Is how spread out the data is from the mean.

Symbol   σ "sigma"   calculator σx   standard deviation

Mean μ "m" "mu"   calc. $\bar{x}$ x bar

The larger the standard deviation, the more spread out the data.

Q1) Find the mean $\bar{x}$ and $\overset{(SD)}{σx}$ from the data set

1, 3, 5, 8, 9 $\bar{x} = 5.2$

Standard deviation using the table

Formula $\sqrt{\dfrac{\text{Sum of } fd^2}{\text{Sum of } f}}$ where f is the frequency and d is the mean- number

Vertical Table

no	f	d	d²	fd²
2	2	6	36	72
5	5	3	9	45
8	6	0	0	0
11	5	3	9	45
14	2	6	36	72
	20			234

T&T3 8.6

T&T3 8.6.pptx

Table

Number	2	5	8	11	14
Frequency	2	5	6	5	2

Mean = $\dfrac{(2\times2)+(5\times5)+(8\times6)+(11\times5)+(14\times2)}{2+5+6+5+2} = \dfrac{160}{20} = 8$ mean

$\sqrt{\dfrac{234}{20}} = 3.42$

chapter
8 Measures of Location and Spread

Section 8.6 Standard deviation

Example 2

These are the test marks of 11 students:

52, 78, 61, 49, 79, 47, 54, 58, 72, 62, 73

Find   (i)   the median   (ii)   the lower quartile
         (iii) the upper quartile   (iv)   the interquartile range.

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Example 2

Find the standard deviation of the following frequency distribution:

Variable (x)	1	2	3	4	5	6
Frequency (f)	9	9	6	4	7	3

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Example 3

Find (a) the mean (b) the standard deviation   of the following sets of numbers:
 (i) 5, 3, 1, 8, 2   (ii) 10, 6, 2, 16, 4

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Example 4

The following frequency distribution table shows the number of birdies scored per round of golf.

No. of birdies	0	1	2	3	4	5	6
Frequency	5	6	4	6	3	1	0

Find the mean and standard deviation, correct to one decimal place.

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Exercise 8.6

1. Calculate the standard deviation of each of the following arrays of numbers, giving your answer correct to one decimal place:

 (i) 2, 5, 6, 7   (ii) 3, 6, 7, 9, 10   (iii) 2, 4, 6, 8, 10
 (iv) 1, 3, 7, 9, 10   (v) 8, 12, 15, 9   (vi) 1, 3, 4, 6, 10, 12

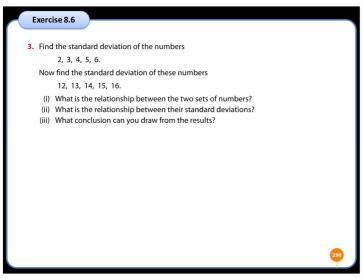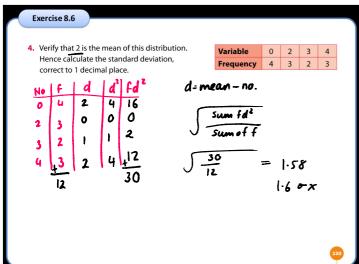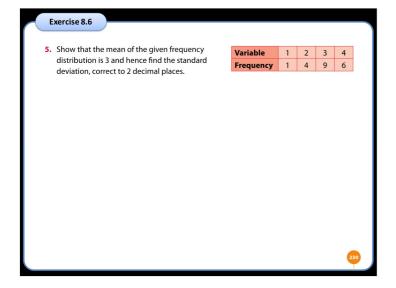 Use your calculator to verify your answer in each case.

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Exercise 8.6

2. Show that the following sets of numbers have the same standard deviation:
 (a) 2, 3, 5, 7, 8   (b) 6, 7, 9, 11, 12

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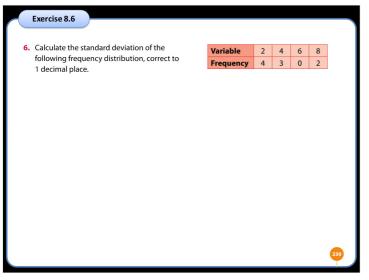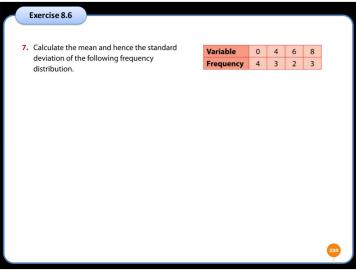
3. Find the standard deviation of the numbers
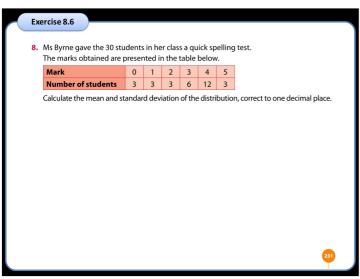
   2, 3, 4, 5, 6.

   Now find the standard deviation of these numbers

   12, 13, 14, 15, 16.

   (i) What is the relationship between the two sets of numbers?
   (ii) What is the relationship between their standard deviations?
   (iii) What conclusion can you draw from the results?

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4. Verify that 2 is the mean of this distribution. Hence calculate the standard deviation, correct to 1 decimal place.

Variable	0	2	3	4
Frequency	4	3	2	3

No	f	d	d²	fd²
0	4	2	4	16
2	3	0	0	0
3	2	1	1	2
4	3	2	4	12
	12			30

$d = mean - no.$

$\sqrt{\dfrac{Sum\ fd^2}{Sum\ of\ f}}$

$\sqrt{\dfrac{30}{12}} = 1.58$

$1.6\ \sigma x$

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5. Show that the mean of the given frequency distribution is 3 and hence find the standard deviation, correct to 2 decimal places.

Variable	1	2	3	4
Frequency	1	4	9	6

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Using the calculator for frequency

① [SHIFT]
② [MODE] → Setup
③ [▾]
④ [3] STAT
⑤ [1] ON

Pg 230
Q5, 6, 7.

$\bar{X}$ mean and σx S.D

① [MODE]
② [2] STAT
③ [1] 1-var
④ Input value use [=] after each input
⑤ [AC]
⑥ [SHIFT]
⑦ [1] STAT
⑧ [4] VAR
⑨ [2] $\bar{x}$ mean or [3] σ-X S.D.

6. Calculate the standard deviation of the
following frequency distribution, correct to
1 decimal place.

Variable	2	4	6	8
Frequency	4	3	0	2

7. Calculate the mean and hence the standard
deviation of the following frequency
distribution.

Variable	0	4	6	8
Frequency	4	3	2	3

8. Ms Byrne gave the 30 students in her class a quick spelling test.
The marks obtained are presented in the table below.

Mark	0	1	2	3	4	5
Number of students	3	3	3	6	12	3

Calculate the mean and standard deviation of the distribution, correct to one decimal place.

9. The number of letters delivered to a business premises on each day of the 5-day working week were as follows:

18, 26, 22, 34, 25

 (i) Calculate the mean number of letters delivered.
 (ii) Calculate the standard deviation, correct to one decimal place.
 (iii) If $\bar{x}$ is the mean and σ is the standard deviation, find the values of $\bar{x} + \sigma$ and $\bar{x} - \sigma$.
 (iv) On how many days is the number of letters delivered within one standard deviation of the mean?

10. The data below gives the number of books read in the last month by a class of 20 students.

Number of books, x	0	1	2	3	4
Number of students, f	2	5	6	5	2

Find the mean and standard deviation of the number of books.

11. Using the mid-interval values, find the standard deviation of the given grouped frequency distribution. Give your answer correct to 1 decimal place.

Class interval	1–3	3–5	5–7	7–9
Frequency	4	3	0	2

12. The following table shows the times taken by 15 pupils to solve a problem.

Time (in minutes)	2–4	4–6	6–10
No. of students	3	5	7

By taking mid-interval values, calculate
(i) the mean (ii) the standard deviation.

13. There are two routes for a worker to get to his office. Both the routes involve delays due to traffic lights. He records the time it takes over a series of six journeys for each route. The results are shown in the table.

Route 1	15	15	11	17	14	12
Route 2	12	15	18	16	17	12

(i) Work out the mean time taken for each route.
(ii) Calculate the standard deviation of each of the two routes.
(iii) Using your answers to (i) and (ii), suggest which route you would recommend. State your reason clearly.

Answers 8.6

1. (i) 1.9 (ii) 2.4 (iii) 2.8
   (iv) 3.5 (v) 2.7 (vi) 3.9
3. (i) 10 is added to each number
   (ii) Same (both $= \sqrt{2}$)
   (iii) equal standard deviations
4. 1.6
5. 0.84
6. 2.3
7. Mean $= 4$; $\sigma = \sqrt{10}$
8. Mean $= 3$; $\sigma = 1.14$
9. (i) 25 (ii) 5.3
   (iii) 30.3; 19.7 (iv) 3
10. Mean $= 2$; $\sigma = 1.5$
11. 2.3
12. (i) 6 (ii) 2
13. (i) Route 1 $= 14$; Route 2 $= 15$
    (ii) Route 1 $= 2$; Route 2 $= 2.3$
    (iii) Route 1 recommended