

Statistics Revision 3

1. A series of mathematics textbooks consists of 6 books. The number of alphabetical and numerical misprints in each book, are assumed to have independent Poisson distributions with mean 1 and 2 respectively.

(i) Find the probability that the series of mathematics textbooks contain a total of 12 misprints.

(ii) Find the probability that a randomly chosen book containing exactly 5 misprints has at least 4 alphabet misprints.

2. La Noir Boutique makes costumes for performing arts groups in schools. The length of a pair of boy's pants (in cm) made by the boutique is known to be normally distributed with mean μ cm and standard deviation σ cm. Given that 50% of the boys' pants are each shorter than 80cm, calculate the values of μ and σ .

The length of a pair of girl's pants (also in cm) made by La Noir Boutique follows a normal distribution with mean 85cm and standard deviation 5cm. Find the probability that total length of two such pairs of pants is at most 170cm.

Suppose that each pair of pants cost \$0.35/cm, find the probability that a pair of girl's pants costs more than a pair of boy's pants.

3(a) Random variables X and Y are related by $Y = a + bX$, where a and b are constants and $b > 0$.

The standard deviation of Y is twice the standard deviation of X . The mean of Y is 7.92 and is 0.8 more than the mean of X . Find the values of a and b .

(b) Random variables R and S are such that $R \sim N(\mu, 2^2)$ and $S \sim N(2\mu, 3^2)$. It is given that

$$P(R + S > 1) = 0.9.$$

(i) Find μ . (ii) Hence find $P(S > R)$.

4. An airline knows that some people who have bought tickets may not arrive for the flight. The airline therefore sells more tickets than the number of seats that are available. For one flight there are 210 seats available and 213 people have bought tickets. The probability of any person who has bought a ticket not arriving for the flight is $\frac{1}{50}$.

(i) By considering the number of people who do not arrive for the flight, use a suitable approximation to calculate the probability that more people will arrive than there are seats available.

Independently on another flight for which 135 people have bought tickets, the probability of any person not arriving is $\frac{1}{75}$.

(ii) Calculate the probability that, for both these flights, the total number of people who do not arrive is 5.

5. The masses of packets of cornflakes are normally distributed with standard deviation 11g. A random sample of 20 packets was weighed and found to have a mean mass of 746g.

(i) Test at the 4% significance level whether there is enough evidence to conclude that the population mean mass is less than 750g.

(ii) Given that the actual population mean mass is 750g, find the smallest possible sample size, n , for which it is at least 97% certain that the mean mass of the sample exceeds 745g.

6(a) (i) Find how many different four digit numbers can be made using only the digits 1, 3, 5 and 6 with no digit being repeated.

(ii) Find how many different odd numbers greater than 500 can be made using some or all of the digits 1, 3, 5 and 6 with no digit being repeated.

(b) Six cards numbered 1, 2, 3, 4, 5 and 6 are arranged randomly in a line. Find the probability that the cards numbered 4 and 5 are not next to each other.

7. The weights, X grams of bars of soap are normally distributed with mean 125 grams and standard deviation 4.2 grams.

(i) Find the probability that a randomly chosen bar of soap weighs more than 128 grams.

(ii) Find the value of k such that $P(k < X < 128) = 0.7465$.

(iii) Five bars of soap are chosen at random. Find the probability that more than two of the bars each weigh more than 128 grams.