

QQQ – Further Statistics 2 – Chapter 4 – Combinations of Random Variables (Version 2)

Total Marks: 25

(25 = Platinum, 23 = Gold, 20 = Silver, 17 = Bronze)

1. The random variable $X \sim N(5, 0.4^2)$ and the random variable $Y \sim N(8, 0.1^2)$

X and Y are independent random variables.

A random sample of a independent observations is taken from the distribution of X and one observation is taken from the distribution of Y

The random variable $W = X_1 + X_2 + X_3 + \dots + X_a + bY$ and has the distribution $N(169, 2^2)$

Find the value of a and the value of b **(6)**

(Total 6 marks)

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2. A company packs chickpeas into small bags and large bags.

The weight of a small bag of chickpeas is normally distributed with mean 500 g and standard deviation 5 g

A random sample of 3 small bags of chickpeas is taken.

- (a) Find the probability that the total weight of these 3 bags of chickpeas is between 1490 g and 1530 g **(3)**

The weight of a large bag of chickpeas is normally distributed with mean 1020 g and standard deviation 20 g

One large bag and one small bag of chickpeas are chosen at random.

- (b) Calculate the probability that the weight of the large bag of chickpeas is at least 30 g more than twice the weight of the small bag of chickpeas.
Show your working clearly. **(6)**

(Total 9 marks)

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3. The weights of eggs are normally distributed with mean 60 g and standard deviation 5 g

Sairah chooses 2 eggs at random.

(a) Find the probability that the difference in weight of these 2 eggs is more than 2 g **(5)**

Sairah is packing eggs into cartons. The weight of an empty egg carton is normally distributed with mean 40 g and standard deviation 1.5 g

(b) Find the distribution of the total weight of a carton filled with 12 randomly chosen eggs. **(3)**

(c) Find the probability that a randomly chosen carton, filled with 12 randomly chosen eggs, weighs more than 800 g **(2)**

(Total 10 marks)