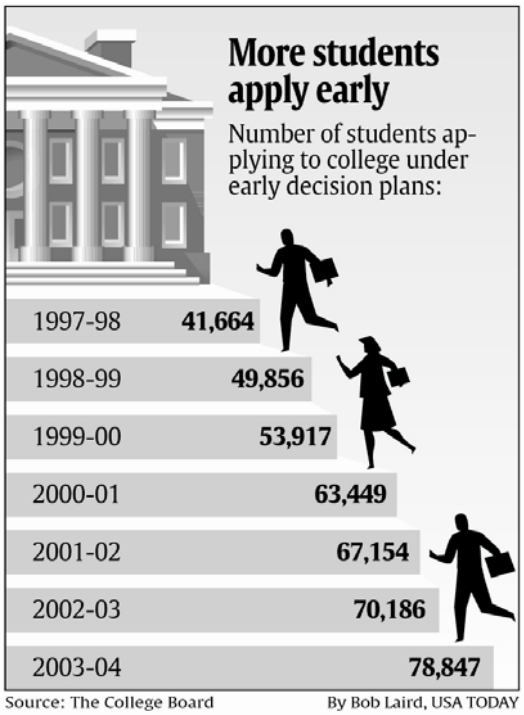
USA TODAY

NO. 1 IN THE USA

Activity 3:

More students apply early

by: Bob Tower



Activity Overview:

Using the USA TODAY Infograph, "More students apply early," students will explore scatter plots and independent and dependent variables. Students will determine a best-fit regression model for the real-life data set and then use the model to make a prediction. The meaning of slope (rate of change) and *y*-intercept will be explored in the context of the problem. Students will find the mean value of the number of students applying under the early decision plan.

Concepts:

- Creating scatter plots of real-life data
- Utilizing linear functions, slope, and *y*-intercept
- Analyzing, evaluating, and synthesizing real-life data
- Determining the mean of a set of data

Activity at a Glance:

- Grade level: 9-11
- Subject: Algebra
- Estimated time: 50 minutes

Materials:

- TI-Navigator™ system
- TI-83 Plus and TI-84 Plus family of graphing calculators

Recommended:

- Multimedia Projector
- TI Keyboards

Prerequisites:

Students should know how to:

- create scatter plots
- determine the mean value of a data set
- use the calculator's regression capabilities

Students should have prior experience and knowledge of:

- linear functions
- slope and *y*-intercept meanings

TI | navigator

For use with the TI-Navigator™ Classroom Learning System

Student Objectives:

- Create a scatter plot of a data set using appropriate values for the independent and dependent variables
- Explore the linear model for a data set and explain what slope and *y*-intercept mean
- Find the mean (average) value for a data set

Background:

When looking at data, students need to practice modeling real-life scenarios. In this activity, students will work with bivariate and univariate data to numerically and graphically describe the relationship seen in the USA TODAY Infograph, "More students apply early."

Preparation:

- Download the activity files to your computer: Teacher Edition, Student Edition, Transparency, Activity Center Settings, Lists, and LearningCheck™ Assessment. (See Appendix B for a list of the files.)
- Make copies of the Student Edition for your class. Students can refer to the Student Edition during the activity and use it to record their work.
- Set up your TI-Navigator system and make sure you are familiar with the following functions: Send to Class, Collect from Class, Screen Capture, Quick Poll, Activity Center, LearningCheck Assessment and Class Analysis.
- Students will need a TI-83 Plus or TI-84 Plus graphing calculator, either working in pairs or individually.
- Recommendations:
  - Multimedia Projector for sharing the Activity Center, Quick Polls, and Screen Captures with your students
  - TI Keyboards to easily answer LearningCheck assessment questions

Data Source:

The College Board

Activity Extensions:

- Invite counselors from your school to talk to the class about early application to college.
- Have students contact local universities/colleges about their policies on the acceptance of early applications.
- Encourage students to go to the College Board website, www.collegeboard.com, and explore the early application process.
- Encourage students to visit USA TODAY Education Online and explore the College and Career Quest resources.
- For independent study, distribute the information from the USA TODAY Infograph to your students, using the TI-Navigator system. Students could compute the percentage of students applying under the early decision criteria out of the total number of students applying. A linear function for this scenario might provide more information about the phenomena. Use TI-Navigator to gather the functions when the class gets together again.

Curriculum Connections:

- Speech
- College and Career Explorations
- Economics

Teacher: **Students:**

Classroom Management Tips:

- You may use the transparency for a class discussion before the students start working. This will give the students a better understanding of how to read the graphic and retrieve data.
- Students can work individually or in small groups on this activity. Working in groups is especially helpful as they learn the various features of the calculator.
- Allow students to talk about the "how" and "why" approach they used to find the solutions.
- This is a good time to talk to the class about limitations of using mathematical models to predict values outside of the data set.

Activity Step-by-Step:

The following steps represent a suggested TI-Navigator classroom procedure to answer the focus questions.

1. Send to Class – send data representing the years and number of students applying to college under early decision plans
2. Calculator – students will explore the average increase in the number of students that are applying early per year and the scatter plot of number of students vs. year
3. Screen Capture – check student understanding of independent and dependent values and setting up a scatter plot
4. Activity Center – enter estimated ordered pairs for the number of students applying early through 2008
5. Calculator – determine the total number students that are expected to apply early from 2004 through 2007
6. Quick Poll – Open Response, how many students are expected to apply early from 2004 through 2007?
7. Optional: LearningCheck Assessment – answer the focus questions and discuss the results with your class to check for understanding

See below for details on each of these steps.

Focus Questions:

- What is the average increase in the number of students that are applying early for the time period shown in the USA TODAY Infograph?
- What is the linear function modeling this data set?
- What does the slope and *y*-intercept mean in the early decision-year scenario?
- Determine the total number of students that are expected to apply for early decision for the period from 2004 through 2007.

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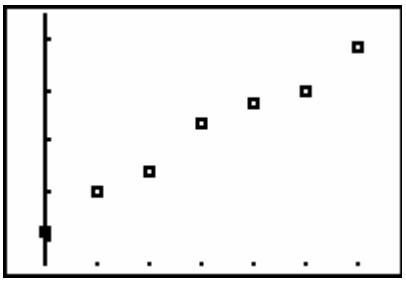
Teacher:	**Students:**
STEP 1 – SEND TO CLASS 1. After students have logged into TI-Navigator, send the "More students apply early" data (MT03L1.8xl and MT03L2.8xl) to the class using **Force send to students now**. *The data represents the number of students applying to college under early decision plans from 1997-98 (L1 = 0) through 2003-04 (L1 = 6).* 2. Once the data is downloaded, instruct your students to exit the TI-Navigator system.	1. Press APPS and select NavNet, login using your username and password. 2. Wait for the teacher transfer – the data is downloaded in two lists, L1 and L2. 3. Once the data is downloaded, press BACK (ZOOM) and then 4 to EXIT APP.
STEP 2 – CALCULATOR 1. Instruct your students to use their calculators to determine the average increase in the number of students that are applying early per year. 2. Prompt the class to create a scatter plot of the data with L1, the independent variable, and L2, the dependent variable.	1. Press STAT ENTER and highlight L3. 2. Press 2nd [LIST] ▶ 7 2nd [L2]) ENTER. 3. Wait for teacher instructions. 4. Press 2nd Y= and adjust the settings for the scatter plot. 5. Press WINDOW and set the appropriate values for the data. 6. Press GRAPH.
STEP 3 – SCREEN CAPTURE 1. Use **Screen Capture** to check student understanding. *The scatter plot should look like the image on the right. If not, this is an opportunity to discuss appropriate independent and dependent variables for this problem.* 2. Instruct your students to return to the TI-Navigator system when you are ready to go to the next step.	 1. Press PRGM, select GONAVNET and press ENTER.

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Teacher:	Students:

STEP 4 – ACTIVITY CENTER

1. In Activity Center, use **Load Activity Settings** to load MT_Apply.act.
2. Press **Start Activity** to begin.
3. Instruct your students to enter three ordered pairs that would follow the pattern of the scatter plot of the early decision-year scenario.
4. As submissions appear, discuss the following with your class to check for understanding.
   - Submissions that are particularly interesting or ambitious
   - Submissions that have common errors

   NOTE: Select **Pause Activity** to have a class discussion. Select **Resume Activity** to continue.

   Sample discussion questions:
   - *Will the linear model be a good predictor for the future?*
   - *Will the number of students be able to continue at a constant rate?*
   - *Are there any limiting factors to the growth?*
5. Choose the **Graph-Equation** tab and add the equation ***y = 5909x + 42998*** to the scatter plot.
6. Discuss with your class to check for understanding.
7. Press **Stop Activity** when you are ready to go to the next step.
8. Instruct your student to exit the TI-Navigator system.

1. From the TI-Navigator home screen press [1] Activity Center.
2. When prompted, enter three ordered pairs for the number of students applying early.

   OPTION: Press PLOT (@) to view the graph of your points before sending.

3. Press BACK ([ZOOM]) and then [4] to EXIT APP.

STEP 5 – CALCULATOR

1. Instruct your students to use their calculators to determine the total number of students that are expected to apply early from 2004 through 2007.

1. Create a linear regression model for the data in L1 and L2. Enter your regression model into Y1 rounding the values for *a* and *b* to the nearest whole number.
2. Return to the home screen and press [VARS] [▸] [ENTER] [ENTER] [(] [7] [)] [ENTER] to evaluate the linear function for 2004-2005. (Use five significant digits.)
3. Repeat for the remaining years.

Teacher:	Students:
2. Instruct your students to return to the TI-Navigator system when you are ready to go to the next step.	4. Determine the total number of students that are expected to apply early. 5. Press PRGM, select GONAVNET and press ENTER.
STEP 6 – QUICK POLL ***NOTE**: The question in this step is also included in Step 7 – LearningCheck™ Assessment. You may want to skip this step and go to Step 7 instead.* 1. From the pull-down menu select **Open Response** and check **Resubmit** so that students can change their answers. 2. Press **Start Poll** when you are ready to start. 3. Instruct the class to answer this question: **Q. How many students are expected to apply early from 2004 through 2007?** A. 270,806 4. Discuss with your class to check for understanding **NOTE**: Select **Pause Poll** to have a class discussion, then select **Resume Poll** to continue. 5. Press **Stop Poll** when you are ready to go to the next step.	1. Press APPS and select NavNet. 2. Input answer and press SEND (Y=). 3. Resubmit answer as needed during the class discussion.
STEP 7 – OPTIONAL LEARNINGCHECK ASSESSMENT 1. Using **Send to Class**, distribute the LearningCheck assessment file Apply.edc to your students using **Force send to students now**. 2. Prompt them to open the LearningCheck assignment and answer the following questions: **Q. What is the average increase in the number of students that are applying early for the time period shown in the USA TODAY Infograph?** A. The calculation for the average increase per year in the number of students is shown in Screenshot #1. This shows that on average about 6197 students are applying for the early decision plan according to the data.	1. From the TI-Navigator home screen press 2 Network Apps. 2. Select LearnChk. 3. Select the Apply assignment and follow the prompts to answer the questions. ***NOTE**: TI Keyboards may be used to answer the questions.*

Teacher:

Q. What is the linear function modeling this data set? What does the slope and *y*-intercept mean in the early decision-year scenario?

A. Screenshot #2 shows the results from the calculator for the linear model. The slope is 5909. This means that there is an increase of 5909 students per year for this time period. The *y*-intercept means that in 1997-1998 about 42,998 students had applied for early decision.

Q. Determine the total number of students that are expected to apply for early decision for the period from 2004 through 2007.

A. The values shown below are found using the linear model. Refer to Screenshot #3.

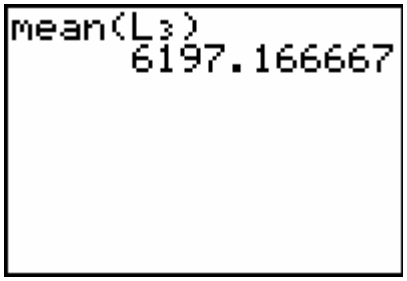
Year	2004-2005	2005-2006	2006-2007	Total
# of students	84,360	90,269	96,177	270,806

3. Select **Class Analysis** and make sure all of the students have completed the assignment.
4. Select **Collect From Class**.

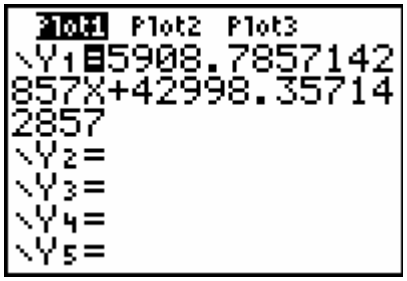
   NOTE: Before collecting the answers, we recommend that you check these options:

   - **Delete Answer File from Device after Collect**
   - **Delete Assignment File from Device after Collect**
5. Using **Class Results Slide Show**, discuss the results with your class to check for understanding.

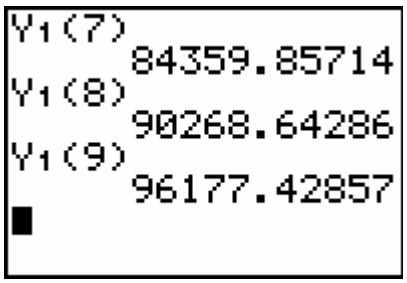
Students:



Screenshot #1



Screenshot #2



Screenshot #3