

B. Learning Objectives and Notes on Teaching (KS3)

Unit	Learning objectives	Notes on teaching	Suggested time ratio
Organization and Representation of data			
Introduction to Various Stages of Statistics	<ul style="list-style-type: none"> recognize various stages involved in statistics use simple methods to collect data so as to analyze posed problems be aware of the existence of different types of data (discrete and continuous) understand the criteria of organizing data and discuss different ways of organizing the same set of data 	In primary school level, students have learnt various types of statistical diagrams to represent discrete data and possessed an intuitive idea of statistics. At this key stage, teachers can give an overview of different stages of statistics. Data will be extended to continuous type; and other means of representations for organizing and presenting data, including stem-and-leaf diagrams and back-to-back stem-and-leaf diagrams will be introduced. Simple statistical projects requiring students to record data from observations, to organize data into different numbers of groups and to present data by using diagrams, etc. can be carried out.	5
Construction and Interpretation of Simple Diagrams and Graphs	<ul style="list-style-type: none"> construct and interpret simple diagrams including stem-and-leaf diagrams, pie charts, histograms, scatter diagrams, broken line graphs construct and interpret simple frequency polygons and curves, cumulative frequency polygons and curves be able to differentiate between histograms and bar charts explore the construction of diagrams and graphs with various tools besides paper and pencil compare the presentations of the same set of data by using various graphs or the same type of graphs but with different scales choose appropriate diagrams/graphs to present a given set of data 	<p>The teaching sequence of the construction and interpretation of statistical graphs is flexible. Teachers could ask students to interpret different statistical diagrams or graphs gathered from various sources first and to construct statistical diagrams afterwards or the vice versa.</p> <p>For the construction of statistical diagrams, it is appropriate to have students to draw graphs manually for some small data sets. For other situations, the emphasis should be put on the use of calculators or computers so as to minimize the drudgery involved. For both cases, students should be reminded not to overlook the accuracy and technical requirements of graphical presentations, such as the lengths of the bars (proportional to the respective frequencies), labelling of the axes and the scales of the axes, etc. Constructing stem-and-leaf diagrams for small data sets can be used as a preparatory activity for introducing histograms. Back-to-back stem-and-leaf diagrams can be introduced to compare 2 data sets.</p>	24

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	<ul style="list-style-type: none"> • read data from given frequencies in graphs (including percentiles, quartiles, median) • read frequencies from given data in diagrams and graphs • use some common wordings such as ‘most popular’, ‘most likely’, ‘equally likely’ to describe trends from line graphs • discuss the impressions from graphs presented in various sources • identify sources of deception in misleading graphs and their accompanying statements • recognize the dangers of misinterpreting statistical data 	<p>Suitable uses of computer software and graphing calculators can facilitate students’ experimentation and exploration when acquiring statistical concepts. As different statistical diagrams representing the same set of data can be plotted within a short period of time, students can focus on discussing the choice of an appropriate diagram to present a certain set of data. If students do not realize that different types of charts should be used in different situations, teachers should remind students to give more thoughts to ways of presentation instead of producing a diagram by the computer software not serving the purpose of giving a quick and accurate impression of the information behind the data.</p> <p>Examples are given as follows:</p> <ul style="list-style-type: none"> • It is more appropriate to use a bar chart than a line graph to present nominal data. • If students want to show the relative portion of each category to the whole data set, a pie chart is more appropriate. • If students want to show the increasing importance of car transportation by air, a time series diagram can better serve the purpose. <p>For the interpretation of statistical diagrams, teachers can ask students to collect different types of statistical diagrams from various sources such as the newspaper, reports from the Consumer Council, etc. These daily-life statistical diagrams can motivate students to study. Students should be encouraged to identify and describe the key features of the data set by reading the diagrams. Questions could be asked about the possible conclusions that can be drawn from a graph.</p> <p>Students should be encouraged to explore different ways in handling a set of data in order to find out the strength and weakness in different forms of graphical representations. Students can compare various representations and comment on their appropriateness or effectiveness. Teachers may prepare questions that elicit different types of information in order to direct students’ attention to the advantages of different graphical representations. Emphasis should be laid upon how data are deliberately misrepresented to lead to a wrong conclusion.</p>	

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Analysis and Interpretation of data			
Measures of Central Tendency	<ul style="list-style-type: none"> find mean, median and mode from a given set of ungrouped data find mean, median and modal class from a given set of grouped data be aware that the mean found for grouped data is an estimation compare 2 data sets with given mean, median and mode construct data set with a given mean, median and mode discuss the relative merits of different measures of central tendency for a given situation <u>explore and make conjectures on the effect of the central tendency of the data such as</u> <ul style="list-style-type: none"> (i) <u>removal of a certain item from the data;</u> (ii) <u>adding a common constant to the whole set of data;</u> (iii) <u>multiplying the whole set of data by a common constant;</u> (iv) <u>insertion of zero on the data set</u> understand weighted mean and be aware of its use in various real-life situations such as Hang Seng Index, calculation of marks in a report, etc. discuss the misuse of averages in various daily life situations recognize the dangers of misusing averages 	<p>Students have learnt simple idea of average for discrete data, namely mean, in their primary school level. In KS3, students are expected to learn other ways of measuring the central tendency for both ungrouped and grouped data. The estimate nature of mean and median for grouped data should be highlighted. It should be noted that students are not expected to find the median from a given histogram.</p> <p>In order to encourage students' exploration and communication, the data being investigated should be meaningful to the students. Teachers can guide students to explore different ways of finding the measure of central tendency based on the data they collected before the introduction of the formal definition of arithmetic mean. Different measures should be compared and the use of them in different real-life situations should be discussed. In this stage, emphasis should be laid upon students' understanding of the significance of mean, median and mode instead of the tedious manipulations on the measures themselves. Teachers can make use of calculators or computer software to explore the characteristics on the measures of central tendency by changing the values in a set of data.</p> <p>Students are not strange to the idea of the weighted mean as they may come across this idea in many real life situations. The mean of grouped data is in fact a mean of the class marks weighted by the class frequencies. Teachers can discuss the weightings of various mathematics tests in calculating the score of the subject in the report, or the weightings of different subjects in calculating the marks of the report. For more able students, teachers can use Hang Seng Index of Hong Kong Stock, Consumer Price Index (A), Consumer Price Index (B) to illustrate the application of the weighted mean in daily life. However, details on the weighting or the calculations on the index numbers are not expected.</p>	22

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Probability			
Simple Idea of Probability	<ul style="list-style-type: none"> • explore the meaning of probability through various activities • have an intuitive idea about the relation between probability and the relative frequency as found in statistics or simulation activities • investigate probability in real-life activities, including geometric probability • compare the empirical and theoretical probabilities • calculate the theoretical probability by listing the sample space and counting • recognize the meaning of expectation 	<p>Students have a simple idea of probability in their daily life experiences. “Chance” is more often used instead of probability. In investigating probability, simple games and real-life activities can be used. Through discussions on chances of different real-life activities, it is expected that students gain an intuitive idea on the meaning of probability and recognize that probability is usually represented by a number p ($0 \leq p \leq 1$). Simple counting or listing out the outcomes to find probability is expected. Teachers should neither introduce the addition nor multiplication laws to students at this stage.</p> <p>Students should carry out experiments, discuss and compare the results of different experiments and note that separate experiments will usually produce somewhat different results. Besides hands-on activities, computers or calculators can be used to facilitate the simulation of large number of trials so as to enable them to develop an understanding of probability as the long-run relative frequency. Teachers should also guide students to recognize that some of the information they come across in real life situations such as the accident rate and the crime rate are empirical probability.</p> <p>The idea of expectation on discrete random variables can be introduced as an application of the weighted mean. Calculations involving fair games, expected gain/loss of a game are best illustrated by real-life examples. It should be noted that detailed properties on expectation and sigma notation should not be introduced at this stage.</p>	12

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