Math 114 Exam 1

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General guidelines

- When you've solved a problem (perhaps on scrap paper), write the answer out neatly on the paper with the problem (you can use the other side too). Don't just circle a number. Show all units, and write complete sentences. If you've used any technology, say so.
- 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.
- Google (and the internet), calculators, class notes and the text are all OK. Make sure you acknowledge any help of this kind. But take care. Time spent searching the web or shuffling through notes is time you're not using to answer the questions. Of course you can't use the computer to exchange email with your classmates during the exam. No text messages either, please.
- 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. Remember to use the equal sign *only between numbers that are equal*, not as a substitute for words that explain what the numbers mean and what you are doing

Name:

1. (5 points) Read the general guidelines - particularly the first two about the form your answers should take, and the chance to improve your answers between now and Thursday. Write "I understand the instructions" here for a free 5 points.

2. (20 points) How much television? [1]

The web page `http://www.shirky.com/herecomeseverybody/2008/04/looking-for-the-mouse.html` claims that U.S. adults spend 200 billion hours a year watching TV. [2]

On July 22, 2010, Hiawatha Bray wrote in *The Boston Globe* :

> My trouble is I don't watch enough television. If I burned through the national average, watching 35 hours a week, I would probably love Hulu Plus, the new pay-to-play video service. [3]

Do these two estimates of the amount of time we spend watching TV agree?

[1] This is an easier version of Exercise 1.8 from *Common Sense*

[2] You can see an interesting visual depiction of this information at `http://www.informationisbeautiful.net/2010/cognitive-surplus-visualized/` – but don't spend exam time on that.

[3] `http://www.boston.com/business/technology/articles/2010/07/22/tv_gurus_will_enjoy_hulus_new_pay_service/`

Name:

3. (20 points) *DATA GLUT AS GENE RESEARCH YIELDS INFORMATION COUNTED IN TERABYTES, RESEARCHERS STRUGGLE TO VISUALIZE AND PROCESS IT WHILE TECHNOLOGY BUSINESSES SCRAMBLE TO PROFIT FROM IT.*

In the article from *The Boston Globe* on February 24, 2003 with that headline you could read that

> [Peter Sorger's] bioengineering lab produces a tera byte of data in a typical month.[4]

(a) At what rate in bytes per minute is the lab producing data? Write your answer with the appropriate metric prefix and the appropriate level of precision.

(b) If the lab has been producing data from the time the article appeared to the present, how much has accumulated now?

(c) When will a petabyte of data have accumulated?

[4] `http://pqasb.pqarchiver.com/boston/access/293479831.html?FMT=ABS&date=Feb`

Name:

4. (20 points) *Listen up on public broadcasting*

From *The Boston Globe* , February 17, 2011:

> Does the federal deficit need to be addressed? Of course. But gutting public radio and public television is not the answer. Eliminating the government's investment in public broadcasting would reduce the $1.5 trillion federal budget deficit by less than three ten-thousandths of one percent. But it would have a devastating impact on local communities nationwide.
>
> For $1.35 per year per American – less than a cup of coffee – people in cities and towns across the United States benefit from public television, radio, and Web content. [5]

(a) Use the information in the *second* paragraph to estimate annual federal spending on public broadcasting.

(b) Find evidence online showing that your answer to the previous question is in the right ballpark.

(c) Show that the information in the *first* paragraph of the quotation leads to an estimate of annual federal spending on public broadcasting that is wrong by *two orders of magnitude*.

(d) How would you rewrite the first paragraph so that it was correct?

(e) (Optional, no credit). Do you listen to public radio or public television? If so, do you contribute when they ask for money?

[5] `http://www.boston.com/bostonglobe/editorial_opinion/oped/articles/2011/02/17/li\sten_up_on_public_broadcasting/`

Name:

5. (20 points) *For Sale: A $160,000 Apple Computer*
(This is Exercise 4.12 from *Common Sense*.)

> The Apple-1 computer was built and sold by Steve Jobs and Steve Wozniak, Apple's co-founders, in 1976 for $666.66 – the strange price was put into effect because Mr. Wozniak liked repetitive numbers. (An inflation calculator determines that price is equivalent to $2560 in today's dollars.) It's estimated that only 200 of these computers were produced and sold before Apple moved onto the next model, the Apple II.[6]

(a) Check the inflation calculation used in this article.

(b) Later on the article says that he computer is expected to sell for $160,000 at auction. Is the expected auction price a bargain?

(c) (Optional – don't spend time on this unless you've done everything else on the exam.) Can you discover what the computer actually sold for at that auction?

[6] `http://bits.blogs.nytimes.com/2010/11/11/for-sale-a-16000-apple-computer/?hp`

Name:

6. (15 points) What's a good basketball player worth these days?
(This is Exercise 3.25 from *Common Sense*.)

In *The Boston Globe* on June 30, 2010 you could read that

> [A] maximum deal for [LeBron] James would start at $16.56 million (at the minimum) and increase by 8 percent each season over the five-year period. [7]

(a) Use the "1+" trick four times to calculate James' salary in the fifth season.

(b) In the five seasons, James will get four eight percent salary increases. Compare the result of your calculation to a single $4 \times 8\% = 32\%$ increase.

[7] http://www.boston.com/sports/basketball/celtics/articles/2010/06/30/game_time_when_james_makes_decision_dominoes_to_fall/