

Question 1

Declining availability of industrial land and shifting consumer demands are driving the average warehouse clear heights (how high the warehouse ceiling is from floor to ceiling) to new levels. Canadian Building Corporation investigated and reported that the mean clear height for a warehouse in Hamilton is 30 feet. Suppose the clear heights are normally distributed and the standard deviation is 5 feet.

- a) A warehouse in Hamilton is randomly selected. What is the probability that the clear height is between 25.25 and 34.45 feet?
- b) Suppose the population standard deviation is unknown, but the mean clear height is still 30 feet. If 99.42% of all Hamilton warehouses have a clear height greater than 24 feet, what is the population standard deviation?
- c) Canadian Building Corporation also reveals that the clear height for a warehouse in Burlington is expected to be uniformly distributed between 20 and 40 feet. A warehouse is randomly selected. What is the probability that the clear height is at least 29.50 feet?
- d) This part is independent of parts a) to c). Which statement is not true?
 - i. Given that Y is a normal random variable, the variable $Z = (Y - 10)$ is also normally distributed.
 - ii. A graph, formula, or table that shows all possible values a random variable can assume, together with their associated probabilities, is called an expected value of a discrete random variable.
 - iii. Given that Z is a standard normal random variable, the value of Z is 0.86 if the area to the right of Z is 0.1949.
 - iv. In the normal distribution, the total area beneath the curve represents the probability for all possible outcomes for a given event.

Question 2

The ages of students at York University are normally distributed with a mean of 25 years and a standard deviation of 3.5 years. The ages of students at U of T follow a normal distribution with a mean of 27 years in a standard deviation of 2.5 years. It is believed that 40% of all students at York University say that they prefer to take online courses.

- a) Suppose a random sample of 100 students was taken at York University. What is the probability that the mean age is greater than 24?
- b) A random sample of 100 students was taken at York University. What is the probability that in the sample, less than 35% say they prefer to take the online courses?
- c) A random sample of 30 York students and 30 U of T students were taken. What is the probability that the mean age of 30 randomly selected students from York university is less than the mean age of 30 randomly selected students from U of T?
- d) This part is independent of parts a) to c). A researcher collected data on the annual salary of professors in Ontario. He wishes to construct a confidence interval for the population mean annual salary. Which of the following statements is true? You can pick more than one if necessary.
 - i. A 98% confidence interval will have a greater chance of including the true mean salary than a 95% confidence interval.
 - ii. A 98% confidence interval will be narrower than a 95% confidence interval.
 - iii. A 98% confidence interval requires the researcher to take a larger sample.

Question 3

At Wonderland amusement Park, parents can drop off their young children under the age of 5 at the daycare center while the rest of the family can enjoy the ride and activities throughout the park. Wonderland has determined there's a 40% chance that parents will drop off their children at the daycare center. If 8 parents are selected at random calculated following:

- a) What is the probability that 3 or more parents will drop off their children at daycare center?
- b) What is the probability that more than 2 but less than 5 parents will drop off their children at the daycare center?
- c) What are the mean and standard deviation of the number of parents who will drop off their children at daycare center?
- d) Based on part c) find $V(3X + 4)$?
- e) Based on part c) find $E(5X + 2)$?

In reviewing the probability, Wonderland now believes there is a 35% chance that parents will drop off their children at the daycare center.

- f) What is the probability that 2 parents will drop off their children at daycare center?