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 Excel formulas like `=D1+D2` so you can change cell values and have Excel recompute everything.
- 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`.

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.
   - If you need feedback in order to decide whether to take the course pass/fail or to withdraw, be sure to say that on this paper.
   - Do your Excel work in a copy of the spreadsheet you will find at `http://www.cs.umb.edu/~eb/114/exam2/exam2.xlsx`.

     Make sure your name is on this paper and on both worksheets in that spreadsheet!

     Send me your spreadsheeet as an attachment *to my gmail address:*

     `ebolker@gmail.com`

     with the subject line `Math 114 Exam 2 spreadsheet`.
   - Save it on a thumb drive or send it to yourself, for safekeeping and reworking.

2. (50 points) The `arrival delays` worksheet in the exam2 spreadsheet (link above) contains data on how many minutes late American Airlines flights to Logan were in January, 2014.

   Answer the following questions. When you do arithmetic in Excel leave the formulas there for me to look at. Write your answers here.

   (a) What does a *negative delay* mean?

   (b) Later I'll ask you to draw a histogram of this data in Excel. Sketch a neat approximate version *here*, with proper titles and reasonable scales for both axes and a proper title for the whole chart. You don't need to draw all the bars!

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

   (d) How many flights were counted in this data?

   (e) What percentage of the flights arrived on time?

(f) Use the data to estimate the mode, median and mean arrival delay. Show these values on your histogram sketch.

(a) Mode:

(b) Median:

(c) Mean:

(g) Flights that are more than two hours late are *outliers* – the delay is probably not American Airlines' fault. Estimate the mode, median and mean arrival delays if you don't include the outliers.

3. (40 points) Comparing telephone calling plans

A cell phone company has introduced a pay-as-you-go price structure, with three possibilities.[1] Your friend has asked for help choosing a plan.

```
Plan 1:  $10 a month, 10 cents per minute
Plan 2:  $15 a month, 7.5 cents per minute
Plan 3:  $30 a month, 5 cents per minute
```

(a) For each plan, find a linear function that describes how the total cost for one month depends on the number of minutes used.

(b) Construct a table in Excel showing how the total cost for one month depends on the number of minutes used for each of the three plans.

Do your work in the `phone plans` worksheet in the exam2 spreadsheet (link above). Organize your data this way:

- Create a sequence of cells in column `A` for the various possible numbers of minutes. Label that column. Start with 0 minutes. What's a good step to use? What's a reasonable place to stop?
- Use columns `B`, `C` and `D` for each of the three plans. The fixed charge and charge per call should be in cells in those columns too, so you can copy the *same formula* to every cell in columns `B:D` in the data table. (That will call for clever use of the `$` to keep Excel from changing row numbers and column letters when you don't want it to.)

(c) Draw *one graph* in Excel showing how the monthly bill (y axis) depends on the number of minutes used (x axis) for *all three* plans.

(d) Write a paragraph explaining to your friend how she should go about choosing the plan that's best for her.

[1] Real cell phone plans are much more complicated than these artificial ones.

