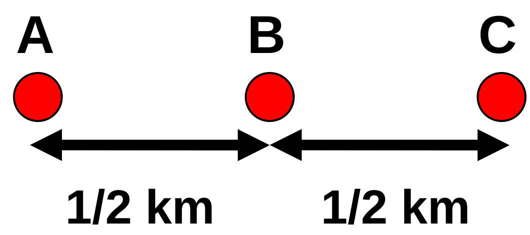
Spatial Ecology Workshop (Quiz 4) - Key

Student: ______________________________ Grader: ______________________

1) Generic auto-correlation is described as the following product:

Correlation = Σ (covariance * w) / (Σ w) (*Where:* w = weight)

You sampled three stations (A, B, C) and want to calculate the global correlation for these data, using the distance between stations to weight these pair-wise comparisons as follows: weight = 1 / distance.



Fill in the cells below (+0.25 points each).

samples	covariance	distance (km)	weight
A-B	+1	0.5	**2**
B-C	0	0.5	**2**
A-C	-1	1	**1**

Autocorrelation for this dataset: **0.20** = [(1 * 2) + (0 * 2) + (-1 * 1)] / (5)

2) Match the answers (A, B, C, D, E, F) with the two definitions (I, II) (0.5 points each):

A - Numerator is a squared difference for each pair
B - Denominator is a variance
C - Value of +1 when data are not correlated
D - Numerator is a covariance
E - Value of +1 when data are positively correlated
F - Value of 0 when data are positively correlated

I - Moran's I: **D, E (B for both)**

$$I_{(d)} = \frac{n\sum_i \sum_j w_{ij} Z_i Z_j}{W_{ij} \sum_i Z_i^{\ 2}}$$

II – Geary's C: **A, C, F (B for both)**

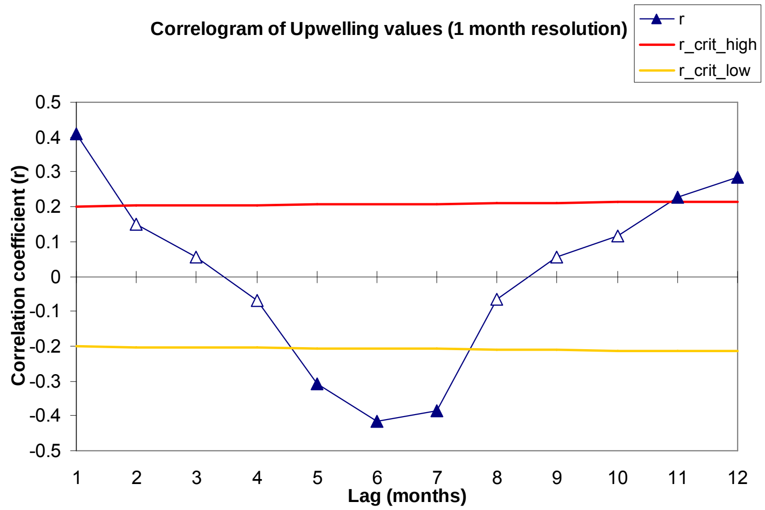
$$C_{(d)} = \frac{[(n-1)[\sum_i \sum_j w_{ij}(y_i - y_j)^2]}{2W_{ij} \sum_i Z_i^{\ 2}}$$

3) List two main applications of auto-correlation in ecology? (1 points each) (Hint: quizz 3)

***Define "Ecological Scales"*: the space or time "distance" apart (lag) at which spatial variation is NO LONGER correlated with "distance". Independence beyond this scale.**

Gain insight into forces structuring spatial distributions by quantifying sign (+ / -) and lags (separation) in the data

4) **Define two metrics used to identify "ecological scales" of autocorrelation (0.25 per value and 0.5 per definition):**



I-zero scale: <u>from 1 to 2</u> **L-zero scale:** <u>from 3 to 4</u>

I-zero is defined as: **First lag where correlogram not significantly different from 0**

L-zero is defined as: **First lag where correlogram crosses the x-axis**

5) **Assign p-values / significance to correlation coefficients, using Pearson table (0.25 per entry):**

df= n-2 n = number of pairs of data	Level of significance for two-tailed test (alpha)			
	.10	.05	.02	.01
1	.988	.997	.9995	.9999
2	.900	.950	.980	.990

For df = 1, r = +0.997 **p value:** <u>$p = 0.05$</u> **result:** **Significant**

For df = 1, r = +0.998 **p value:** <u>$0.05 > p > 0.02$</u> **result:** **Significant**

For df = 2, r = +0.997 **p value:** <u>$p < 0.01$</u> **result:** **Significant**

For df = 2, r = -0.940 **p value:** <u>$0.10 > p > 0.05$</u> **result:** **Not significant**

For df = 2, r = +0.050 **p value:** <u>$p > 0.10$</u> **result:** **Not significant**