

Lesson 63 – Working With Standard Deviation | IB Studies 2

(A) Lesson Objectives

- Calculate the standard deviation using frequency distribution tables by hand and by technology
- Calculate the standard deviation using grouped data by hand and by technology
- Compare dispersions of samples with different means and different standard deviations

(B) DETAILED EXAMPLE #1 - Here is a frequency distribution table for cars per week sold by a dealership over a year.

Cars Sold	0	1	2	3	4	5	6	7
Number of weeks	2	3	5	4	7	13	10	8
$(x - \bar{x})$								
$f \times (x - \bar{x})^2$								

- Determine the mean, median, mode of the data set.
- Calculate the standard deviation of the data set.
- Compare your calculated results by using the TI-84

(C) PRACTICE EXAMPLE #2 - Here is a frequency distribution table number of piglets in a litter.

# of piglets	6	7	8	9	10	11	12	13	14
frequency	8	15	16	20	22	7	4	2	1
$(x - \bar{x})$									
$f \times (x - \bar{x})^2$									

- Determine the mean, median, mode of the data set.
- Calculate the standard deviation of the data set.
- Compare your calculated results by using the TI-84

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(D) DETAILED EXAMPLE #3 – Here is the grouped data arising from the QUIZ scores from the IB Studies 2 quiz (quizzes were scored out of 100 percent):

Grouped scores	frequency	Interval midpoint	$(x - \bar{x})$	$f \times (x - \bar{x})^2$
$0 \leq x < 14$	2			
$14 \leq x < 28$	4			
$28 \leq x < 42$	13			
$42 \leq x < 56$	11			
$56 \leq x < 70$	17			
$70 \leq x < 84$	12			
$84 \leq x < 100$	6			

- a. Determine the mean, median, mode of the data set.
- b. Calculate the standard deviation of the data set.
- c. Compare your calculated results by using the TI-84

(E) PRACTICE EXAMPLE #4 - 500 earthworms were collected from a sample of soil. Their lengths were recorded and the results are given in the following table:

Length (mm)	Number of worms	Interval midpoint	$(x - \bar{x})$	$f \times (x - \bar{x})^2$
≤ 10	0			
$10 < x \leq 20$	10			
$20 < x \leq 30$	20			
$30 < x \leq 40$	50			
$40 < x \leq 50$	90			
$50 < x \leq 60$	150			
$60 < x \leq 70$	100			
$70 < x \leq 80$	50			
$80 < x \leq 90$	20			
$90 < x \leq 100$	10			

- a. Determine the mean, median, mode of the data set.
- b. Calculate the standard deviation of the data set.
- c. Compare your calculated results by using the TI-84

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(F) Practice Example #5 - The lengths of 600 leaves from a tree are measured. The following table gives the cumulative frequency distribution of these lengths:

Length (x mm)	$x \leq 20$	$x \leq 25$	$x \leq 30$	$x \leq 35$	$x \leq 40$	$x \leq 45$	$x \leq 50$
Number of leaves	0	20	80	260	500	580	600

- Determine the mean, median, mode of the data set.
- Calculate the standard deviation of the data set.
- Compare your calculated results by using the TI-84

(G) Practice Example #6 - The results of a music examination taken by 160 pupils are shown in the cumulative frequency table below:

Mark	< 10	< 20	< 30	< 40	< 50	< 60	< 70	< 80
Number of pupils	0	8	21	55	103	135	150	160

- Determine the mean, median, mode of the data set.
- Calculate the standard deviation of the data set.
- Compare your calculated results by using the TI-84

(H) Comparing Populations using Mean and Standard Deviation

- a. DISCUSSION EXAMPLE #1 – I have two shot put throwers. Thrower #1 throws an average of 10.25 m with a standard deviation of 1.35, while Thrower #2 throws an average of 10.25 m with a standard deviation of 2.05 m.
- Which thrower is most consistent? How do you know?
 - Which thrower is more probable of throwing a distance over 12 m?
 - Which thrower do I take to IASAS?
 - EXTENSION → The distance of 12.3 m placed 7th last year and earned points for his school. So what is the probability that Thrower #2 throws a distance over 12.3 m at IASAS (assume normal distribution)
- b. DISCUSSION EXAMPLE #2 – I have two shot put throwers. Thrower #1 throws an average of 10.25 m with a standard deviation of 1.25, while Thrower #2 throws an average of 11.75 m with a standard deviation of 1.35 m.
- Which thrower is most consistent? How do you know?
⇒ (Introduce the “coefficient of variation” to help decide)

(I) Homework/Classwork:

- Haese & Harris Textbook, Exercise 5I.2, p154, Q1,2,3 & Investigation #5
- Haese & Harris Textbook, Exercise 5I.1, p152, Q3,4,5,6