Math 114 Exam 1
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General guidelines

- When you've solved a problem (perhaps at the back of the blue book, or on scrap paper) write your answer out neatly starting on a new page in the blue book. Make it easy for me to find each problem. Don't just circle a number. Show all units, and write complete sentences. If you've used any technology, say so.

- Remember to *read the questions carefully* before you start playing with the numbers.

- The purpose of this course is to help you learn how to use quantitative reasoning principles to solve real problems that matter to you. An exam can't test that well because you must answer the questions quickly. Here's a compromise. For homework for Thursday, rethink your answers. If you can write better ones, submit them. (Don't redo problems you got right the first time.) I will correct both the exam and the resubmissions. Getting a problem right the second time isn't worth as much as getting it right the first time, but it can make a difference in your grade. The exam is posted on the course web page at `http://www.cs.umb.edu/~eb/114/exam1/exam1.pdf` .

  Work independently. You can email me with questions, but don't consult with friends or classmates or tutors.

- The exam is "open everything" — open book, open notes, calculator. Since there are no computers in the exam room (unless you brought your own) you won't need internet access to answer the questions. If you use the internet when you redo the exam, just say so.

- Remember to show only the number of significant digits (precision) in your answer justified by the numbers you start with and the estimates you make.

- Write complete sentences. Don't use arrows and equal signs instead of the words that explain what numbers mean and what you are doing. You don't need to show me your arithmetic.

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1. (5 points)

    (a) What electronic aids will you be using? (Calculator, smartphone, computer, none?)

    (b) Read the general guidelines - particularly the ones about the form your answers should take, and the chance to improve your answers between now and Thursday. Write "I understand the instructions" as an answer for a free 5 points.

2. (20 points) Warren Buffet.

    In *The Boston Globe* on September 30, 2015 you could read that Warren Buffet is worth $62 billion, and that

    > . . . if [he] gave up on aggressive investing and put his money into a simple savings account, with returns at a bare 1 percent, he'd earn more in interest each hour than the average American earns in a year.

    Use the data in this story to estimate the annual earnings of the average American. Do you think the estimate is reasonable?

3. (25 points) State's rainy day fund has dwindled over past decade,

On October 5, 2015 *The Boston Globe* published a story with that headline that said (in part):

> In the summer of 2007, before the massive recession began, the rainy day fund had $2.3 billion — a cushion of about 7.8 percent of total state spending, according to the Taxpayers Foundation. This summer, the rainy day balance stood at $1.1 billion — about 2.7 percent of total state spending, a fraction small enough to raise a red flag for analysts.

(a) Calculate total state spending as of the summer of 2007 and this past summer.

(b) What is the percentage change in total state spending between the summer of 2007 and this past summer?

(c) Write a short argument supporting the statement "Today's rainy day fund is only about half what it was in 2007". (One good sentence will do the job.)

(d) Write a short argument supporting the statement "Today's rainy day fund is only about a third of what it was in 2007".

(e) Which of the previous two statements is a better description of the situation? (Tell me why you think so, don't just say it's one or the other.)

4. (25 points) Medicare fraud.

An Associated Press story in Easton, Maryland's *The Star Democrat* on June 3, 2010 reported that

> All told, scam artists are believed to have stolen about $47 billion from Medicare in the 2009 fiscal year, nearly triple the toll a year earlier. Medicare spokesman Peter Ashkanaz said that . . . charges have been filed against 103 defendants in cases involving more than $100 million in Medicare fraud.

(a) What percentage of the Medicare fraud has been targeted by filed charges?

(b) What is the average claim in each fraud charge?

(c) How many of these average size claims would need to be filed to recover the entire $47 billion?

(d) The article suggests that the administration is vigorously pursuing Medicare fraud. Do the numbers support that suggestion?

5. (25 pointe) For-profit colleges could be banned from using taxpayer money for ads.

In April 2012, Senators Tom Harkin and Kay Hagan introduced a Senate bill to prohibit colleges from using federal education dollars for advertising or marketing. In March 2013 they reintroduced the bill. The Senate committee on Health, Education, Labor and Pensions reported that

- Fifteen of the largest for-profit education companies received 86 percent of their revenues from federal student aid programs — such as the G.I. Bill and Pell grants.
- In Fiscal Year 2009, these for-profit education companies spent $3.7 billion dollars, or 23 percent of their budgets, on advertising, marketing and recruitment, which was often very aggressive and deceptive.

(a) What were the total revenues of those fifteen for-profit colleges in fiscal year 2009?

(b) How much did those colleges receive in federal student aid in fiscal year 2009?

(c) How much of the money they spent on advertising, marketing and recruitment could be considered as coming from the federal government?

(d) Could the colleges maintain the same level of advertising, marketing and recruiting expenses if they did not use any federal dollars for those purposes?