Linear Combinations of Random Variables – 2021 A2

1. June/2021/Paper_9709/61/No.7

The masses, in kilograms, of large and small sacks of flour have the distributions $N(55, 3^2)$ and $N(27, 2.5^2)$ respectively.

(a) Some sacks are loaded onto a boat. The maximum load of flour that the boat can carry safely is 340 kg.

Find the probability that the boat can carry safely 3 randomly chosen large sacks of flour and 6 randomly chosen small sacks of flour. [5]

(b) Find the probability that the mass of a randomly chosen large sack of flour is greater than the total mass of two randomly chosen small sacks of flour. [5]

2. June/2021/Paper_9709/62/No.2

The random variable X has the distribution B(400, 0.01).

(a) Find Var$(4X + 2)$. [3]

(b) **(i)** State an appropriate approximating distribution for X, giving the values of any parameters. Justify your choice of approximating distribution. [2]

(ii) Use your approximating distribution to find $P(2 \leqslant X \leqslant 5)$. [2]

3. June/2021/Paper_9709/62/No.4

Wendy's journey to work consists of three parts: walking to the train station, riding on the train and then walking to the office. The times, in minutes, for the three parts of her journey are independent and have the distributions $N(15.0, 1.1^2)$, $N(32.0, 3.5^2)$ and $N(8.6, 1.2^2)$ respectively.

(a) Find the mean and variance of the total time for Wendy's journey. [2]

If Wendy's journey takes more than 60 minutes, she is late for work.

(b) Find the probability that, on a randomly chosen day, Wendy will be late for work. [3]

(c) Find the probability that the mean of Wendy's journey times over 15 randomly chosen days will be less than 54.5 minutes. [3]

4. March/2021/Paper_9709/62/No.5

The volumes, in litres, of juice in large and small bottles have the distributions N(5.10, 0.0102) and N(2.51, 0.0036) respectively.

(a) Find the probability that the total volume of juice in 3 randomly chosen large bottles and 4 randomly chosen small bottles is less than 25.5 litres. [5]

(b) Find the probability that the volume of juice in a randomly chosen large bottle is at least twice the volume of juice in a randomly chosen small bottle. [5]