STATISTICS 20 Practice Midterm 1

There are 5 questions, with a total of 13 points. Most explanations require only 1 or 2 sentences. On calculations, show your work, and work through to a numerical answer.

1. [3 points] Draws are being made at random with replacement from a box, and the number of draws is getting larger and larger. The box contains numbered tickets – some numbers are positive, and others are negative.

Say whether the following statements are true or false, and explain briefly.

(a) The probability histogram for the sum (when put into standard units) follows the normal curve more and more closely.

(b) The histogram for the numbers drawn (when put into standard units) follows the normal curve more and more closely.

(c) The probability histogram for the number of times negative numbers have been drawn (when put into standard units) follows the normal curve more and more closely.

2. [2 points] Duration of pregnancy for humans has average 266 days and s.d. 16 days, and the histogram follows the normal curve. Amongst pregnancies which last at least 280 days, about what percentage will last at least 5 more days? Or can this not be determined from the information given?

3. [2 points] The University of Washington instituted an experimental physical-fitness program. To evaluate its effectiveness, all those who registered for the program at the beginning of its first year of operation were tested at registration and re-tested at the end of the year. Physical fitness improved remarkably. So it was decided to continue the program. It was considered unnecessary to test new participants at the beginning of the second year, because the results from the previous year were available as benchmarks. At the end of the second year, all participants were tested. The test results showed a marked deterioration in physical fitness by comparison with the scores at the beginning of the first year. Does this mean the second year of the program was a failure? Or is there an alternative explanation?

4. [2 points] An ordinary 52 card deck contains 13 Spades and 13 Hearts. Deal the top two cards from a well-shuffled deck. What is the chance that one of these cards is a Spade and the other is a Heart?

5. [4 points] One possible bet at roulette is as follows. You pick 4 numbers, for example 14,15,17,18. You bet \$1. If one of your 4 numbers comes up, then you win \$8 and also get back your \$1 stake. If not, you lose your \$1.

(a) Suppose you make this bet 8 times in succession. What is the chance that you are an overall winner (i.e. end with more money than you started with)? [use an exact, not an approximate, method]

(b) The correct chance in (a) works out to be more than 50%. Does this mean that if you repeat the strategy "make 8 bets of this kind in succession" many times, you are likely to end up with more money than you started with? Explain briefly.

[Recall the roulette wheel has 38 slots.]