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| **Stage 2 General Mathematics – Guidelines for determining complexity of mathematical calculations** | | |
| **Note:** The outline below is intended as a guide only. In all topics the complexity of questions in SATs is also be affected by the degree to which they are scaffolded. Questions in which the steps of a complex calculation are spelled out become more routine. | | |
| **Content** | **Routine** | **Complex** |
| **Topic 1 – Modelling with Linear relationships** | | |
| 1.1 Solution of simultaneous linear equations | Solving when the equations are given | Solving when the equations have to be formed from contextual information |
|  | Interpreting unique solutions in context | Interpreting non-unique solutions |
| 1.2 Linear programming | Finding the optimal solution if a drawn graph is given |  |
|  | Graphing constraints if the equations are given | Formulating the constraint equations from contextual information |
|  | Labelling constraint lines, finding intersection points and shading the feasible region of solutions |  |
|  | Determining the objective function and corners of the feasible region. Finding and interpreting the optimal solution in context. | Considering ‘wastage’, changes to the original scenario, or discrete solutions when the optimal solution occurs at a non-discrete point. |
| **Topic 2 – Modelling with Matrices** | | |
| 2.1 Connectivity matrices | Creating a matrix from a network diagram or vice versa | Creating a matrix or network diagram from contextual information |
|  | Performing basic matrix arithmetic or evaluating a given matrix expression (eg calculate C + 0.5C2 + 0.2C3) | Determining what the calculation needs to be to achieve a required result |
|  | Interpreting the entries of a given matrix | Interpreting the result of a matrix calculation in context |
|  |  | Considering the effects of changes to the original conditions |
| 2.2 Transition Matrices | Interpreting or completing entries in a given transition matrix, **T**, of order 3x3, or larger. | Creating a transition matrix of order 3x3, or larger, from contextual information |
|  | Stating the initial state row matrix from given information and calculating subsequent expected states by multiplying by appropriate powers of **T**. |  |
|  | Interpreting the results of calculations of the form **T**n or **ST**n in context as numbers, proportions or decimals as required |  |
|  | Finding the steady state of a given transition matrix and interpreting the result in context | Considering the effects of making changes to the original conditions |
| Both subtopics | Stating appropriate standard underlying assumptions made in the matrix model being used | Giving a contextually appropriate description of the implications of the underlying assumptions of the model |

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| **Topic 3 – Statistical Models** | | |
| 3.1 Bivariate Statistics | Sketching a scatterplot with appropriate labels and indication of scale on both axes from given data. |  |
|  | Describing the strength, direction, and nature of the trend observed in a scatterplot | Creating and interpreting residuals plots |
|  | Finding the values of **r** & **r**2 and their interpretation. Finding the equation of a regression line (either linear or exponential) | Interpreting the values of the parameters ‘a’ and ‘b’ in the regression equation in context |
|  | Predicting (interpolation and extrapolation) using the regression equation and interpreting the answer in context | Discussing the reasonableness/reliability of making predictions |
|  |  | Considering the effects of removing an outlier |
| 3.2 The Normal Distribution | Sketching normal curve graphs and labelling the scale on the horizontal axis | Comparing two different normal distributions on the same graph |
|  | Calculating proportions, probabilities & quantities from a given normal distribution | Calculating a value using the inverse normal function |
| **Topic 4 – Financial Models** | | |
| 4.1 Saving & 4.2 Borrowing | Subsequent calculations after the initial set up\* | Initial set up of annuity/loan calculations from written information or if changing the value of two or more variables at the same time\* |
|  | Calculating effects of taxation and inflation (4.1) | Calculating the effect on interest of an offset account for periods *within* the term of the loan (4.2) |
|  | Calculating comparative (annualised) rates with different compounding periods (4.1 & 4.2) | Calculating comparison rates taking fees and charges into account (providing the steps are not given) (4.2 only) |
|  | \*Please note complexity in financial questions is often determined more by the structure of the question than by the individual mathematical calculations involved | |
| **Topic 5 – Discrete Models** | | |
| 5.1 Critical Path Analysis | Interpreting information given in a network or a precedence table (with or without earliest and latest starting times given) | Drawing the network from a given precedence table (with the exception of identifying start and end points and using directed links) |
|  | Using a forward and backward scan on a given network to find the critical path and minimum completion time for the job and earliest and latest starting times for individual tasks | Interpreting dummy links.  Discussion of leeway (or slack time) over sections of the network not on the critical path |
|  | Interpreting aspects of the optimum solution in context | Considering the effects of changes to the original conditions |
| 5.2 Assignment Problems | Solving square arrays of order 4x4 or larger and interpreting the optimum solution(s) in context | Solving non-square arrays larger than order 4x4 and interpreting the optimal solution(s) in context |
|  |  | Considering the effects of changes to the original conditions |
|  |  | Interpreting multiple solutions |