**Homework 5 STAT 305E Fall 2010 Due 10/12 Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

 **\*\*\*\*\* Some Real-World Applications \*\*\*\*\***

**PROBLEM 1: Winning the Lottery- Twice!**

 Months after winning $1M in lottery, man wins $2M

*By JIM SALTER, Associated Press Writer Jim Salter, Associated Press Writer* Tue Sep 28, 6:27 pm ET

ST. LOUIS – The odds against winning $1 million in the Lottery: Astronomical. How about doing it twice?

It happened to a man from Bonne Terre, Mo., Missouri Lottery officials said Tuesday. Ernest Pullen, 57, won $1 million with a "100 Million Dollar Blockbuster" Scratchers ticket in June. And this month, he won $2 million with a "Mega MONOPOLY" Scratchers ticket. Pullen, a retired military man who was working at the help desk for a telecommunications company before retiring after the first lottery win, said he considers himself to be a "lucky guy." You think?

John Wells of the Missouri Lottery said the chances of winning $1 million in the "$100 Million Dollar Blockbuster" game are 1 in 2.28 million. The odds of winning $2 million in "Mega MONOPOLY" are about the same. The chances of winning both? Because they're independent games, it is impossible to calculate the odds, Wells said. "But it's a pretty amazing coincidence," he said. "We've had players win big multiple prizes before, but this is the first person to ever win a second million-dollar prize in the history of the Missouri Lottery."

Pullen bought the most recent winning ticket on Sept. 17 at Miller's Quick Shop in Bonne Terre, a community in the Old Lead Belt region of eastern Missouri, about 60 miles southwest of St. Louis. He opted to take the cash payment instead of the annuity for both wins. He received $700,000 for the June winner and will get about $1.3 million for the September winner - both before taxes. Pullen recalled a dream six years ago in which he won a lot of money. Even after the $1 million win in June, he didn't feel like the dream was complete. He does now. "All the numbers I dreamed about, and all my lucky numbers, were on the card," Pullen said. Pullen plans to use the money to fix up his new house, which needs a new lakeside wall. As for the Lottery, he figures he's about used up his luck, though he still might play the big jackpots on Powerball and Mega Millions. "My wife said she's winning the next time," Pullen said.

**Discuss the highlighted comment. In doing so, be as quantitative as possible.**

**PROBLEM 2: Translating Statistics into Probabilities Related to Random Variables**

**McClatchy Washington Bureau**

[Print This Article](http://www.mcclatchydc.com/2010/09/17/v-print/100771/as-iraq-winds-down-us-army-tries.html) Posted on Fri, Sep. 17, 2010

**As Iraq winds down, U.S. Army confronts a broken force**

**Nancy A. Youssef | McClatchy Newspapers**

*last updated: September 17, 2010 08:18:31 PM*

WASHINGTON — When Lt. Col. Dave Wilson took command of a battalion of the 4th Brigade of the 1st Armored Division, the unit had just returned to Texas from 14 months traveling some of Iraq's most dangerous roads as part of a logistics mission. What he found, he said, was a unit far more damaged than the single death it had suffered in its two deployments to Iraq.

Nearly 70 soldiers in his 1,163-member battalion had tested positive for drugs: methamphetamine, cocaine and marijuana. Others were abusing prescription drugs. Troops were passing around a tape of a female lieutenant having sex with five soldiers from the unit. Seven soldiers in the brigade died from drug overdoses and traffic accidents when they returned to Fort Bliss, near El Paso, after their first deployment.

"The inmates were running the prison," Wilson said. What Wilson had to deal with, however, was hardly an isolated instance. With the U.S. drawdown in Iraq, the Army is finally confronting an epidemic of drug abuse and criminal behavior that many commanders acknowledge has been made worse because they'd largely ignored it during nearly a decade of wars on two fronts. The Army concedes that it faces a mammoth problem. A 350-page report issued in July after a 15-month investigation into the Army's rising suicide rate found that levels of illegal drug use and criminal activity have reached record highs, while the number of disciplinary actions and forced discharges were at record lows. The result, the Army found, is that "drug and alcohol abuse is a significant health problem in the Army." Where the Army once rigidly enforced rules on drug use, it got sloppy in the rush to get soldiers ready for the battlefield, commanders say. Officers who once trained soldiers on everything from drug abuse to financial planning had only enough time to get their troops ready for battle.

The number of misdemeanors that soldiers committed — including traffic infractions, drunk driving and being absent without leave — rose to 50,523 in fiscal year 2009 — a sign, the report said, that "good order and discipline" were declining in the ranks. Five years earlier, the number was 28,388. No disciplinary action was taken in at least 15,074 of the 2009 cases, the report said.

From 2001 to 2009, only 70 percent of DUIs and 61 percent of positive drug tests were referred to the Army's substance abuse program, and drug testing became haphazard, as well: In 2009, 78,517 soldiers went untested for illegal drug use. Statistically, the Army estimated, that meant that 1,311 offenders probably escaped detection. Sexual assault more than tripled in the same period, from 302 cases in 2001 to 1,015 in 2009.

The increase in drug abuse and bad behavior came at the same time that the Army enlisted thousands of recruits who in previous years would have been ruled ineligible because of drug or other criminal convictions. According to the report, nearly 20 percent of the soldiers who've enlisted in the Army since 2004 — perhaps as many as 10,000 — would "not have been eligible for entry into the Army before."

"I think we've got to understand that the force we have today is different from the force we had 10 years ago," said Gen. Peter W. Chiarelli, the vice chief of staff of the Army, who oversaw the study and is heading up the Army's response to it. "We've got kids that are going to have some behavioral health issues. The real hard part for us is to determine, 'OK, I am willing to help this kid with behavioral health issues, but how long can I help him? How long can I do that and make sure I have a force capable of doing whatever the nation asks it to do?' "Chiarelli said that simply discharging soldiers with drug and behavioral problems wasn't an option. "We can't use these people up, have them develop a problem and then throw them away and not take care of them. There is no way. I can't be part of an organization like that," he said. "Part of the reason they're having the problem is the situation we put them into." Wilson said he found a failure of leadership to be a major factor in the deterioration of his unit. When the brigade returned from Iraq in December 2007, many commanders were moved to other units, and new soldiers were rushed through the system to get them to the battlefield quickly, without the proper guidance.

As a result, 37 of the 69 drug abusers in Wilson's battalion belonged to one company of 200, he said. When he was a company commander a decade ago, having five soldiers test positive would have been considered a lot, he added.

"We found that we had leaders that were dealing with combat stress issues as well. So when you have sick leaders, that leader can't care for the soldiers properly," said Wilson, who commanded 1,163 of the brigade's 3,800 soldiers. "The drug problem was just a symptom of the disease."

Wilson said he turned his unit around by keeping leaders in place, disciplining soldiers and making time during combat training for things such as leadership and the perils of drug abuse. He had them read the motivational books "Who Moved My Cheese?" and former Notre Dame coach Lou Holtz's "Winning Every Day." Positive drug tests later fell to five a year.

The brigade also kicked 200 soldiers out of the Army.

"There were times I walked out of my headquarters at 2 and 3 in the morning and went back in an hour and a half later for PT," or physical training, Wilson said. "There are times the Army requires us to give up a little more juice than normal." Chiarelli said he was hopeful that the drawdown of American troops in Iraq would give the Army more time to address the issue. "As our soldiers start to spend more time at home, we can start to dust off some of the things we used to do ... and start tracking these kids, make sure we are taking care of them," he said.

ON THE WEB: Read the Army report, [Health Promotion, Risk Reduction, Suicide Prevention](http://bit.ly/cll7VH)

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[Army suicides: Poor leadership, not repeat deployments blamed](http://www.mcclatchydc.com/2010/07/29/98364/army-suicides-poor-leadership.html)

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McClatchy Newspapers 2010

**Translate the reported data into probabilities associated with specified ‘generic’ random variables**

**PROBLEM 3: Addressing Uncertainty in Estimators of Probability**



*Published on Thursday, September 2, 2010 by ProPublica*

**Feds Warn Residents Near Wyoming Gas Drilling Sites Not To Drink Their Water**

by Abrahm Lustgarten, ProPublica

The federal government is warning residents in a small Wyoming town with extensive natural gas development not to drink their water, and to use fans and ventilation when showering or washing clothes in order to avoid the risk of an explosion.

![[The federal government is warning residents in a small Wyoming town with extensive natural gas development not to drink their water, and to use fans and ventilation when showering or washing clothes in order to avoid the risk of an explosion. (photo: Creative Commons/ Flickr user woodleywonderworks)]]()The federal government is warning residents in a small Wyoming town with extensive natural gas development not to drink their water, and to use fans and ventilation when showering or washing clothes in order to avoid the risk of an explosion. (photo: Creative Commons/ Flickr user woodleywonderworks)

The announcement accompanied results from a second round of testing and analysis in the town of Pavillion by Superfund investigators for the Environmental Protection Agency. Researchers found benzene, metals, naphthalene, phenols and methane in wells and in groundwater. They also confirmed the presence of other compounds that they had tentatively identified last summer and that may be linked to drilling activities.

"Last week it became clear to us that the information that we had gathered" "was going to potentially result in a hazard -- result in a recommendation to some of you that you not continue to drink your water," Martin Hestmark, deputy assistant regional administrator for ecosystems protection and remediation with the EPA in Denver, told a crowd of about 100 gathered at a community center in Pavillion Tuesday night. "We understand the gravity of that."

Representatives of the EPA and the Agency for Toxic Substances and Disease Registry, which made the health recommendation, said they had not determined the cause of the contamination and said it was too early to tell whether gas drilling was to blame. In addition to contaminants related to oil and gas, the agency detected pesticides in some wells, and significant levels of nitrates in one sample -- signs that agricultural pollution could be partly to blame. The EPA's final report on Pavillion's water is expected early next year.

ProPublica [**first drew attention to Pavillion's water**](http://www.propublica.org/article/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113) [1] in late 2008, and [**reported extensively**](http://www.propublica.org/article/epa-chemicals-found-in-wyo.-drinking-water-might-be-from-fracking-825) [2] on the EPA's ongoing investigation there last August.

EnCana, the oil and gas company that owns most of the wells near Pavillion, has agreed to contribute to the cost of supplying residents with drinking water, even though the company has not accepted responsibility for the contamination.

EnCana spokesman Doug Hock told ProPublica in an e-mail that the petroleum hydrocarbon compounds the EPA found "covers an extremely wide spectrum of chemicals, many of which aren't associated with oil and gas."

"ATSDR's suggestion to landowners was based upon high levels of inorganics -- sodium and sulfate that are naturally occurring in the area," he said.

EPA scientists began investigating Pavillion's water in 2008 after residents complained about foul smells, illness and discolored water, and after state agencies declined to investigate. Last August the EPA found contaminants in a quarter of samples taken during the first stage of its investigation, and the agency announced it would continue with another round of samples -- the set being disclosed now.

In the meeting Tuesday, the agency shared results from tests of 23 wells, 19 of which supply drinking water to residents. It found low levels of hydrocarbon compounds -- various substances that make up oil -- in 89 percent of the drinking water wells it tested. Methane gas was detected in seven of the wells and was determined to have come from the gas reservoir being tapped for energy. Eleven of the wells contained low levels of the compound 2-butoxyethanol phosphate -- a compound associated with drilling processes but that is also used as a fire retardant and a plasticizer.

The scientists also found extremely high levels of benzene, a carcinogen, and other compounds in groundwater samples taken near old drilling disposal pits. Some of the samples were taken less than 200 yards from drinking water sources and scientists expressed concerns that the contaminated water was connected to drinking water wells by an underground aquifer.

"The groundwater associated with some inactive oil and gas production pits" "is in fact highly contaminated," Ayn Schmit, a scientist with the EPA's ecosystems protection program, told residents. But she also cautioned that the EPA has not determined the cause of the contamination and is continuing its investigation.

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**Formulate data collection random variable and probability estimators based on them. Then, for each one, under simple assumptions, (i) estimate the mean and standard deviation, and (ii) use your estimates to obtain an estimate of the *pdf*.**