Randomisation workshop

Student handout · Class 3 · 12:30–16:00 · no preparation required

Shared case

Twenty-four pig pens are distributed among North, Central and South rooms, with eight positions per room. Four diets will each be applied to six pens. Diet is delivered to each whole pen.

Experimental unit and reason

R quick reference

Code	Purpose
set.seed(123)	Recreate the same pseudo-random sequence
rep(x, each = n)	Repeat each value n times
sample(x)	Randomly permute a vector without replacement
tibble(...) / mutate(...)	Construct or add columns to a table
count(data, a, b)	Count combinations of variables
group_by(a) / ungroup()	Apply an operation within groups, then remove grouping
ggplot(data, aes(...))	Map design variables to a visual layout

Build an allocation

Create the unit table, then use seed 123 to shuffle a vector containing six copies of each diet label. Attach one label to every pen.

Core code

```
pens <- tibble(
pen_id = sprintf("P%02d", 1:24),
room = rep(c("North", "Central", "South"), each = 8),
position = rep(1:8, times = 3)
)

treatments <- rep(c("Control", "Diet A", "Diet B", "Diet C"), each = 6)
set.seed(123)
allocation <- pens |> mutate(diet = sample(treatments))
```

Record the first six pen assignments

Why is this both random and balanced?

Audit the allocation

Use code and the layout plot as evidence. Do not infer that a surprising pattern is a coding error.

Audit question	Evidence	Conclusion
All 24 pens appear once		
Six pens receive each diet		
Distribution among rooms		
No fixed repeating rule		
Seed, code and table retained		

Checks

```
allocation |> count(diet)
allocation |> count(room, diet)
allocation |> summarise(rows = n(), distinct_pens = n_distinct(pen_id))
```

What does overall balance conceal?

Comparison with another group's assigned seed

Randomise within rooms

Now require two pens per diet within every room. Use group_by(room), shuffle eight labels within each room, and then ungroup().

```
allocation_blocked <- pens |>
group_by(room) |>
mutate(diet = sample(rep(c("Control", "Diet A", "Diet B", "Diet C"), each = 2))) |>
ungroup()
```

Evidence that every restriction is satisfied

Why is this restricted but still random?

Why is a repeating Control–A–B–C pattern not equivalent?

Group extension

Use your group's extension card. Prepare a 60-second explanation and justification.

Required output	Record
Experimental unit	
Block and scientific reason	
Unit-table structure	
Random operation	
Checks passed	
Plot design	

Explain and justify your allocation

Exit question

A researcher assigns equal numbers of cages to treatments using the fixed repeating pattern A, B, A, B. Is the allocation random, balanced and defensible? What single change would improve it?

Individual answer

After class

Read Ruxton & Colegrave, Experimental Design for the Life Sciences, 4th ed., Chapter 7, sections 7.1–7.4, pp. 101–108. Watch the two short post-class recordings.