

## PROBABILITY AND STATISTICS, CLASS EXERCISE 9

- (1) An experiment consists of tossing two fair coins and recording the number of heads. Approximate (using CLT) the probability that the average number of heads obtained by repeating this experiment 100 times will be in the range from 0.9 to 1.1?
- (2) A sample of five "8-hour" workdays in a bank had actual lengths (in minutes) of 468, 449, 494, 496, 479. Compute the sample variance (show detail, but check with software) and construct a 95% confidence interval for the population standard deviation  $\sigma$ , assuming that the lengths are  $N(\mu, \sigma)$ .
- (3) Use the CLT to approximate the probability that the sum on 12 fair dice is less than 38.
- (4) An elevator can carry a maximum of 1575 lb. What is the probability that 10 people will overload the elevator if their weights are random selections from  $N(150, 10)$ ?
- (5) The US National Health Statistics Reports dated Oct. 22, 2008 claim that the mean waist size for the population of 18-year-old American males is 85 cm with standard deviation of 15 cm. Approximate the probability that a random sample of 277 individuals from this population will result in a sample mean waist size of at least 86.3 cm?
- (6) Let  $X$  be a normal random variable with mean 1 and variance 16.
  - (a) What is the probability an observation is within 2 units of the mean?
  - (b) What is the probability that the mean of 4 observations is within 2 units of the mean?
- (7) A random sample of 12 observations is taken from a normal population with  $\sigma^2 = 100$ . Find the probability that  $50 < s^2 < 240$ .
- (8) A study of the fracture toughness of base plate of 18% nickel maraging steel gave  $s^2 = 5.04$  based on a sample of 22 observations. Assuming that the sample comes from a normal population, construct a 99% upper confidence bound for  $\sigma^2$ , the true variance.