

1. The percentage impurity of a chemical can be modelled by a normal distribution with a mean of 5.8 and a standard deviation of 0.5. Obtain the probability that a sample of the chemical has percentage impurity between 5 and 6.
2. Melons sold on a market stall have weights that are normally distributed with a mean of 2.18kg and a standard deviation of 0.25kg. For a melon chosen at random, find the probability that its weight lies between 2kg and 2.5kg.
3. Soup is sold in tins which are filled by a machine. The actual weight of soup delivered to a tin by the filling machine is always normally distributed about the mean weight with a standard deviation of 8g. The machine is set originally to deliver a mean weight of 810g.
 - (a) Determine the probability that the weight of soup in a tin, selected at random, is less than 800g.
 - (b) Determine the probability that the weight of soup in a tin, selected at random, is between 795 g and 820 g.
4. The weight, X grams, of a particular variety of orange is normally distributed with mean 205 and standard deviation 25.

A wholesaler decides to grade such oranges by weight. He decides that the smallest 30 per cent should be graded as small, the largest 20 per cent graded as large, and the remainder graded as medium.

Determine, to one decimal place, the maximum weight of an orange graded as:

- (i) small
 - (ii) medium.
5. Jars of bolognese sauce, sold by a supermarket, are stated to have contents of weight 500 g. The weights, in grams, of the actual contents of jars in a large batch are normally distributed with mean 506 and standard deviation 5.

Find the weight which is exceeded by the contents of 99.9% of the jars in this batch.
 6. The distance, in kilometres, travelled to work by the employees of a city council may be modelled by a normal distribution with mean 7.5 and standard deviation 2.5.

Find d such that 10% of the council's employees travel less than d kilometres to work.
 7. An airline operates a service between Manchester and Paris. The flight time may be modelled by a normal distribution with mean 85 minutes and standard deviation 8 minutes. In order to gain publicity for the service, the airline decides to refund fares when a flight time exceeds q minutes. Find the value of q such that the probability of fares being refunded on a particular flight is 0.001.

8. A coin-operated machine dispenses soft drinks into cups when a button is pressed. Investigation shows that the amount, Y millilitres, of soft drink dispensed is less than 475 on 15% of presses of the button. Find the mean of Y , assuming that it may be modelled by a normal distribution with standard deviation 10.
9. The weights, in grams, of the contents of tins of mackerel fillets are normally distributed with mean μ and standard deviation 2.5. Find, to one decimal place, the value of μ such that 99% of the tins have contents weighing more than 125.0 grams.
10. The content, in milligrams, of vitamin C in a litre carton of cranberry juice can be modelled by a normal distribution with a mean of μ and a standard deviation of 2. Find, to the nearest milligram, the value of the mean required to ensure that the **percentage** of cartons with a vitamin C content of less than 30 mg is 2.5.
11. A hot drinks machine is bought. Each cup receiving the hot water has a capacity of 500 ml. It is observed that for this machine the mean volume delivered is 490 ml and cups overflow on 15% of occasions. Assuming that the volume delivered by this machine may also be modelled by a normal distribution, find its standard deviation.
12. An automatic hot drinks machine dispenses water into cups containing coffee or tea as required. Find the value of the standard deviation which would ensure that 90% of the volumes dispensed would lie between 250 ml and 270 ml if the mean volume remains at 260 ml.
13. The volume, L litres, of emulsion paint in a plastic tub may be assumed to be normally distributed with mean 10.25 and variance σ^2 . Find the value of σ so that 98% of tubs contain more than 10 litres of emulsion paint.