Lecture 10 Exercises

10.1 The weight of packages filled by a machine are Normally distributed with mean 25g and standard deviation 2g. What is the probability that the mean weight of a random sample of n packages from the machine will be more than 26g if

a) $n = 1$

b) $n = 4$

c) $n = 16$

d) $n = 36$

Can you explain the pattern in the answers you have obtained graphically?

10.2 The distribution of starting salaries of university graduates is Normally distributed with mean £14000 and standard deviation £1000. What is the probability that a sample of 36 such graduates

a) had mean salary greater than £14250?

b) had mean salary between £13500 and £14500?

10.3 Marks in a statistics examination are Normally distributed with mean 50 and standard deviation 10. What is the probability that

a) the mean mark of a group of 5 students will be above 60?

b) the mean mark of a group of 20 students will be between 44 and 48?

10.4 Electrifab has determined that the assembly time for a particular electrical component is Normally distributed with mean 20 minutes and standard deviation 3 minutes.

a) What is the probability that that an employee in the assembly division takes longer than 22 minutes to assemble one of these components?

b) What is the probability that the average assembly time for 15 such employees exceeds 22 minutes?

c) What is the probability that the average assembly time for 15 such employees is between 19 and 21 minutes?

10.5 A ski-lift is designed with a load limit of 18,000lbs and claims a capacity of 100 people. If the weight of people using the lift is Normally distributed with mean 175lbs and standard deviation 30lbs, what is the probability that a group of 100 randomly selected people will exceed the load limit of the lift? Would you be willing to use the lift?

10.6 Lengths of bicycle chain links are Normally distributed with mean 0.5cm and standard deviation 0.04cm. The finished chains must be between 49 and 50cm long.

a) If the chains are made of 100 links, what proportion meets the standard?

b) If chains are made instead of 99 links what proportion meets the standard?

c) Using 99 links, to what value must the standard deviation be reduced in order to have,

i) 90% ii) 95% iii) 99%

meet the standard?

10.7 In all the following questions, if an interval is required, assume that it is symmetric about the mean of the distribution.

Assume that Z is a standard Normal variable. Find the z value corresponding to the following probabilities.

a) $P(Z > ?) = 0.15$

b) $P(Z > ?) = 0.75$

c) $P(Z < ?) = 0.01$

d) $P(Z < ?) = 0.99$

e) $P(? < Z < ?) = 0.9$

f) $P(? < Z < ?) = 0.5$

g) $P(? < Z < ?) = 0.99$

10.8 The lifetime of a certain brand of lightbulb is Normally distributed with mean 2000 hours and standard deviation 75 hours. What lifetimes will be

a) exceeded by 25% of bulbs

b) exceeded by 90% of bulbs

c) 95% of bulbs last less than

d) 15% of bulbs last less than

e) 50% of bulbs be between

f) 98% of bulbs be between

g) 99.9% of bulbs be between

10.9 Bags of sugar packed by a machine have a mean weight of 2kg and a standard deviation of 0.02kg.

a) What weights will

(i) exceeded by 15% of bags

(ii) exceeded by 90% of bags

(iii) 20% of bags contain less than

(iv) 90% of bags be between

b) A multipack contains 5 bags of sugar. What is the probability that

(i) All the bags contain less than 1.992 kg

(ii) Exactly four bags contain less than 1.992kg

Hint: Consider using the normal distribution and then the Binomial with the appropriate probability.