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| **STAGE 2 Essential 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. |

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| **Topic 1 – Scales, Plans, and Models** |
| **CONTENT** | **ROUTINE** | **COMPLEX** |
| 1.1 Geometry | Names and properties of 2D shapes (number of vertices and edges) and 3D shapes (number of vertices, faces and edges). | Describing the difference between prisms and pyramids. |
|  | Identifying a 3D solid from a given net. |  |
|  | Constructing a net for 3D solid (not to scale). | Constructing a net for 3D solid (to scale). |
| 1.2 Scale diagrams | Gaining information to find lengths, perimeters and simple areas from provided 2D or 3D scale representations. | Using 2D scale representations to find compound areas. |
|  | Measuring angles and determining bearings of provided 2D representations. | Creating 2D and 3D scale representations from unstructured information (including distances, angles, bearings). |
|  | Discussion of the accuracy of measurements.  | Considering the reasonableness of answers, including an understanding of the effect errors have on the accuracy of measurements and calculated values. (Note: calculations of absolute and relative errors are not required)  |

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| **Topic 2 - Measurement** |
| **CONTENT** | **ROUTINE** | **COMPLEX** |
|  | Metric unit conversions and selection of appropriate units of measurement for length, area, volume and capacity. Conversion of imperial measurements (given the conversion information) to metric. |  |
| 2.1 Linear measure | Estimation of distances. | Discussion of the level of accuracy required for a particular task. |
|  | Perimeters of regular and non-regular shapes from given information, including composite shapes (not including circular shapes). | Circumference and perimeter of circles and arc lengths, and composite shapes including circular shapes. |
|  | Finding missing lengths using Pythagoras’ theorem, and missing lengths and angles for right-angled triangles using sine, cosine and tangent ratios with diagrams providing visual aid. | Finding missing lengths using Pythagoras’ theorem, and missing lengths and angles for right-angled triangles using sine, cosine and tangent ratios without diagrams provided. |
|  |  | Calculation of missing lengths and angles for non-right angled triangles using the Sine and Cosine rules. |
| 2.2 Area Measure | Areas of simple shapes and composites of simple shapes (not including circular shapes). | Area calculations for irregular shapes (including Simpson’s rule and approximation using polygons) and circles or parts of circles. |
|  | Surface area of solids including cubes, rectangular- and triangular-based prisms. | Surface area of solids including cylinders, pyramids, cones and spheres. The surface area of simple composites of cubes, rectangular and triangular-shaped prisms, cylinders, pyramids, cones and spheres. |
| 2.3 Mass, Volume and Capacity | Volume of solids including cubes, rectangular- and triangular-based prisms. | Volume of solids including cylinders, pyramids, cones and spheres. |
|  | Using density to determine the volume or mass of a specified material. | Solving multi-step problems involving density (e.g. transporting materials where the number of loads required to transport the material is determined from density information.) |

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| **Topic 3 – Business Applications** |
| **CONTENT** | **ROUTINE** | **COMPLEX** |
| 3.1 Planning a Business Premises | Factors affecting location of business and choice of premises — comparison of location, facilities, costs of potential business premises. |  |
| 3.2 Costing Calculations | Calculations of pricing structures including trade discount, net cost rate and series discounts. | Calculations of pricing structures involving several steps in the process where the question has been provided without parts leading the students through the multi-step problem. |
|  | Calculation of Depreciation for both straight-line and reducing balance methods, and construction of depreciation graphs. | Construction of depreciation graphs with both models represented on one graph and analysis of which method better enables the business to minimise their tax liabilities. |
|  | Discussion of other insurance costs including WorkCover and public liability. |  |
| 3.2 Break-even point | Calculations related to finding the break-even point (graphical representation and marginal income). | Calculations of the break-even point incorporating changes to the original scenario (graphical representation and marginal income). |
|  |  | Construction of Profit and Loss statements – including COGS and analysis. |
| 3.3 Business Structures and Taxation | Knowledge of common business structures – Sole Trader, Partnership and Company. |  |
|  | Calculations to compare the taxation liabilities of businesses under sole trader or a partnership with a specified split (with step-by-step scaffolding for the partnership calculation). | Calculations to compare the taxation liabilities of a partnership, including investigating different proportioning of ownership within a partnership (without step-by-step scaffolding). |

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| **Topic 4 – Statistics** |
| **CONTENT** | **ROUTINE** | **COMPLEX** |
| 4.1 Sampling from Populations | Methods of sampling (simple random, stratified (including calculations), systematic, self-selected) | Discussion of the validity of different sampling methods for a described population. |
|  | Discussion of bias in sampling. |  |
|  | Sample size and the reliability of findings. | Understand the implications of the *sample size* on the sample mean compared to the population mean. |
| 4.2 Analysis and Representation of Sets of Data | Calculation of measures of central tendency (mean and median). | Using measures of central tendency (mean and median) to determine the nature of, and to compare, two or more distributions. |
|  | Calculation of measures of spread (including range, interquartile range, standard deviation). | Using measures of spread (including range, interquartile range, standard deviation) to determine the nature of, and to compare, two or more distributions. |
|  | Effect of outliers on measures of central tendency and spread. |  |
|  | Drawing box-and-whisker diagrams on one scale.  | Using box-and-whisker diagrams on one scale for comparing two or more sets of data. |
|  | Construction of stem-and-leaf plots or other appropriate graphs for comparing two sets of data. | Comparison/analysis of two data sets displayed on stem-and-leaf plots or other appropriate graphs. |
| 4.3 Linear Correlation | Sketching and interpreting scatter plots. |  |
|  | Calculation of Pearson’s correlation coefficient and coefficient of determination to determine the degree of linear relationship using ET. | Effect of outliers on results, appropriate removal of outliers, and recalculation of Pearson’s correlation coefficient and coefficient of determination. |
|  | Determining where appropriate to sketch and use the least squares regression line (‘line of best fit’) to predict values within and outside the range of data where straight substitution into the regression formula is required. | Using the least squares regression line (‘line of best fit’) to predict values within and outside the range of data where rearrangement of the regression formula is required. |

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| **Topic 5 – Investments and Loans** |
| **CONTENT** | **ROUTINE** | **COMPLEX** |
| 5.1 Lump-sum Investments | Calculation of interest earnt on a lump sum investment, using simple or compound interest calculations. | Rearranging the simple interest formula **or** investigating multi-step problems without step-by-step scaffolding **or** CI problems requiring a change of more than one variable **or** using technology to investigate a range of what-if questions. |
|  | Calculations relating to the impact of taxation on investments with step-by-step scaffolding. | Calculations relating to the impact of taxation on investments without step-by-step scaffolding. |
|  | Calculations relating to the impact of inflation on investments with step-by-step scaffolding. | Calculations relating to the impact of inflation on investments without step-by-step scaffolding. |
| 5.2 Annuity Investments | Calculations of future-value annuities beyond the initial calculation. | Recognition and initial set-up of calculation of future-value annuities, with and without an initial investment, including superannuation calculations. |
|  | What if questions…changing one variable (future values, payments, rates and time). | What if questions…changing more than one variable (future values, payments, rates and time). |
|  | Calculations relating to the impact of taxation and inflation on the future-value annuity. |  |
|  |  | Analysing the assumptions made and reasonableness of answers in future value annuity calculations. |
| 5.3 Loan Annuities | Calculation of present-value annuities beyond the initial calculation.  | Recognition and initial set-up of calculation of present-value annuities. |
|  | ‘What if’ questions…changing one variable (present values, payments, rates and time). | ‘What if’ questions…changing more than one variable (present values, payments, rates and time). |
|  | Strategies that can minimise the interest paid on a loan. | Analysing the reasonableness of the strategies for minimising interest paid on a loan. |
|  | Importance of factors other than interest rate when taking out a loan (fees and charges, comparison rates – no calculations required).  |  |