

**Modeling Data with Core Math Tools: Enhancing Mathematical Practices Implementation**  
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**April 19, 2013**

To download the free Core Math Tools, go to: [nctm.org](http://nctm.org) (click on top left purple cell “Core Math Tools”)

Tasks Highlighted in Session

- **Pay It Forward** (*Core-Plus, Course 1, Unit 5, Lesson 1, Investigation 1*)
- **More Bounce to the Ounce** (*Core-Plus, Course 1, Unit 5, Lesson 2, Investigation 1*)
- **Modeling Decay: Coin Experiment** (*Core-Plus, Course 1, Unit 5, Lesson 2, Investigation 3*)

Videos Shown During the Session

- Annenberg Video (Handshake Problem #42): <http://www.learner.org/vod/login.html?pid=910>
- Pay It Forward Motivation: <http://www.youtube.com/watch?v=N0HTneOLrEc>
- Bouncing Ball Motivation: <http://www.youtube.com/watch?v=-zOrV-5vh1A&feature=related>

More Information About Core Math Tools

- Features include:
  - Algebra- CAS and Spreadsheet
  - Geometry- Coordinate and Synthetic
  - Statistics- Data Analysis and Simulation
  - Discrete Math- Vertex-Edge Graphs
- Pre-made data files + Extra Apps

Using Core Math Tools for Tasks in Session

**1. Pay It Forward**

- Algebra->Spreadsheet (a new window will appear)
- Label Columns with: Stage Number, Good Deeds in this Stage, Total Deeds
- In the Stage Number column, enter the number 1 in cell A2, 2 in cell A3, and so on until you have entered numbers 1-10
- In the Good Deeds Column use a mathematical formula to fill the first cell. Type  $=3*A2$  in cell B2 to fill in 3 for the number of good deeds at stage 1.
- Then type  $=3*B2$  into cell B3 to generate the number of deeds at stage 2.
- Then, to fill the formula down, highlight the cells you want to fill (B3 through B11) and click Edit->Fill Down
- In the third column, for the total number of deeds, type 3 into cell C2.
- Then, type  $=B2+B3$  into cell C3.
- Fill that formula down by highlighting cells C3 through C11 and repeating the fill down step from step e.
- Graph the data: *Tools, Graph, Scatterplot*
  - Set the horizontal axis to column A (stage #)
  - Set the vertical axis to column B (# good deeds)
- Find an equation for the data: *Options, Draw Regression Model*
  - Use the *Models* tab to fit different models and to see the equation

## 2. More Bounce to the Ounce

- a. Algebra->CAS->File->Data->New
- b. Type "Bounce Number" in Column A and "Rebound Height" in Column B
- c. To enter fractions in the cell type " $=16/3$ ", then hit ENTER
- d. Fill in each column as necessary for the problem (similar to the previous problem with the Fill Down feature)
- e. To plot: Click on blue Graph in the menu pane, Scatterplot, choose Column A for horizontal and Column B for vertical, click "OK"
- f. Click on the "Graph" box in gray next to Table and Data.
- g. Change the window in "Settings" tab
- h. Checking your Work on this task:
  - i. Click the Y= tab
  - ii. Type in the equation you believe to be correct
  - iii. In the Command line, check the box next to "Graph" for the function you just entered
  - iv. Click the Graph tab and your function should be listed in red along with your data points

## 3. Coin Task (Steps a-j can be skipped if you use real coins with your class for this investigation)

- a. Click on Simulation
- b. Click on the coin
- c. Go to Build->Count # of
- d. Enter 100 in the "In \_\_\_\_ Trials" to have 100 coins flipped
- e. Select "H" as the outcome to count
- f. Put "1" in the \_\_\_\_ Run box.
- g. Click "Conduct" to run the trial
- h. On the right side you will see the outcomes and at the top right you will see the number of heads that resulted. Let's just say it is 52
- i. Repeat by entering the total number of coins that are left after we remove all the heads into the "In \_\_\_\_ Trials". Record this number. So for our example if there were 52 heads removed then there are 48 coins left; 48 goes into the box for the next trial.
- j. Repeat the process until you get 5 or fewer heads.
- k. Now enter data into the CAS feature of Core Math Tools:
  - i. Remind students how to enter data
  - ii. Show them how to create a slider to find an equation
  - iii. In Y= type in " $y=a*(1/b)^x$ " then Enter
  - iv. Check the box next to "Graph  $y=a(1/b)^x$ "
  - v. In the Graph tab you can move the sliders for  $a$  and  $b$  to find a model for your data
  - vi. To adjust the range for  $a$  and/or  $b$ , double click on the box with the letter and set a new maximum value.