## C. Learning Objectives and Notes on Teaching (KS 4)

| Unit | Learning objectives | Note on teaching | Suggested time ratio |
|---|---|---|---|
| **Analysis and Interpretation of Data** | | | |
| Measures of Dispersion | • recognize range, inter-quartile range and standard deviation as measures of dispersion for a set of data<br>• find range from a given set of data<br>• find inter-quartile range from the cumulative frequency polygon<br>• construct box-and-whisker diagrams and use them to compare the distributions of different sets of data<br>• interpret the basic formula of standard deviation and be able to find the standard deviation for both grouped and ungrouped data set<br>• compare the dispersions of different sets of data using appropriate measures<br>• explore and make conjecture on the effect of the dispersion of the data such as<br>  i. removal of a certain item from the data;<br>  ii. adding a common constant to the whole set of data;<br>  iii. multiplying the whole set of data by a constant;<br>  iv. insertion of zero in the data set. | To introduce the idea of dispersion, teachers are suggested to introduce 2 sets of data with the same mean and median but with different spread and then point out the importance of describing both the central tendency and the dispersion of the data.<br><br>Different types of measures of dispersion can be discussed and illustrated with some concrete examples such as the temperature difference in weather reports and the difference in the academic results of students in Hong Kong Attainment Test, etc. Graphs can be used to illustrate the meaning of different measures. Simple calculations to find measures of dispersion are expected. However, emphasis should be on how to use the measures to compare dispersion of data sets rather than tedious manipulations on the measures.<br><br>Students can learn better about the characteristics of a summary statistic by modifying values in a set of data. Suitable uses of computer software and graphing calculators can facilitate students' experimentation and exploration when acquiring statistical concepts. Moreover, they can also observe the effect on the distribution by examining the changes in the diagrams. This kind of tasks can help them to realize that it is the relations among the values, rather than the individual values, which are being investigated.<br><br>Students should note the general configuration of the box-and-whisker diagram (also known as the box plot) and its use in illustrating the minimum value, the lower quartile, the median, the upper quartile and the maximum value of the data set.<br><br>Students are expected to construct the diagrams and to use the diagrams to compare different sets of data. | 13 |

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|---|---|---|---|
| **Simple Statistical Surveys** | | | |
| Uses and Abuses of Statistics | • <u>recognize different techniques in choosing samples and the criteria in choosing data collection method</u><br>• <u>investigate methods in which statistical surveys are used and misused in various daily-life activities</u><br>• <u>discuss the strengths and weaknesses of statistical investigations presented in different sources such as news media, advertisement, etc including methods of collecting, presenting and analysing data, etc.</u><br>• <u>recognize the complexity in conducting surveys</u> | As students are getting mature at this key stage, they are asked to apply their statistical knowledge to study statistical reports presented from various sources. Teachers may ask students to collect some statistical reports from newspapers, journals, magazines, etc. An intuitive idea on sampling techniques and different data collection methods would be introduced in order to provide background knowledge for students to study the reports. However, students should not go into details of sampling techniques and sophisticated methods in designing questionnaires. Simple sampling methods, including simple random sampling, stratified random sampling, systematic sampling should be introduced. Methods of data collection, including observation, simple questionnaire design, etc., and the consideration in collecting data from these methods should be discussed.<br><br>Reasons for selecting samples instead of the whole population, based on the reports collected by students, can be discussed. From the reports, teachers can guide students to find out the sampling techniques and the data collection methods prior to the formal introduction of techniques. Teachers can ask students to discuss in groups the strengths and weaknesses of the methods used and ways to improve the investigation reports. Students should discuss and report the validity of the inferences and to be alert to the credibility of various statistics reports presented in daily life. | 11 |

| Unit | Learning objectives | Note on teaching | Suggested time Ratio |
|---|---|---|---|
| **More about Probability** | | | |
| More about Probability | • <u>recognize the basic laws in probability</u><br>• <u>apply the addition or multiplication laws in a wide variety of activities including real-life problems</u><br>• <u>recognize the notion of conditional probability and the notation of P(A│B)</u><br><br><u>Note: The Bayes' Theorem need not be introduced.</u> | As students are acquainted with the idea of probability at KS3, it is natural for them to consider more complicated cases at this stage.   Examples like tossing 2 coins, throwing dice and drawing cards can be used to illustrate the concepts of "mutually exclusive" and "independent" events.   However, more discussions should be made on various cases in real-life situations. The addition and multiplication laws, instead of listing all the possible outcomes as in KS3, should be introduced to solve more complicated problems.<br><br>The notion of conditional probability could be introduced as a consequence of finding probabilities for cases like drawing cards with replacement and without replacement. However, Bayes' Law need not be introduced at this stage. | 11 |

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Note:   The objectives <u>underlined</u> are considered as **non-foundation** part of the syllabus.