4.15 The central limit theorem

Checklist

What you should know

By the end of this subtopic, you should be able to

- state that a linear combination of n independent normal random variables is normally distributed
- find the distribution of a combination of normal random variables by using the rule $aX_1 \pm bX_2 \sim \mathrm{N}\left(a\mu \pm b\mu,\ a^2{\sigma_1}^2 + b^2{\sigma_2}^2\right)$
- calculate the expectation and variance of an average random sample of a normally distributed random variable using the formulae $\mathrm{E}(X) = \mu$ and $\mathrm{Var}(X) = \frac{\sigma^2}{n}$
- use the central limit theorem to calculate probabilities that random samples will fall within specified ranges
- state that the necessary sample size depends on the distribution of the population. However, for most cases, a sample size of $n > 30$ is sufficient.