



賽馬會「知優致優」計劃

Jockey Club “Giftedness Into Flourishing Talents” Project

# Statistics – Weighted Mean

## Mathematics Secondary 3

Level 1: School-based Whole-class Teaching



香港賽馬會慈善信託基金

The Hong Kong Jockey Club Charities Trust

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## **Background and Notes**

The design of the learning and teaching plan reflects the actual circumstances of the particular school at the time of implementation. As it is developed and tailor-made to meet the specific cognitive and affective needs of students, all learning and teaching resources are for reference only.

When adapting the materials, curriculum, instructional and assessment modifications can be made in accordance with the diverse needs and abilities, learning styles and aspirations of students, professional competence of teachers, and gifted education development of the schools.

Teachers are strongly recommended to read the introduction, theoretical background and summary of the resource package to have a better understanding of the principles of Gifted Education and strategies for implementation.

**This unit includes 1 lesson plan, 3 worksheets, 1 sample spreadsheet and 1 file of students' work.**

With reference to our resources, educators can design suitable learning activities and implement the elements of Gifted Education, based on students' needs and interests, and teaching experience, so as to unfold students' potentials to the fullest.

All educators can view, download and use the resources for educational and non-commercial purposes. The Jockey Club "Giftedness Into Flourishing Talents" Project of the Chinese University of Hong Kong is the copyright owner. When using the resources, acknowledgement should be made in full name, i.e. Jockey Club "Giftedness Into Flourishing Talents" Project of the Chinese University of Hong Kong.

## Topic — Statistics: Weighted Mean

Subject: Mathematics

Grade: Secondary 3

No. of Lessons (Learning Time): 2 Consecutive Lessons (80 minutes)

<b>Prior Knowledge</b>	Arithmetic Mean		
<b>Learning Objectives</b>	<ul style="list-style-type: none"><li>- Students develop the skills of evaluating weighted mean</li><li>- Students understand the application of weighted mean in daily life</li><li>- Students become able to identify the misuse and misleading presentation of weighted mean</li><li>- Students learn to make decisions based on proper interpretation of statistics</li></ul>		
<b>Learning &amp; Teaching Strategies</b>	Student-led Activity, Flexible Grouping, Differentiated Worksheets, E-learning		
<b>Operation Mode of Gifted Education</b>	Level 1: School-based Whole-class Teaching		
<b>Core Elements of Gifted Education</b>	 Higher-order Thinking Skills	 Creativity	 Personal-social Competence

## Lessons 1 & 2

### Pre-lesson Tasks

1. Pre-lesson Worksheet: students are asked to finish the worksheet before the lesson. The worksheet introduces arithmetic mean, geometric mean, root mean square and harmonic mean.
2. Before the lesson, teacher chooses two to three students with good presentation skills. They are responsible for preparing a slideshow involving concept, formula, examples and questions about weighted mean.
3. Teacher needs to prepare a shared google spreadsheet for students to input data.  
(Refer to Sample Spreadsheet)
4. Teacher should arrange students into groups, 3 to 4 students each, matching students' characteristics and interests with the 4 sets of worksheets about weighted mean. Students can be seated according to this group at the beginning of the lesson.  
(Refer to Note I for the grouping considerations)

### Procedure

Learning Focus (Time)	Activity / Content	Learning & Teaching Strategies	Elements of Gifted Education	Learning & Teaching Resources
Feedback on the Pre-lesson Task (10 minutes)	Through questioning, teacher may check the understanding of students about the four types of means introduced in the pre-learning worksheet.			Pre-lesson Worksheet
	Teacher may also ask questions related to the four types of means or provide some of the following extra information: <ol style="list-style-type: none"> <li>1. <i>Arithmetic and geometric usually refer to sum and product respectively.</i></li> <li>2. <i>Root, mean, square are actually describing the three types of computations involved in the formula.</i></li> <li>3. <i>The root-mean-square equals to zero if and only if all the data are zero.</i></li> </ol>			

Collecting authentic data and finding mean (15 minutes)	Students work in groups of 4 students. Students measure their own heart rate and input into the online spreadsheet using tablet. Students then compute and input the arithmetic mean and geometric mean of heart rate of their group.  (Refer to Sample Spreadsheet)	E-learning	 	Tablet
	After viewing the data from other groups, students are asked to look for property about arithmetic mean and geometric mean. They are expected to see that arithmetic means are always greater than or equal to the geometric means for all groups.			
	Teacher demonstrates how to find the arithmetic and geometric means of the whole class's heart rate of whole class using spreadsheet formula. Students can see the effectiveness of using computer when handling a large set of data.			
	As supplementary knowledge, teacher can also brainstorm with students about the factors affecting one's heart rate.			
Presentation of weighted mean by students (15 minutes)	Pre-chosen students present the meaning and calculation of weighted mean through comprehensive examples. These presenters also raise questions to classmates to check their understanding.	Student-led Activity		Slideshow prepared by students
Group Activity 1: Finding the weighted means in four different scenarios (20 minutes)	Each group receives a set of worksheets (Refer to Note I). Following the worksheets provided, students collaborate in groups to study the scenario about weighted mean. They finish calculations on their worksheets and have discussion on open-ended questions related.	Ability Grouping	  	Four sets of lesson worksheet (each group receives one specific set)
	Each group prepares a short presentation with the theme "How do statistics affect our decisions?" with the help of their worksheet. Teacher walks around the classroom and provides assistance to the groups in need. The presentation will be used in the next activity.	Differentiated Worksheets		

Group Activity 2: Sharing and Presentation (20 minutes)	Students are rearranged into groups of mixed abilities. Each group is formed from four students studied a different scenario (Refer to Note II).	Mixed Ability Grouping	 	
	In each group, students take turns to make a presentation of one's own scenario studied. They can raise related questions for further discussion.			
	Teacher walks around the classroom or sits in some groups to provide feedback on students' presentation. If time is allowed, teacher can choose a student to present to the whole class.			
Summary (5 minutes)	Teacher makes a summary on the concept, formula and application of weighted mean. Teacher also conveys the message that statistics affect decision-making.			
	Teacher can provide more real-life examples like the use of statistics for hotel pricing or policy-making. Teacher can also alert students that statistics may be misused to mislead people.			

### Extended Learning Activity

Extension Worksheet: students are encouraged to work in pairs to discuss the factors that a principal should consider when hiring a new teacher. They also need to suggest a weighing system and justify their suggestion. This worksheet can help nurture students' creativity.

## Note I: Grouping for Lesson Worksheet

In the first group work, there are four different sets of worksheets. Students are grouped and worksheets are assigned according to different considerations as shown. Teacher can therefore provide suitable help to the group or raise further questions to be discussed in the group.

Set	Scenario	Worksheet Settings	Grouping Consideration
1	Bus Fare	Difficult, related to the real situation of Hong Kong policy-makers	Suitable for students with average or above average ability and students having strong interest in buses
2	S1 Admission	Medium, easier to get familiar with	Suitable for students with average or below average ability
3	Subject Selection	Difficult and complex, require students to reason with calculation	Suitable for students with high ability
4	Restaurant	Simpler calculation required, more questions that allow creative answers and suggestions	Suitable for students with high creativity

## Note II: Grouping Method for Group Activity 2

The following figure is a sample which demonstrates the grouping.

In the first grouping, teacher groups students by their Mathematical ability. Teacher can also make sure there are some students with good leadership or communication skills in each group to ensure smooth group discussion.

The second grouping is just generated by computer by picking one student from each of the four groups.

First Grouping				
Group 1 (Set 1)			Group 3 (Set 3)	
Annie	Bianca		Alan	Becky
Candy	Donald		Calvin	Debbie
Group 2 (Set 2)			Group 4 (Set 4)	
Angel	Ben		Anthony	Brenda
Connie	Derek		Cali	Daniel
Second Grouping (Mixing the four groups in the First Grouping)				
Group 1			Group 3	
Annie	Alan		Bianca	Becky
Angel	Anthony		Ben	Brenda
Group 2			Group 4	
Candy	Calvin		Donald	Debbie
Connie	Cali		Derek	Daniel