Aim: To use sampling techniques (quadrats and/or transects) to investigate the distribution and abundance of organisms in a habitat.

Background Theory

- A quadrat is a square frame (typically 0.5 m × 0.5 m or 1 m × 1 m) used to sample an area.
- Random sampling prevents bias — ensures all areas of the habitat have an equal chance of being sampled.
- A transect is a line across a habitat used to show the distribution of organisms along an environmental gradient.
- The distribution of organisms is affected by abiotic factors (temperature, light, pH, moisture).
- ★ Population estimate = (mean number per quadrat) × (total area of habitat ÷ area of quadrat).
- ★ Species richness and diversity can be used as indicators of habitat quality.

Equipment

- Quadrat frames (0.25 m² or 1 m²)
- Metre rules or tape measures
- Random number tables or app
- Data recording sheets
- Identification key (for plant species)
- Abiotic factor measuring equipment: light meter, thermometer, soil pH meter

Method — Random Quadrat Sampling

1. Set up two tape measures at right angles to each other along the edges of the study area.
2. Use a random number generator to select coordinates (e.g. 3.2 m along, 7.5 m up).
3. Place the quadrat at each pair of coordinates.
4. Count all individuals of the target species within the quadrat.
5. Record percentage cover for plant species that cannot be individually counted.
6. Measure relevant abiotic factors at each quadrat location (light, temperature, pH).
7. Repeat for at least 10 quadrats. Calculate the mean number per quadrat.
8. Estimate total population: mean per quadrat × total area ÷ quadrat area.

Method — Belt Transect

1. Place a tape measure across the habitat (e.g. from shade to open ground).
2. Place a quadrat at regular intervals along the transect (e.g. every 2 m).
3. Record all species and their percentage cover in each quadrat.
4. Measure abiotic factors at each quadrat position.
5. Plot kite diagrams or bar charts to show how species distribution changes along the transect.

Variables

Independent variable	Position along transect (m) or randomly selected quadrat location

Dependent variable	Number of organisms / percentage cover / species diversity per quadrat
Controlled variables	Quadrat size (same throughout), observer (same person to reduce identification error), time of day

Results Table

Quadrat number	Location (m)	Target species count	Light level (lux)	Temperature (°C)	Notes

Analysis

- Calculate mean number per quadrat across all quadrats.
- Estimate total population if total area is known.
- Describe any patterns — does species abundance correlate with any abiotic factor?

★ Suggest reasons for the distribution pattern — link to abiotic factors (e.g. shade-tolerant species increase where light decreases).

★ Discuss sources of error: observer identification errors, edge effects at quadrat boundaries.

Exam Tip: Random sampling must be truly random — using random number tables, not your own judgment. Examiners ask why random sampling is used: to avoid bias / to give every part of the habitat an equal chance of being sampled.

Common Mistake: Do not estimate population by multiplying mean per quadrat by just "the area". You must divide total area by quadrat area first to get number of quadrats, then multiply by mean count.