EXPLORATIONS

Activity 2

The Women's 5000 Meter World Record Progression: The Median-Median Line

The world record for the women's 5000 meter run has steadily decreased over the past years. A linear function can be used to model or approximate the data.

In this activity, you will develop one type of linear model, the median-median line.

Exploration

1. Open a new TI InterActive! file. Title this document **The Women's 5000 Meter World Record Progression.** Add your name and the date to this document.

2. Click List  to open the list editor. Double-click on the name **L1** and change the name to **Year**. Click OK. Double-click on the name **L2** and change the name to **Time**. Click OK.

3. Click on the Web Browser icon  to open TI InterActive!'s Internet Browser. Click on the Data Sites icon  . Under the **Activity Book Links** category, click *TI InterActive! Math for High School*. Choose **Activity 2: The Women's 5000 Meter World Record Progression.**

4. Once the page has been loaded in the browser, highlight the women's world record progression for the 5000 meter run and then 

to download the data into the open list editor.

5. In the **Year** column, type the two-digit year since 1900 of each of the records. In the **Time** column, convert each of the world record times to minutes. Example: 16:17.4 should be entered as 16 + 17.4/60.

6. Highlight and copy the first third of the data in lists **Year** and **Time**. Paste this data into **L3** and **L4**. Rename **L3** as **xGroup1** and **L4** as **yGroup1**, respectively.

7. Highlight and copy the second third of the data in lists **Year** and **Time**. Paste this data into **L5** and **L6**. Rename **L5** as **xGroup2** and **L6** as **yGroup2**.

8. Click in the first cell of the next column. Click on Insert Column and insert two columns.

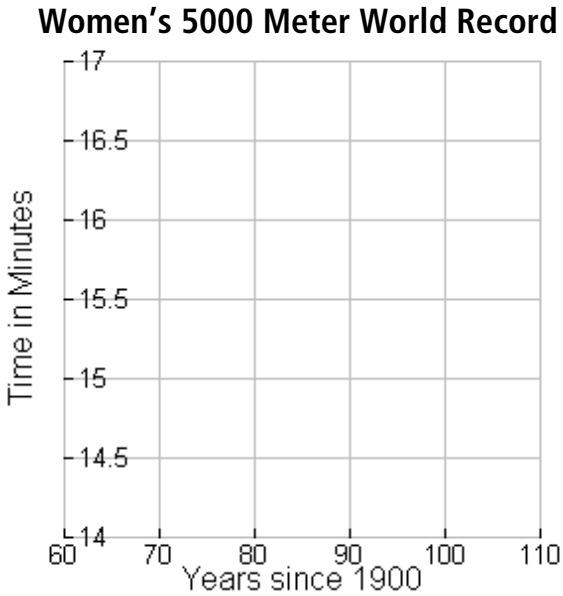
9. Highlight and copy the last third of the data in lists **Year** and **Time**. Paste this data into the two new columns. Rename the columns **xGroup3** and **yGroup3**.

   Click on Save to Document  .

10. Select Graph  . Click on the Stat Plots tab. Enter **Year** in the first field and **Time** in the second field. Click in the checkbox to the left of these fields to select the plot.

11. Click on Format. Since the *x*-values in **Year** represent years since 1900, let x: [60, 110], Xscale = 10. Since the *y*-values in **Time** represent time minutes, let y: [14, 17], Yscale = 0.5

12. Click on the Labels tab in the Format dialog box. Title this graph **Women's 5000 Meter World Record**. Label the X-Axis **Years since 1900** and the Y-Axis **Time in Minutes**. Click on OK and then click on Save to Document  . Record your graph on the grid provided.



Analysis

1. On May 30, 1978 Loa Olafsson set a new world record for the women's 5000 meter run. What is significant about this record and why?

   _____

2. In a math box  inserted above the graph, define $x1$ to be the median of the x-values in group 1 by entering **x1: = median** (**xGroup1**). In the next math box define y1: = median (**yGroup1**) to be the median of the y-values in group 1. Repeat for groups 2 and 3. Record these ordered pairs.

   $(x1, y1)$ = _____ $(x2, y2)$ = _____ $(x3, y3)$ = _____

3. In a math box, find the slope of the line passing through $(x1, y1)$ and $(x3, y3)$ and define m to be the value of this slope by typing **m: = (y3 – y1)/(x3 – x1).** Record your results below .

   m = _____

4. In a math box, find the y-intercept of the line passing through $(x1, y1)$ and $(x3, y3)$ by typing **solve (y3 = m*x2+b,b)**. In the next math box, define $b1$ to be the value of this y-intercept by typing **b1: = right(ans)**. Record your results below.

   b1: = _____

5. In a math box, define $f1(x)$ to be the line with slope m and y-intercept b1. Record your results below.

   f1(x): = _____

6. Double-click on the graph and enter **f1(x)** in $y1(x)$. How well does this line fit the data?

   _____

7. In a math box  inserted above the graph, find the y-intercept of the line passing through $(x2, y2)$ that is parallel to the line $f1(x)$ by typing **solve (y2 = m*x2+b,b)**. In the next math boxes, define $b2$ to be the value of this y-intercept as directed in step 4 above and define $f2(x)$ to be the line with slope m and y-intercept $b2$. Record your results below.

   m: = _____ b2: =_____ f2(x): _____

8. Double-click on the graph and enter **f2(x)** in $y2(x)$. How well does this line fit the data?

   _____

9. In a math box  inserted above the graph, define $b3: = \frac{b1 + b2 + b1}{3}$ and define $f(x)$ to be the line with slope m and y-intercept $b3$. This is the median-median line for this data. Record your results below.

   b3: = _____ f(x): = _____

10. Double-click on the graph and enter $f(x)$ in $y3(x)$. How well does this median-median line fit the data?

    _____

11. In a math box  inserted above the graph, define $g(x)$ as the linear regression for this data set by typing **linReg (Year,Time,1,g(x))**. To see the linear regression, enter **g(x)** in the next math box. Record your results below.

    _____

12. Double-click on the graph and enter **g(x)** in $y4(x)$. How well does the linear regression fit the data?

    _____

13. Uncheck $y1(x)$ and $y2(x)$. Which do you think better fits the data, the median-median line or the linear regression? Justify your answer.

    _____

    _____

14. Save this document as **median.tii**. Print a copy of this document.