1. [**JJC 18 MYE**]
   A company, intending to employ a new general manager, sets a leadership assessment for all its job applicants. The assessment consists of a test that computes the leadership potential index, x, of the applicant, where $x \geq 0$. Extensive studies have shown that the leadership potential indexes are normally distributed with mean 16 and standard deviation 5.

   (a) Find the probability that the sum of indexes of five randomly chosen applicants will be between 90 and 115. [2]

   An applicant is deemed suitable if he or she has a leadership potential index above 22.

   (b) Find the probability that a randomly chosen applicant is found suitable. [2]

   There are 74 applicants for the job.

   (c) Find, to the nearest whole number, the expected number of suitable applicants. [2]

   (d) Find the probability that the number of suitable applicants found is less than the expected number found in (c) [2]

   (e) Find the value of r, giving your answer to 2 decimal places, such that the probability of the average of the indexes of all applicants exceeding r is 0.25. [3]

2. [**MI 18 MYE (modified)**]
   The masses, in grams (g), of packets of Godiva chocolate and Guylian chocolate are modelled as having independent normal distributions. The means and standard deviations of these distributions, and the selling prices, in cents per gram, are shown in the table.

	Mean (g)	Standard deviation (g)	Selling price (cents per g)
Godiva	184.2	5.2	0.03
Guylian	80	3.1	0.02

   (a) Find the probability that both a randomly chosen packet of Godiva has a selling price exceeing \$5.50 and a randomly chosen packet of Guylian has a selling price exceeding \$1.50. [3]

   (b) Find the probability that the total selling price of a randomly chosen packet of Godiva and a randomly chosen packet of Guylian is more than \$7.00. [3]

   (c) Explain why the answer to part (b) is greater than the answer to part (a). [2]

   Packets of Neuhaus chocolate have mass with mean 75 g and standard deviation 2.1 g.

   (d) A random sample of 50 packets of Guylian and a random sample of 50 packets of Neuhaus are taken. Find the probability that the difference in the sample means is less than 4 g. [3]

3. **[MJC 18 MYE (modified)]**

A gaming company claims that gamers spend an average of m hours daily on a new game that they have launched. A random sample of 30 gamers was surveyed and the time, x hours, spent daily on the game was recorded. The results are summarized by

$$\sum x = 126, \qquad \sum x^2 = 550.1525.$$

(a) Calculate unbiased estimates of the population mean and variance of the number of hours a gamer spends daily on the game. [2]

A second sample of 50 gamers is surveyed and the time, y hours, spent daily on the game was recorded, and the results are summarized by

$$\sum y = 215, \qquad \sum y^2 = 964.19.$$

(b) Find the unbiased estimates of the population mean and variance of the number of hours a gamer spends daily on the game based on the **combined** results of the two samples. [2]

Answers

1. (a) 0.185.

   (b) 0.115.

   (c) 9.

   (d) 0.517.

   (e) 16.39.

2. (a) 0.536.

   (b) 0.774.

   (c) The event in part (a) is a subset of the event in part (b). For example, the case where Godiva chocolates costs \$5 and the Guylian chocolate costs \$2 is in part (b) but not in part (a).

   (d) 0.0295.

3. (a) $\bar{x} = 4.2, s^2 = 0.7225$.

   (b) $\bar{w} = 4.2625, s^2 = 0.77$.