Data Analysis in Evol/Evol - HW Week2 – updated 10/15

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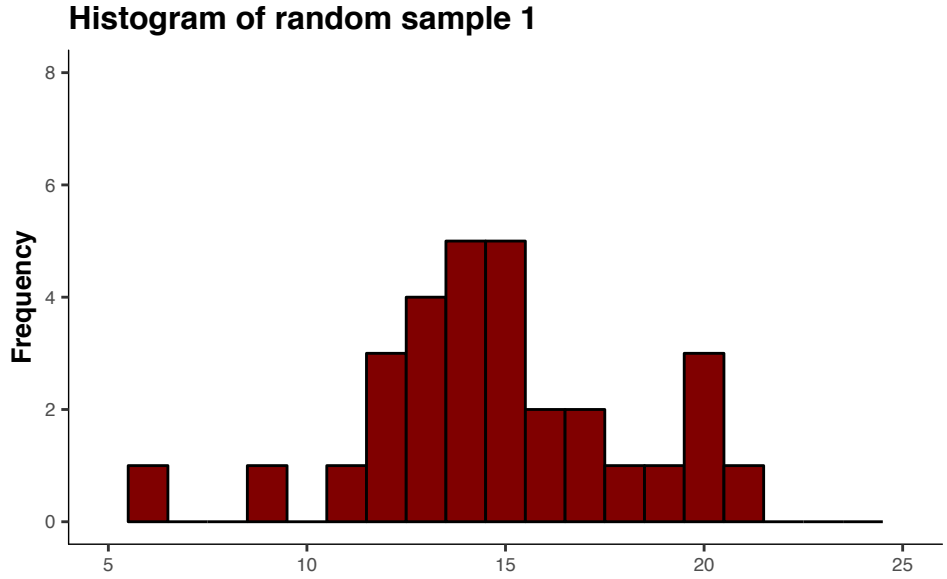
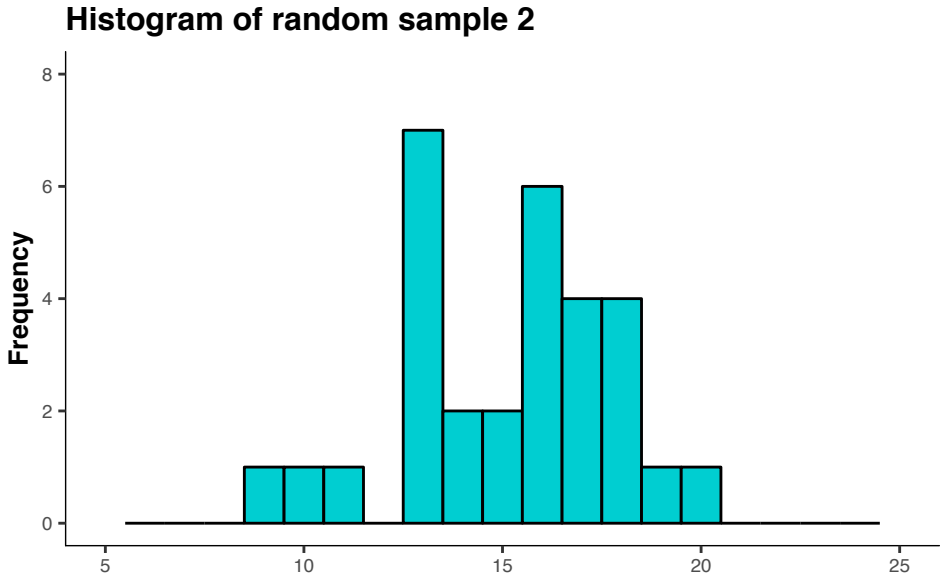
Reference R code see: github.com/jingyilu/Data-analysis-ecoevo

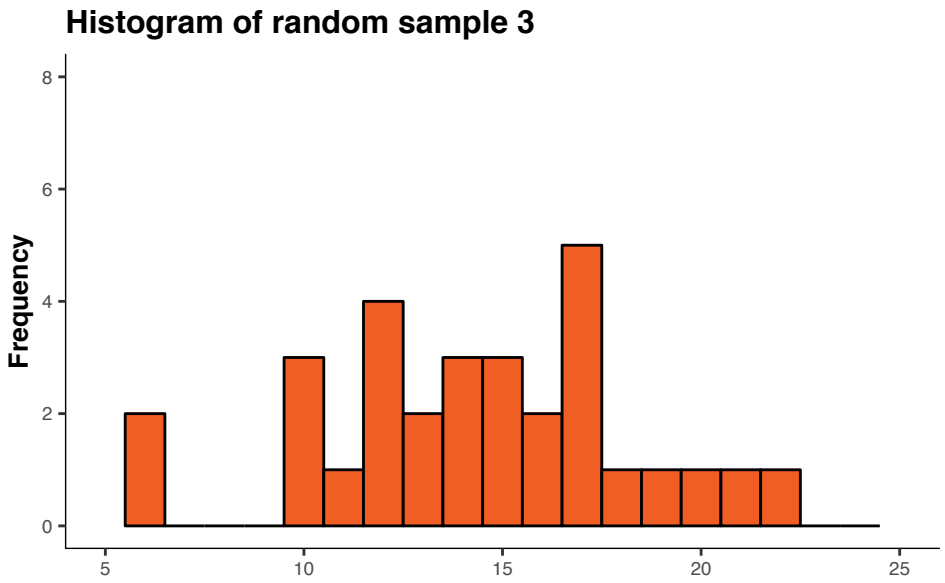
1. **Use the rnorm function in R to generate 3 random samples of size 30 from a normal distribution with mean 15, and standard deviation 3. Plot these as histograms, each on the same X scale. Write down the mean and standard deviation for each.**



Mean: 14.70; Standard deviation: 3.32



Mean: 15.06; Standard deviation: 3.32



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(diameter is between 4 and 6∪ diameter is between 8 and 12) = 0.14+0.48 = 0.62.

c. P(diameter ≥ 10) = P(diameter is between 10 and 12) + P(diameter is between 12 and 14) = 0.12+0.02 = 0.16.

d. P(diameter is between 8 and 10) = P(diameter is between 8 and 12) - P(diameter is between 10 and 12) = 0.48-0.14 = 0.34.

e. P(diameter is between 8 and 12∪ diameter ≥ 10) = P(diameter is between 8 and 12) + P(diameter ≥ 10) - P(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*	3	4.01	0.26

* Goals equal to or larger than 4 per game were grouped into one category to avoid expected value smaller than 1

Chi-square Goodness-of-fit test: (degree of freedom = 5-1-1)

$\mathbf{X^2} = 2.944 < \boldsymbol{X^2_{0.05,3}} = 7.815$; $P > \alpha = 0.05$.

Observation is not significantly different from expectation. Fail to reject the null hypothesis. The goals are independent, following a Poisson distribution.