Math 114 Exam 2
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General guidelines

- Both the questions on this exam call for Excel work. Some of your answers belong there. Some belong on these pages. Write complete sentences where that's appropriate.

- Don't use a calculator for arithmetic when you have Excel open on your desktop! Use some of the extra cells, and leave your work so I can see it.

- You have access to anything on your computer or the internet, class notes and other material and the text. I don't think I've asked questions that a web search will help you answer. You're free to try, of course, but don't waste time!

- After class you may improve your answers, and send me updated spreadsheets by midnight tomorrow. *Work independently. Don't consult with friends or classmates or tutors.*

  The exam is posted on the course web page at `http://www.cs.umb.edu/~eb/114/exam2/exam2.pdf`.

  The spreasheet is at `http://www.cs.umb.edu/~eb/114/exam2/marathon.xlsx`.

1. (10 points) Turning in your work. (These are not free points. To earn them you have to follow the instructions.)

   - Read the general guidelines.
   - Turn in this paper.
   - Make sure your name is on this paper and on both worksheets in your spreadsheet!
   - If you need feedback before the end of the day Thursday in order to decide whether to take the course pass/fail or to withdraw, be sure to say that on this paper.
   - Send me your spreadsheeet as an attachment *to my gmail address:*

     `ebolker@gmail.com`

     with the subject line `Math 114 Exam 2 spreadsheet`.
   - Send it to yourself, for safekeeping and reworking.

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2. (50 points) The `2012summary` worksheet in the marathon spreadsheet (link above) contains data for the numbers of men and women who finished the 2012 Boston marathon, grouped by finishing times. For example, 26 men and one woman finished with a time between two and two and a half hours. (That one woman was a wheelchair racer.)

Here are the data:

Finishing time	Men	Women
2:00-2:30	26	1
2:30-3:00	444	27
3:00-3:30	1844	260
3:30-4:00	3389	1714
4:00-4:30	2819	2833
4:30-5:00	1861	1966
5:00-5:30	1068	1013
5:30-6:00	607	609
6:00-6:30	323	339
6:30-7:00	160	162

Answer the following questions. Do as much of the arithmetic in Excel as possible, and leave the formulas there for me to look at. Write your answers here.

(a) Sketch a neat histogram for this data *here*.

(b) Draw your histogram with Excel. Does it match your sketch?

(c) How many men finished the marathon? How many women?

(d) Use the data to estimate the mode, median and mean for the mens' finishing times.
Hint/warning: 2:30 is 2 hours and 30 minutes. That's 2.5 hours, not 2.3 hours.

    (a) Mode:

    (b) Median:

    (c) Mean:

    (d) Show the mens' mode, median and mean on your histogram sketch on the previous page.

(e) Suppose my friend ran the marathon and finished ahead of half the men. What was his finishing time (approximately).

(f) About what percentage of the women finished ahead of half the men?

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3. (40 points) Faster than a speeding bullet.

The `marathonhistory` worksheet (the second tab in the spreadsheet) shows the history of the winning time for men and women from 1966 (when women first ran) through last year (2013). The tragedy then didn't happen until after the winners crossed the finish line.

I have graphed this information and asked Excel to put in the trend lines. You should see the chart in the spreadsheet. I've drawn the chart for you, and put in the trend lines.

(a) Add a title and axis labels to the chart.

(b) What is the average rate at which the men's finishing time changed from year to year?

(c) Use the trendline to predict when the men's winner will finish in two hours. How confident are you in that prediction?

(d) Use the trendline to predict when the men's winner will finish in one hour. How confident are you in that prediction?

(e) The trendlines suggest that in about six years the fastest woman will be as fast as the fastest man, and will be faster thereafter. Explain why the lines say that, and why it's nonsense.

(f) Make a better prediction about the long run relation between men's and women's winner finishing times.

Hint: look at the data starting in about 1980.

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