All material covered so far in this course will be on Term Test B, excluding the Central Limit Theorem. For test examples 7, 8, and 10 below you need the Central Limit Theorem for your solution. Such a question will NOT be on Term Test B; it's still good practice for the term test to do these examples because they require skill with the normal distribution. Solutions are on D2L.

Term Test B Preparation

Test Example 1. The mean number of patients admitted per day to the emergency room of a small hospital is 2. If, on any given day, there are only 3 beds available for new patients, what is the probability that the hospital will not have enough beds to accommodate its newly admitted patients?

Test Example 2. The number of accidents that occur at a busy intersection is distributed with a mean of 3.4 per week. Find the probability of the following events. (a) No accidents occur in one week. (b) 3 or more accidents occur in a week. (c) One accident occurs today.

Test Example 3. Use normal approximation to estimate the probability of getting at least 57 girls in 100 births. Assume that boys and girls are equally likely.

Test Example 4. Based upon past experience, 40% of all customers at Miller's Automotive Service Station pay for their purchases with a credit card. If a random sample of three customers is selected, what is the probability that (a) none pay with a credit card? (b) two pay with a credit card? (c) at least two pay with a credit card? (d) not more than two pay with a credit card? If a random sample of 200 customers is selected, what is the approximate probability that (e) at least 75 pay with a credit card? (f) not more than 70 pay with a credit card? (g) between 70 and 75 customers, inclusive, pay with a credit card?

Test Example 5. Suppose a consultant was investigating the time it took factory workers in an automobile plant to assemble a particular part after the workers had been trained to perform the task using an individual learning approach. The consultant determined that the time in seconds to assemble the part for workers trained with this method was normally distributed with a mean $\mu = 75$ seconds and a standard deviation $\sigma = 6$ seconds.

1. What is the probability that a randomly selected factory worker can assemble the part in under 75 seconds or in over 81 seconds?

2. What is the probability that a randomly selected factory worker can assemble the part in 69 to 81 seconds?

3. What is the probability that a randomly selected factory worker can assemble the part in under 62 seconds?

4. What is the probability that a randomly selected factory worker can assemble the part in 62 to 69 seconds?

5. How many seconds must elapse before 50% of the factory workers assemble the part?

6. How many seconds must elapse before 10% of the factory workers assemble the part?

7. What is the interquartile range (in seconds) expected for factory workers to assemble the part? (The interquartile range is the centre 50%, i.e. such that one quarter of the workers is slower and one quarter of workers is faster than the workers in the interquartile range.)

Test Example 6. Historically, 93% of the deliveries of an overnight mail service arrive before 10:30 the following morning. If random samples of 500 deliveries are selected, what proportion of the samples will have (a) between 93% and 95% of the deliveries arriving before 10:30 the following morning? (b) more than 95% of the deliveries arriving before 10:30 the following morning?

Test Example 7. According to the web site `www.torchmate.com`, "manhole covers must be a minimum of 22in in diameter, but can be as much as 60in in diameter." Assume that a manhole is constructed to have a circular opening with a diameter of 22 in. Men have shoulder breadths that are normally distributed with a mean of 18.2in and a standard deviation of 1.0in (based on data from the National Health and Nutrition Examination Survey).

1. What percentage of men will fit into the manhole?
2. Assume that the Connecticut Light and Power company employs 36 men who work in manholes. If 36 men are randomly selected, what is the probability that their mean shoulder breadth is less than 18.5in?

Test Example 8. Passengers died when a water taxi sank in Baltimore's Inner Harbor. Men are typically heavier than women and children, so when loading a water taxi, assume a worst-case scenario in which all passengers are men. Assume that weights of men are normally distributed with a mean of 182.9lb and a standard deviation of 40.8lb. The water taxi that sank had a stated capacity of 25 passengers, and the boat was rated for a load limit of 3500 lb.

1. Given that the water taxi that sank was rated for a load limit of 3500 lb, what is the mean weight of the passengers if the boat is filled to the stated capacity of 25 passengers?
2. If the water taxi is filled with 25 randomly selected men, what is the probability that their mean weight exceeds the value?
3. After the water taxi sank, the weight assumptions were revised so that the new capacity became 20 passengers. If the water taxi is filled with 20 randomly selected men, what is the probability that their mean weight exceeds 175lb, which is the maximum mean weight that does not cause the total load to exceed 3500lb?
4. Is the new capacity of 20 passengers safe?

Test Example 9. Loading M&M Packages M&M plain candies have a mean weight of 0.8565g and a standard deviation of 0.0518g. The M&M candies used in a data set came from a package containing 465 candies, and the package label stated that the net weight is 396.9g. (If every package has 465 candies, the mean weight of the candies must exceed $396.9/465 = 0.8535g$ for the net contents to weigh at least 396.9g.)

1. If 1 M&M plain candy is randomly selected, find the probability that it weighs more than 0.8535g.
2. If 465 M&M plain candies are randomly selected, find the probability that their mean weight is at least 0.8535g.
3. Given these results, does it seem that the Mars Company is providing M&M consumers with the amount claimed on the label?

Test Example 10. A ski gondola in Vail, Colorado, carries skiers to the top of a mountain. It bears a plaque stating that the maximum capacity is 12 people or 2004lb. That capacity will be exceeded if 12 people have weights with a mean greater than $2004/12 = 167$lb. Because men tend to weigh more than women, a worst-case scenario involves 12 passengers who are all men. Assume that weights of men are normally distributed with a mean of 182.9 lb and a standard deviation of 40.8lb.

1. Find the probability that if an individual man is randomly selected, his weight will be greater than 167lb.
2. Find the probability that twelve randomly selected men will have a mean weight that is greater than 167lb (so that their total weight is greater than the gondola maximum capacity of 2004lb).
3. Does the gondola appear to have the correct weight limit? Why or why not?