

Normal Distribution (Before Z-scores)

- 1 Draw each of the following normal distributions accurately on one set of axes.

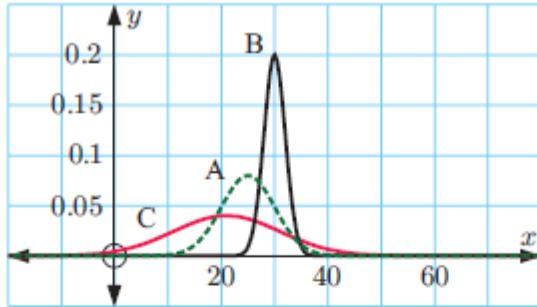
<i>Distribution</i>	<i>Mean (mL)</i>	<i>Standard deviation (mL)</i>
A	25	5
B	30	2
C	21	10

- 2 Explain why it is likely that the distributions of the following variables will be normal:
- the volume of soft drink in cans
 - the diameter of bolts immediately after manufacture.
- 3 State the probability that a randomly selected, normally distributed value lies between:
- σ below the mean and σ above the mean
 - the mean and the value 2σ above the mean.
- 4 The mean height of players in a basketball competition is 184 cm. If the standard deviation is 5 cm, what percentage of them are likely to be:
- taller than 189 cm
 - taller than 179 cm
 - between 174 cm and 199 cm
 - over 199 cm tall?
- 5 The mean average rainfall of Claudona for August is 48 mm with a standard deviation of 6 mm. Over a 20 year period, how many times would you expect there to be less than 42 mm of rainfall during August in Claudona?
- 6 Two hundred lifesavers competed in a swimming race. The mean time was 10 minutes 30 seconds, and the standard deviation was 15 seconds. Estimate the number of competitors who:
- took longer than 11 minutes
 - took less than 10 minutes 15 seconds
 - completed the race in a time between 10 min 15 s and 10 min 45 s.
- 7 The weights of babies born at Prince Louis Maternity Hospital last year averaged 3.0 kg with a standard deviation of 200 grams. If there were 545 babies born at this hospital last year, estimate the number that weighed:
- less than 3.2 kg
 - between 2.8 kg and 3.4 kg.
- 8 Given $X \sim N(3, 0.1^2)$, find:
- the probability that a randomly selected value lies within 2 standard deviations of the mean
 - the value of X which is 1 standard deviation below the mean.
- 9 The weights of Jason's oranges are normally distributed. 84% of the crop weigh more than 152 grams and 16% weigh more than 200 grams.
- Find μ and σ for the crop.
 - What percentage of the oranges weigh between 152 grams and 224 grams?

- 10** The height of male students in a university is normally distributed with mean 170 cm and standard deviation 8 cm.
- a** Find the percentage of male students whose height is:
 - i** between 162 cm and 170 cm
 - ii** between 170 cm and 186 cm.
 - b** Find the probability that a randomly chosen student from this group has a height:
 - i** between 178 cm and 186 cm
 - ii** less than 162 cm
 - iii** less than 154 cm
 - iv** greater than 162 cm.
 - c** Find the value of k such that 16% of the students are taller than k cm.
- 11** The heights of 13 year old boys are normally distributed. 97.72% of them are above 131 cm and 2.28% are above 179 cm.
- a** Find μ and σ for the height distribution.
 - b** A 13 year old boy is randomly chosen. What is the probability that his height lies between 143 cm and 191 cm?

Answers:

1



- 2 a, b The mean volume (or diameter) is likely to occur most often with variations around the mean occurring symmetrically as a result of random variations in the production process.
- 3 a 0.683 b 0.477
- 4 a 15.9% b 84.1% c 97.6% d 0.13%
- 5 3 times 6 a 5 b 32 c 137 competitors
- 7 a 459 babies b 446 babies 8 a 0.954 b 2.9
- 9 a $\mu = 176$ g, $\sigma = 24$ g b 81.9%
- 10 a i 34.1% ii 47.7%
- b i 0.136 ii 0.159 iii 0.0228 iv 0.841
- c $k = 178$
- 11 a $\mu = 155$ cm, $\sigma = 12$ cm b 0.84