

## CS456 Homework Assignment 1

**Due date:** \_\_\_\_\_

**General info:** Turn in all code on both paper and by email (to [dbahr@regis.edu](mailto:dbahr@regis.edu) with “CS456 Homework” in the subject line). Use old-fashion paper for everything else. For calculations, please show all your work.

In the real world, your ideas and your work must be communicated effectively to your boss, to your client, and to potential investors. Therefore, *please use succinct but clear and well-written English for your answers (as if I was your boss)*. Sometimes you will need to look up salient facts to effectively support your ideas and answers. Please briefly quote sources.

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**Problem #1:** (a) Need incentive to develop better code? The September 2002 issue of Scientific American reports that “Buggy software drains the U.S. economy to the tune of nearly \$60 billion” per year. To get a sense for how much money this is, calculate how many years it would take to count \$60 billion at one dollar per second.

(b) Again, to get a sense for how much money this is, compare \$60 billion to the economy (GDP or gross domestic product) of three underdeveloped or “third world” countries in Africa.

(c) The same study concludes that better software testing tools could reduce the cost by \$22 billion. If donated to families in need, how many U.S. families could \$22 billion support at the poverty line?

Remember: Quote your sources for the GDPs and U.S. poverty line. e.g., U.S. Dept of Deep Facts web page, sociology professor So-and-So, Senator Foo-Bar’s office staff, etc.

**Problem #2:** *For the next few problems, let’s write a simple program that will illustrate the necessity of writing flexible code.* First, suppose a client has asked you to write a Java program that tests if each of the numbers 1 to 100 is a triangular number. Print the number followed by yes or no. Recall that triangular numbers are 1, 1+2, 1+2+3, etc.

**Problem #3:** Now suppose that the client wants another program with a method called `printRandomEvenNumbers()`. This method should print 10 random even (not odd) numbers. You may use Java's built-in `Random` class.

**Problem #4:** *Now, here's where code flexibility is highlighted. We're going to learn lots of techniques this semester for writing flexible code.*

(a) Now the fickle client wants code that prints 10 random even numbers on the screen, and also prints whether or not each of these random numbers is triangular. To save your company time and money (and to therefore impress the boss and save your job when the company downsizes next week), reuse as much of the code from problems #2 and #3 as is possible.

(b) Was integrating your code from problems #2 and #3 easy? Why or why not? Which parts were hard (or easy)? When you started your homework, could you have planned anything differently to make the integration easier?

**Problem #5:** You work at HAL Mega-Corp, purveyor of many fine software products. The president of the company has decided that he is tired of losing stock value over buggy software releases. Therefore he has tasked you with writing a program called "Omni-Check" that will automatically test *all* of the company's existing and future software to make sure that there are no bugs. The president wants to be very clear that this software should be able to check *any and all* programs that are ever written by the company (past, present, and future). There's a big bonus for you if you can complete the task by December.

Based on the handout describing the halting problem, can you guarantee the president that "Omni-Check" will be able to test all existing and future software applications? Will you collect the bonus? *Explain your reasoning.*