THE ACADEMY OF ST NICHOLAS	Y13 Applied	CH01 1.1,1.2,1.3	Statistics Regression, Correlation & Hypothesis Tests	Lessons 5

Essential Knowledge Milestones

- be able to change the variable in a regression line;
- be able to estimate values from regression line.
- understand correlation coefficients;
- be able to calculate the PMCC (calculator only);
- be able to interpret a correlation coefficient;
- be able to conduct a hypothesis test for a correlation coefficient.

Success Criteria

- ❑ You can interpret and apply the exponential models in bivariate data
- ❑ You can change variables to estimate coefficients in an exponential model
- ❑ You can describe the correlation between the two variables in context
- ❑ You can interpret and calculate PMCC
- ❑ You can conduct a hypothesis test for a correlation coefficient.

Teaching Points

- Start the revision of topics from year one by recapping regression.
- This needs to be extended to working with changing variables (coding) within regression lines. This relies on logarithms from the pure content and students should be able to work with equations of the form y = axn and y = kbx. Students will need to know how to put these into linear form and be able to estimate a and n or k and b. An understanding of reliability when extrapolating will also need to be recapped.
- Recap scatter diagrams and the terminology used in year one to describe correlation. Students should understand that measures of correlation can be calculated to identify the strength of correlation. They need to understand that one of these, the product moment correlation coefficient (PMCC) is denoted by r, and that $|r| \leq 1$. If $r = \pm 1$ then the data points lie on a perfect straight line on a graph.
- Students are expected to be able to calculate r using their calculators, but are not required to know or use the formula. They should be able to interpret their value for the PMCC in the context of the question.
- Students are required to perform hypotheses tests for correlation coefficients. The hypotheses need to be stated in terms of ρ where ρ represents the population correlation coefficient. All tests should have the null hypothesis $H_0: \rho = 0$. Tables of critical values or a p-value will be given to students.

Assumed Prior Knowledge/ Links / Interleaving

AS Mathematics – Statistics

- Understanding of regression
- Understanding of correlation
- Use appropriate language of statistical hypothesis testing
- Be able to apply a hypothesis test to the binomial distribution

AS Mathematics – Pure

- Knowledge of logarithms

Opportunities for Reasoning/Problem Solving/Proofs

- Relate to real-world problems and discuss the reality of extrapolation.
- This is a good opportunity here to bring together the AS and A level content relating to regression and correlation.

Potential Barriers to Access /Misconceptions

- Notation and stating a conclusion are the most common errors: 'some students failed to state their hypotheses in terms of ρ. Common errors include failing to ensure that critical values match the alternative hypothesis and giving conclusions that do not include a reference to the context.
- Note writing or applying the following statements
- A small p-value (≤ 0.05) shows strong evidence against the null hypothesis, therefore reject the null hypothesis (at the 5% significance level).
- A large p-value (> 0.05) shows weak evidence against the null hypothesis, therefore accept the null hypothesis (at the 5% significance level).

Unfamiliarity of the Casio calc wiz functionality

Key Mathematical Vocabulary	Hypotheses, significance level, one-tailed test, two-tailed test, test statistic, null hypothesis, alternative hypothesis, critical value, critical region, acceptance region, p-value, binomial model, correlation coefficients, product moment correlation coefficient, population coefficient, sample, inference, mean, normal distribution, variance, assumed variance, linear regression, interpolation, extrapolation, coded data

Personal Development	**Notes**	**Resources**
Pupils are taught that they must 'respect' each other's opinions and well-being when working collectively in class. Pupils to learn that mathematicians have 'ambition' to push boundaries when aiming to solve new problems.		