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Memorandum to the Western Cape LAC
(Mathematical Literacy, Mathematics and Mathematical Sciences)

Re: Suggestions for Performance Indicators for Specific Outcome 6
(Use data from various contexts to make informed judgements)

We value the time and effort which has been invested in the construction of Performance Indicators for Specific Outcome 6 and indeed for the entire Learning Area and have found the outline of assistance in constructing our own framework. We do, however, have some suggestions for the rearranging and rewording of these indicators.
We are attaching our recommendations for the Foundation, Intermediate and Senior Phases. This includes

- Copies of the original May 18 documents with hand-written comments to motivate our changes
- Retyped documents for each phase. In the case of the Foundation and Intermediate Phases, we have highlighted any changes to the Range Statements in bold and the changes to the Performance Indicators in italics. In the case of the Senior Phase, we have highlighted any changes to the Range Statements in bold and italics have been used to indicate performance indicators in the original document that require further clarification.

There are also a few general comments which we would like to raise:

1. In some cases the performance indicators of the existing document (18 May 1997) do not correlate well with the range statement concerned. This is particularly the case for the Intermediate document. Although we recognise that there is necessarily an overlap between range statements, we have made some suggestions for rearrangement.

2. In the Foundation and Intermediate Phases, we feel that an important component of range statement 1.1. ('Identifying situations for data collection'), has been omitted. This concerns posing the relevant general research question or hypothesis. We have thus added this as a performance indicator.

3. As regards Assessment Criteria 2, we feel the range statements are not entirely clear: Sampling is a process which takes place before the data can be gathered or collected, rather than a method of data collection. We suggest that the range statements be adapted accordingly, or that the distinction become clear through the performance indicators: In other words, data collection involves the selection and use of sampling techniques as well as data collection methods such as interviews, questionnaires etc.

4. The order of the Assessment Criteria could imply that Communication of findings (6) precedes Critical evaluation (7). For each phase we have thus indicated that communication involves *communication of the critical evaluation in a convincing argument*.

5. We feel that Assessment Criteria 8 should include the 'idea of chance' as an overall concept rather than/in addition to 'evidence of knowledge of ways of counting'.

6. The use of available technologies is named as a range statement for several Assessment Criteria, but not for Assessment Criteria 3 'Organisation of data'. In fact it is necessary in this case as in the Senior Phase, spreadsheets are indicated in the performance indicators.

We would be very grateful if you could consider our suggestions. We are happy to discuss and clarify our proposals, and can be contacted as above.

Thank you for your time.

Yours sincerely

Kate Hudson Kate Bennie Karen Newstead
5 June 1997

FOUNDATION

Specific Outcome 6: Use data from various contexts to make informed judgements

Assessment Criteria	Range Statement	Performance Indicators - evident when the learner can	Examples
1. Identification of situations for investigation	1.1 Identify problematic situations for data collection	• identify situations for data collection • *identify relevant variables and ask appropriate questions which can be addressed by the collection and analysis of data*	*in this class, how many boys in our families?*
2. Collection of data	2.1 *Choose appropriate methods for sampling and data collection* 2.2 *Demonstrate various methods for sampling* 2.3 *Demonstrate various methods for collecting data* 2.4 Use available technologies in collecting data	• *plan, design and use appropriate* questionnaires, interviews etc to collect data	*conducting a survey to determine how many people in this class have blue eyes*
3. Organisation of data	3.1 List and arrange data in a logical order 3.2 Sort relevant data 3.3 Group data	• record data accurately on paper • *group, sort and classify data given specific criteria*	*ranking learners' heights from smallest to biggest* filling in given graphs, tables, pictograms
4. Application of statistical tools	4.1 Choose relevant method 4.2 Show understanding of averages, variance and frequency	• read, interpret and extract the relevant information from simple *frequency* tables • *summarise and analyse data using the concepts of location / middle value and spread*	*the number of learners who come to school by bus, bicycle and car*
5. Display of data	5.1 Draw summary 5.2 Represent data using graphs, charts, tables, text 5.3 Use available technologies	• present data in a simple table and in simple graphical form	
6. Communication of findings	6.1 Show understanding of use of simple and statistical language	• *communicate the critical evaluation in a convincing argument*	

7. Critical evaluation	7.1 Explain meanings of information 7.2 Analyse validity 7.3 Analyse the impact of results 7.4 Make projections over time	• *summarise/analyse the trends or most/least popular groupings in the data* • discuss possible reasons for the trends • discuss whether trends may change in time	most learners come to school by bus, *not bicycle or car*
8. Evidence of knowledge of ways of counting	8.1 Show strategies for choosing 8.2 Demonstrate knowledge of the idea of chance	• *determine the number of possible ways of arranging and counting a collection of objects* • *recognise that some events are more likely to happen than others*	*how many different ways can I dress if I have four different pairs of trousers and three different shirts?*
9. Understanding of the concept of probability	9.1 Make predictions 9.2 Use to address real or simulated problems	• *model situations by devising simple experiments to determine probability* • solve simple problems involving chance, probability and predictions	if I throw a die, what are the chances of throwing a six?

INTERMEDIATE

Specific Outcome 6: Use data from various contexts to make informed judgements

Assessment Criteria	Range Statement	Performance Indicators - evident when the learner can
1. Identification of situations for investigation	1.1 Identify **problematic** situations for data collection	• identify natural experiences from where to gather data • provide data sources from sports, music, fashion etc • *identify relevant variables and ask appropriate questions which can be addressed by the collection and analysis of data*
2. Collection of data	2.1 ***Choose appropriate methods for sampling and data collection*** 2.2 ***Demonstrate various methods for sampling*** 2.3 ***Demonstrate various methods for collecting data*** 2.4 Use available technologies in collecting data	• *use a variety of sampling procedures* • *select and use a variety of methods to collect/gather data eg formulate questions, conduct surveys, interviews etc.* • engage in large data collection projects
3. Organisation of data	3.1 Arrange in a logical order, listing 3.2 Sort, sequence and classify data	• *use a variety of methods to organise and represent data* • *sort data by grouping and combining using one or more given criteria*
4. Application of statistical tools	4.1 Use and understand averages, variance and frequency	• *summarise and analyse data using average (mode for non-numerical data), range, variance and frequency*

5. Display of data	5.1 Summarise and display data using graphs, charts, tables and text 5.2 Use available technologies to display data	• *construct, read and interpret tables, charts and graphs*
6. Communication of findings	6.1 Use ordinary and statistical language	• *describe the findings clearly* • *communicate the critical evaluation in a convincing argument*
7. Critical evaluation	7.1 Explain meanings of information 7.2 Analyse validity of **findings and overall study** 7.3 Analyse the impact of results 7.4 Give projections over time	• *accurately* summarise and interpret the data *using graphs, tables and statistical tools* • critically evaluate the results • make inferences and *predictions* based on the findings • *recognise possible sources of bias and distortion*
8. Evidence of knowledge of ways of counting	8.1 Show strategies for choosing 8.2 Demonstrate knowledge of the idea of chance	• *determine the number of possible ways of arranging and counting a collection of objects, and the effect of order on this e.g. the difference between selecting a committee of three and selecting first, second and third place.* • *recognise that some events are more likely to happen than others*

9. Understanding of the concept of probability	9.1 Make predictions 9.2 Use probability to address real or simulated problems	• *model situations by constructing a sample space, and devising and carrying out experiments to determine probability* • *recognise the relationship between numerical expressions of probability and the events that give rise to these numbers* • use knowledge of probability to solve problems • make predictions that are based on experimental or theoretical probabilities

SENIOR

Specific Outcome 6: Use data from various contexts to make informed judgements

Bold type indicates suggested alterations to the range statements.
Italics indicates existing performance indicators that require further clarification.

Assessment Criteria	Range Statement	Performance Indicators
1. Identification of situations for investigation	1.1 Identify **problematic** situations for data collection	This will be evident when the learner can: • recognise different trends e.g. in fashion, advertising, music, food. • recognise different issues e.g. of political, economical, cultural, social and spiritual importance. • identify relevant variables and ask appropriate questions about themselves, their peers, their surroundings in relation to the above. • recognise that data could be applied to analyse and verify assumptions, perceptions and/or bias in the analysis of the above.
2. Collection of data	2.1 Choose and appropriate method 2.2 Demonstrate various methods for interviewing and sampling 2.3 Use available technologies in collecting data	• plan and carry out simple experiments and surveys to describe and summarise a set of data. • plan data collection to enable the comparison of two groups on the same variable. • select and use different sampling techniques, such as convenience, random, self-selection and stratified random. • decide when a sample is adequate and when a census is needed e.g. census carried out in1996. • use a variety of sources available for databases e.g.

		telephone directories, dictionary, class lists, computer databases and family trees. • select an appropriate method for data collection, taking space, time, place, economics and accuracy into account Possible methods being: survey census referendum questionnaire interview simulation • design and use data collection tools for all of the above methods • explain what a simulation is in relation to an actual experiment • *adapt a simple model to simulate a situation involving change processes?*
3. Organisation of data	3.1 Arrange in a logical order, listing 3.2 Sort, sequence and classify data 3.3 **Use available technologies to organise data**	• identify variables that provide information that help answer given questions and suggest new questions. • sort, sequence and classify data by using a specific given criteria using several given criteria constructing and using own criteria to answer specific questions. • organise data in given tables and/or nested tables. • design tables to represent data. • compare different ways of organising data. • enter and manipulate data in a spreadsheet with a

		template already set up. • organise a reasonable sized database. • plan and use a spreadsheet to organise data
4. Application of statistical tools	4.1 Use and understand averages, variance and frequency	• summarise data by selecting and using appropriate measures of central tendency (i.e. mean, median and mode), dispersion (i.e. range and variance), and frequency • calculate measures of central tendency i.e. mean, median and mode • compare the advantages and disadvantages of mean, median and mode. • compare two data sets by examining their central tendency and spread.
5. Display of data	5.1 Summarise and display data using graphs, charts, tables and text 5.2 Use available technologies to display data	• organise and present data in table form, bar graphs, jagged line graphs and pie diagrams, using correct labelling. • display one, two and/or more variables of data in line plots *with various scales?* • use stem and leaf plots to group and display one, two and/or more variables • represent grouped univariate data in histograms • represent bivariate data in scatter plots • describe scatter plots as suggestive of positive, negative or no association, and place informal expressions of correlation on a scale e.g. perfect negative correlation, strong negative correlation etc. • *use variety of available resources for display?*
6. Communication of findings	6.1 Use ordinary and statistical language	• communicate the critical evaluation in a convincing argument.

		• report in written and/or verbal form the planning and process used for data collection and the conclusions. • make recommendations for the improvement of own and other data projects. • present a convincing argument for the advantages and disadvantages of certain types of summary statistics and displays for representing particular data.
7. Critical evaluation	7.1 Explain meanings of information 7.2 Analyse validity of study 7.3 Analyse the impact of results 7.4 Give projections over time	• interpret bar graphs and histograms of data, including where the scales on the axis must be read between calibrations. • summarise accurately the information displayed in a range of tables and graphs. • compare two data sets by using graphs or statistical tools. • explain what is indicated by summary statistics, tables and graphs taken from resources such as magazines, newspapers etc. • analyse and recognise the following forms of manipulation of data to different ends - distorting techniques of display e.g. 2D and 3D figures, misleading scales - sources of distortion and bias arising from sampling, design of questions etc. and assumptions - interpretation of data and construction of a particular argument to support conclusions drawn. • distinguish plausible, possible and impossible interpretations of data, including when critiquing the claims of others, as in media articles when dealing with emotive issues.

		• eliminate sources of bias, by for example rephrasing questions and redesigning techniques of display. • identify everyday situations where projections are used. • draw inferences from time series data and predictions from trends.
8. Evidence of knowledge of ways of counting	8.1 Show strategies for choosing 8.2 Demonstrate knowledge of the idea of chance	• analyse the importance of randomness and various methods of choosing random samples. • recognise the element of chance in data collection as arising from natural variability and measurement errors. • investigate the factor of chance by designing and using games and experiments. • recognise certainty, impossibility and likelihood of events. • order data from least likely to most likely.
9. Understanding of the concept of probability	9.1 Make predictions 9.2 Use probability to address real or simulated problems	• make predictions about situations based on personal experiences and assess the limitations of such predictions e.g. it will rain on three days in December in Cape Town but one can not predict on which days it will rain. • make predictions based on the concept of chance. • provide reasonable data to support predictions, by for example carrying out a simple experiment, and drawing conclusions. • calculate theoretical probabilities by using tree-diagrams, Venn-diagrams and counting. • interpret 'and', 'or' and 'not' when used to describe events.

		• recognise and explain the differences between experimental and theoretical outcomes. • *use census data to assign probabilities?*