

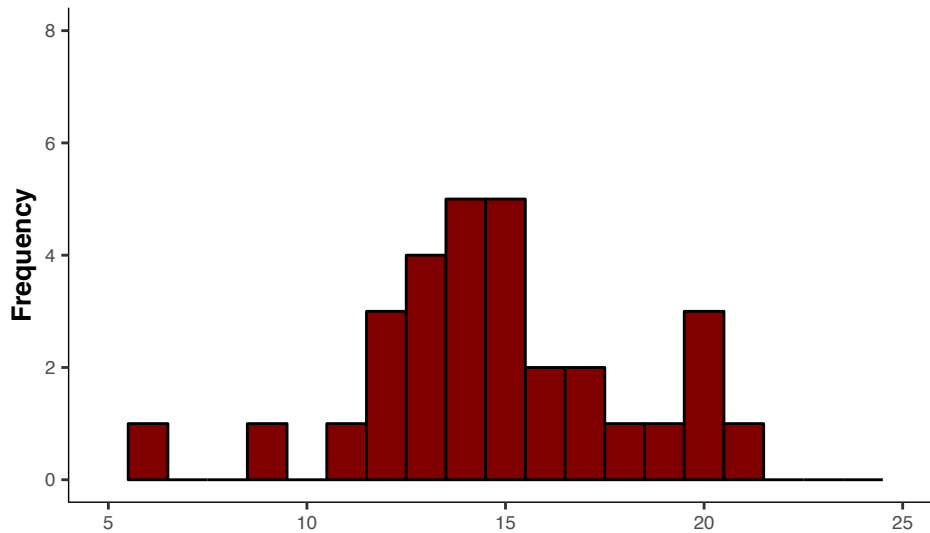
Data Analysis in Evol/Evol - HW Week2

Jing-Yi Lu

Reference R code see: github.com/jingyilu/Data-analysis-ecoevo

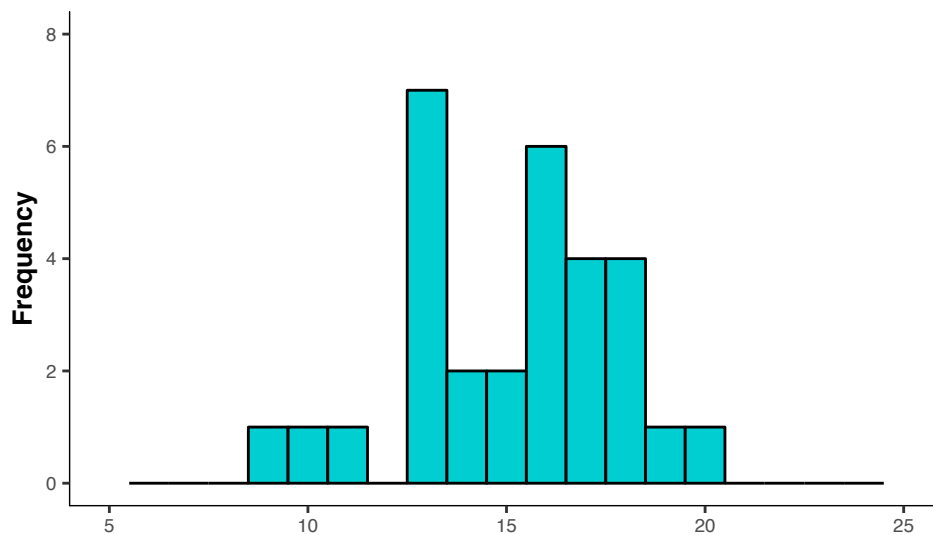
1. Use the `rnorm` function in R to generate 3 random samples of size 30 from a normal distribution with mean 15, and standard deviation 3. Plot these as histograms, each on the same X scale. Write down the mean and standard deviation for each.

Histogram of random sample 1



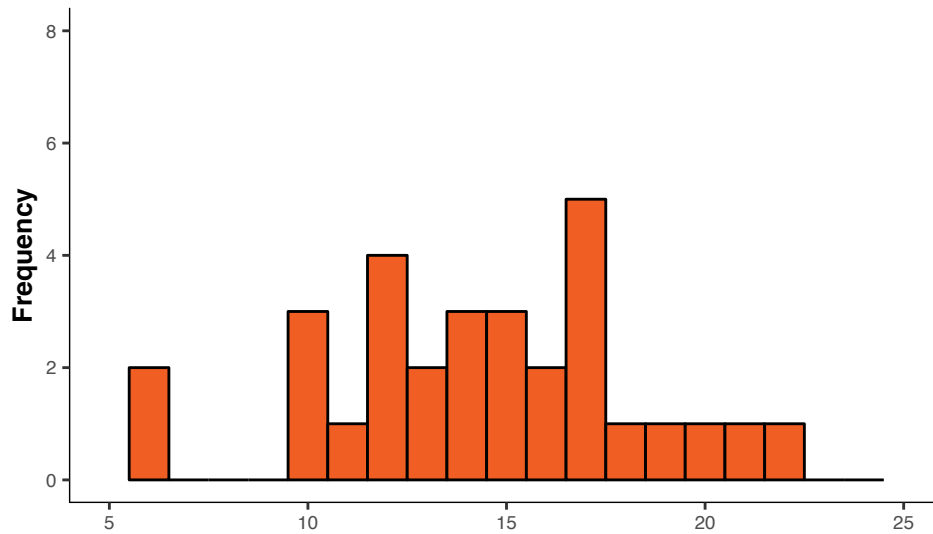
Mean: 14.70; Standard deviation: 3.32

Histogram of random sample 2



Mean: 15.06; Standard deviation: 3.32

Histogram of random sample 3



Mean: 14.28; Standard deviation: 3.93

2. 141, q.7

The probability is 0.014. (0.035×0.40)

3. 146, q.31

a. Yes. The two events are mutually exclusive because it is impossible to randomly choose a colony with the diameter falling into both the range of 4 to 6 and 8 to 12.

b. $P(\text{diameter is between 4 and 6} \cup \text{diameter is between 8 and 12}) = 0.14 + 0.48 = 0.62$.

c. $P(\text{diameter} \geq 10) = P(\text{diameter is between 10 and 12}) + P(\text{diameter is between 12 and 14}) = 0.12 + 0.02 = 0.16$.

d. $P(\text{diameter is between 8 and 10}) = P(\text{diameter is between 8 and 12}) - P(\text{diameter is between 10 and 12}) = 0.48 - 0.14 = 0.34$.

e. $P(\text{diameter is between 8 and 12} \cup \text{diameter} \geq 10) = P(\text{diameter is between 8 and 12}) + P(\text{diameter} \geq 10) - P(\text{diameter is between 10 and 12}) = 0.16 + 0.48 - 0.14 = 0.50$.

4. 226, q.4. conduct a test for independence of goals.

H_0 : The goals are independent, following a Poisson distribution.

H_1 : The goals are not independent, not following a Poisson distribution.

Decision rule: $P < \alpha = 0.05$; $\bar{X} = 1.22$ (used as the approximated mean of Poisson distribution.)

Goals	Observed	Expected	X^2
0	37	32.96	0.50
1	44	40.32	1.11
2	31	24.66	0.22
3	10	10.05	0.86
4	4	3.07	0.38
5	1	0.75	0.08
>5	0	0.15	0.15

Chi-square Goodness-of-fit test: (degree of freedom = $7 - 1 - 1$)

$X^2 = 3.299 < X^2_{0.05,5} = 11.07$; $P > \alpha = 0.05$.

Observation is not significantly different from expectation. Fail to reject the null hypothesis.

The goals are independent, following a Poisson distribution.