Solutions of homework 8

10.19. In the long run, the gambler earns an average of 94.7 cents per bet. In other words, the gambler loses (and the house gains) 5.3 cents for each $1 bet.

10.22. (a) Normal with mean 123 mg and standard deviation $\sigma/\sqrt{3} \approx 0.0462$ mg.

(b) $P(X \geq 124 \text{ mg}) = P\left(Z \geq \frac{124 - 123}{\sigma/\sqrt{3}}\right) = P(Z \geq 21.65)$ – essentially 0.

10.27. (a) $\bar{x}$ is approximately $N(2.2, 1.4/\sqrt{52}) = N$ (2.2 accidents, 0.1941 accidents).

(b) $P(\bar{x} < 2) \approx P(Z < -1.03) = 0.1515$.

(c) Let A be the number of accidents in a year.

$P(A < 100) = P(\bar{x} < 100/52) \approx P(Z < -1.43) = 0.0764$.

Alternatively, we might use the *continuity correction* that adjusts for the fact that counts must be whole numbers. The alternative answer is 0.0694.

13.2. No: The interval refers to the mean NAEP score, not to individual scores, which will be much more variable (indeed, if more than 95% of young men score below 276.2, then very few can, for example, determine the price of a meal from a menu).

13.3. (a) The standard deviation of $\bar{x}$ is $\sigma/\sqrt{1000} \approx 1.8974$.

(b) Omitted.

(c) m = 2*1.8974 ≈ 3.8 (or "±3.8")

(d) The confidence interval drawn may vary, but they should be 2m = 7.6 units wide

(e) 95%

13.9. (a) (b) & (c) n =1000: CI 18.9 to 25.1 points; margin of error: 3.1

n = 250: CI 15.8 to 28.2 points; margin of error: 6.2
n =4000: CI 20.45 to 23.55 points; margin of error: 1.55

(d) The margin of error decreases with large samples (by a factor of $1/\sqrt{n}$).

13.10. (a) The 98% confidence interval is $10.0023 \pm (2.326*0.0002/\sqrt{5}) = 10.0021$ to 10.0025 grams.

(b) n = (2.326*0.0002/0.0001)^2 ≈ 21.64. Take n = 22.