Pick Up

The Warm Up

Delay (n minutes)	Frequency
$0 < n \leq 20$	16
$20 < n \leq 30$	26
$30 < n \leq 40$	23
$40 < n \leq 50$	10
$50 < n \leq 60$	5

Cumul. freq

16

42

65

75

80

(20, 16)

(30, 42)

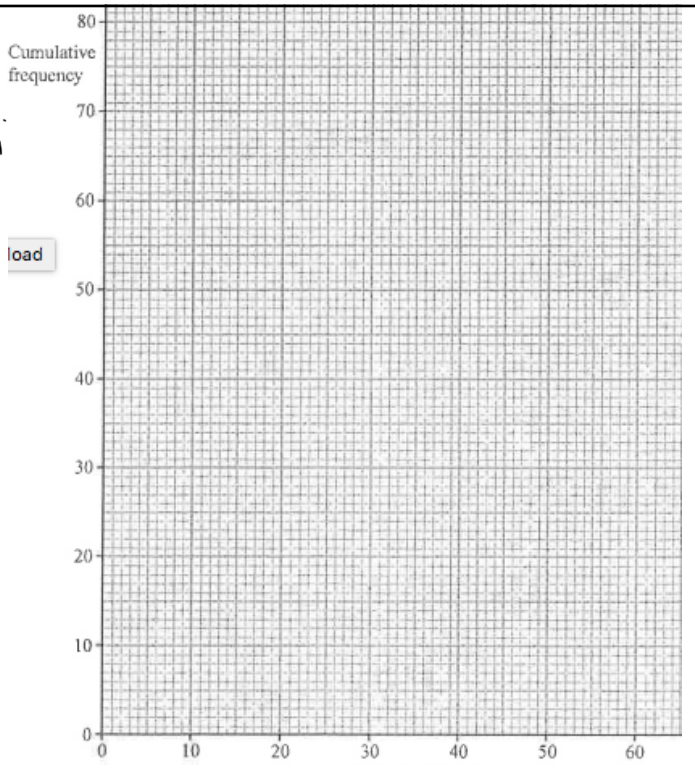
(1) Construct a cumulative

Delay (n minutes)	Frequency
$0 < n \leq 20$	16
$20 < n \leq 30$	26
$30 < n \leq 40$	23
$40 < n \leq 50$	10
$50 < n \leq 60$	5

Cumul. freq
16
42
65
75
80

load

(2) From the graph estimate the Delay at the 35th percentile



(1) Construct a cumulative

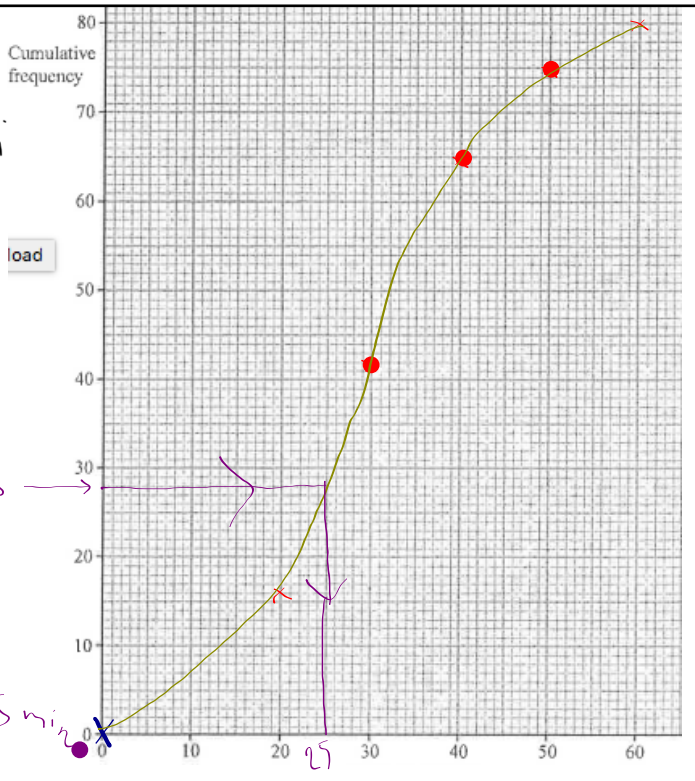
Delay (n minutes)	Frequency
$0 < n \leq 20$	16
$20 < n \leq 30$	26
$30 < n \leq 40$	23
$40 < n \leq 50$	10
$50 < n \leq 60$	5

Cumul. freq
16
42
65
75
80

load

(2) From the graph estimate the Delay at the 35th percentile

35th percentile
Delay time is 25 min



35% of 80

$\simeq$ 28

(3) Consider $f(x) = x+1$ and $g(x) = 3^x - 2$

a) Write down the x-intercept of $f(x)$

$y = x+1 \quad 0 = x+1 \quad (-1, 0)$

$x = -1$

b) write down the y-intercept of $g(x)$

$g(0) = 3^0 - 2$

$1 - 2$

-1

a) Using your GDC, solve the equation

$f(x) = g(x)$

$x+1 = 3^x - 2$

Solutions $x \doteq 1.34$

$x \doteq -2.96$

Consider $f(x) = x+1$ and $g(x) = 3^x - 2$

About Random HW Checks

- will be entered directly in gradebook and then returned to you
- I'll give you a score out of 10 based on fidelity (work shown / quality time spent / not rushed) → written at bottom
- will be scaled to about 5
- It will be returned to you. Keep it and include with all your other papers.

If you are absent the day of a random check, I'll collect 2 assignments from you the next time I do a random check

that day + day before

If you have an excused absence the day day before a random check, you can either turn it in if completed or you fall in the group above.

As you look at the HW solutions

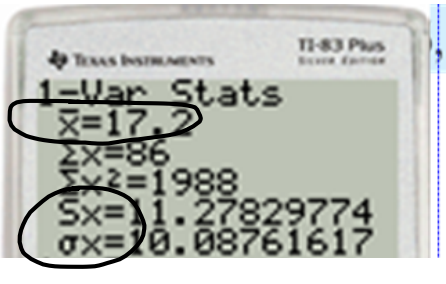
I'll return yesterday's HW

Calculate the *Mean, x and Std Dev.*

With Simple Data.... 13, 12, 15, 13, 18, 14, 16, 15, 15, 17

which means you can quickly enter the data in your GDC and use

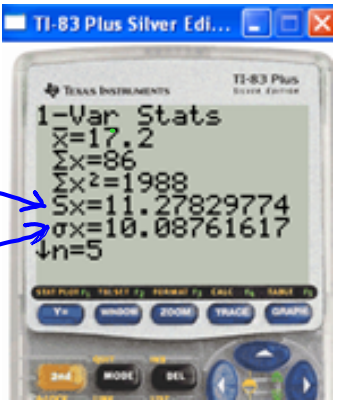
STAT-CALC-1variable statistics



Your GDC will calculate both versions of the standard deviation.

Sample standard deviation
(not for IB)

Population standard deviation
(always use for any IB work)



For IB, always use the value given for the second one σ_x, but *write it* using the notation s_x

$s_x = 10.0876$

However, if .....

Score	*Frequency*
11	3
12	4
13	5
14	2
15	8

or like this.....

Mark	*Frequency*
50 - 59	16
60 - 69	24
70 - 79	13
80 - 89	6
90 - 99	2

$$\bar{x} = \frac{\sum f \cdot x}{n}$$

1-Variable Stat L_1, L_2

for Standard Deviation:

Yesterday.....we only looked at data **not** grouped in intervals when calculating $\mathbf{S_x}$

13, 12, 15, 13, 18, 14, 16, 15, 15, 17

The formula is $s_x = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$

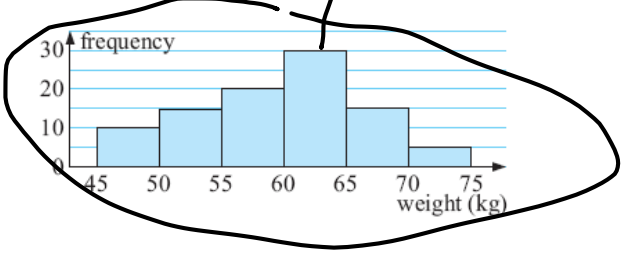
However, if each pieceof data has frequencies (and possibly grouped into intervals) like this.....

Score	*Frequency*
11	3
12	4
13	5
14	2
15	8

or like this.....

Mark	*Frequency*
50 - 59	16
60 - 69	24
70 - 79	13
80 - 89	6
90 - 99	2

or like this.....



TODAY

Calculate standard deviation if data is grouped into intervals and has frequencies

Take Notes in your own paper today

then the more complicated formula is required

Regular Data

Grouped with frequencies

Mean $\bar{X} = \frac{\Sigma x_i}{n}$

$\bar{X} = \frac{\Sigma f x}{\Sigma f}$

$S = \sqrt{\frac{\Sigma (x_i - \bar{x})^2}{n}}$

$S = \sqrt{\frac{\Sigma f (x_i - \bar{x})^2}{\Sigma f}}$

σ

example

Find the estimated mean and standard deviation. Show all critical values.

[the quick option]

Families at a school in Australia were surveyed, and the number of children in each family recorded. The results of the survey are shown alongside.

Number of children	*Frequency*
1	5
2	28
3	15
4	8
5	2
6	1
Total	59

$\bar{x} =$

$s =$

Number of children	*Frequency*
1	5
2	28
3	15
4	8
5	2
6	1
Total	59

$$\bar{X} = \frac{\Sigma fx}{\Sigma f} = \frac{154}{59} = 2.61 \text{ children}$$

Number of children	*Frequency*
1	5
2	28
3	15
4	8
5	2
6	1
Total	59

$$\bar{X} = \frac{\Sigma fx}{\Sigma f}$$

L_1 L_2 2.61 L_3

$$s = \sqrt{\frac{\Sigma f(x_i - \bar{x})^2}{\Sigma f}} = \sqrt{\frac{640339}{59}} = 1.04 \text{ children}$$

Example 2.... find the average Mark on a college chemistry exam [w/critical totals]

L1

Marks	Frequency
0 - 9	2
10 - 19	31
20 - 29	73
30 - 39	85
40 - 49	28

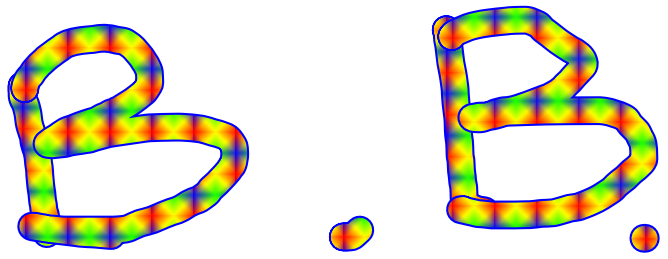
4.5
14.5

$\bar{X} = 29.34$

$$s = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} = \sqrt{\quad}$$

$=$

$$\sqrt{\frac{18469.4}{219}} \doteq 9.18 \text{ marks}$$



$$s = \sqrt{\frac{\sum f(x_i - \bar{x})^2}{\sum f}}$$

If using on a project with a ton of large data, you will have to use a spreadsheet.

In that case you have to calculate the mean first

$$\bar{x} = \frac{\sum x_i}{n}$$

A guy was walking along and saw a frog sitting on the side of the road. The frog said, "If you kiss me, I'll turn into a beautiful princess."

The guy picked up the frog, looked it over, smiled, put it into his pocket and continued on his way.

A few minutes later the frog said, "If you kiss me, I'll turn into a beautiful princess and stay with you for a week!" The guy took the frog out of his pocket, smiled, and put it back into his pocket.

A few minutes later the frog said " If you kiss me, I'll turn into a beautiful princess, stay with you for a week and do ANYTHING you want!!" The guy took the frog out of his pocket again, smiled at it, and put it back into his pocket.

Finally, the frog said, "I SAID that if you would just kiss me, I would turn into a beautiful princess and do ANYTHING you want for a whole week!

Why won't you kiss me?"

The guy said, "Look, I'm a statistician and I don't have time for girl friends, but a talking frog is kind of neat."

Example with a laptop.

find the mean and std. deviation

Number of children	*Frequency*
1	5
2	28
3	15
4	8
5	2
6	1
Total	59

Open Google Sheets

1	Allen, Robert T
2	Andrade-Pelayo,
3	Apker, Cory R.
4	Barnes, Hannah
5	Capper, Carolin
6	Collins, Naomi
7	Cramer, Aiden J
8	Engle, Akira R.
9	Flow, Ethan J.
10	Ford, Peter T.
11	Grigsby, Owen A
12	Healey, Brandon
13	Heusch, Ashlyn
14	Hoffman, Anne M
15	Hyder, Macey G.
16	Iboa, Abraham J
17	Jacobson, Luke
18	Lee, Blake M.
19	Lippert, Zachar
20	Martinez, Aaliy
21	Mau, Owen T.
22	Mayers, Edith J
23	McNamara, Mazie
24	McNeale, Maggie
25	Mehlhaff, Benja
26	Morris, Olivia
27	Opdahl, Ellison
28	Papen-Gould, An
29	Poulsen, Eadie
30	Quesada, Anthon
31	Ratzlaff, McKen
32	Sales, Emily N.
33	Sanderson, Zoe
34	Stalie, Kelton
35	Strode, Serena
36	Thometz, Ethan
37	Wagers, Morgan
38	Ward, Jenna K.
39	Williams, Brock
40	Yakovich, Nicho

first the mean

$$\bar{X} = \frac{\sum fx}{\sum f}$$

=

$$\bar{X} = \sqrt{\frac{\sum f(x-\bar{x})}{\sum f}}$$

$$= \sqrt{\qquad\qquad} = \frac{9}{9} = 0$$

What would be different if finding the standard deviation of the following ?

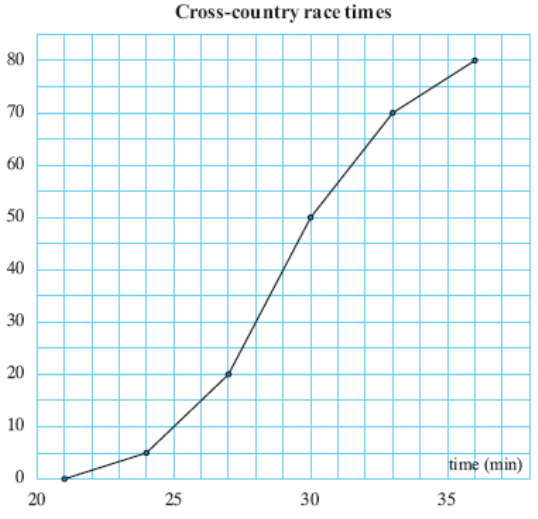
Number of vehicles	*Frequency*
1 - 5	4
6 - 10	16
11 - 15	22
16 - 20	28
21 - 25	14
26 - 30	9
31 - 35	5
36 - 40	2

Assignment

Worksheet 2 for Day 2 of Standard Deviation

Will need Access to Google Sheets via your 4J account

The following cumulative frequency graph displays the performance of 80 competitors in a cross-country race.



Find:

a the lower quartile time

b the median

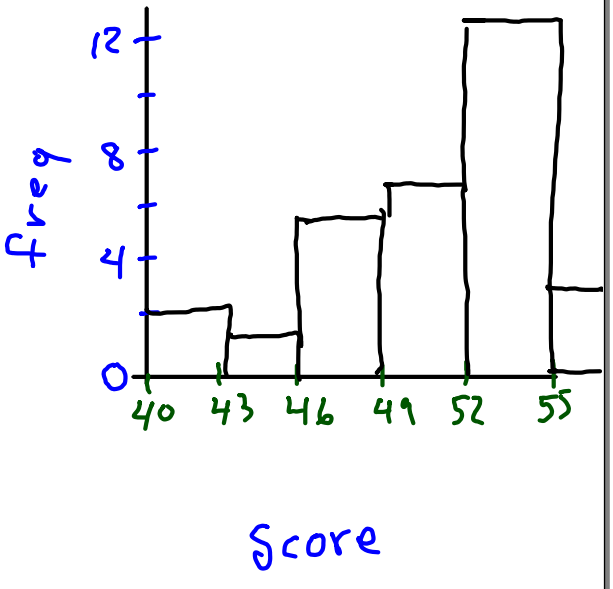
c the upper quartile

d the interquartile range

e an estimate of the 40th percentile.

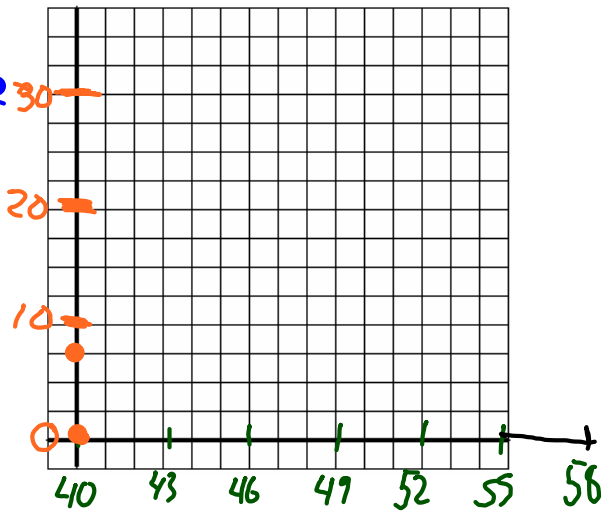
1.

	Score (x)	freq (f)
40-	40-42	2
43-	43-45	1
46-	46-48	5
49-	49-51	6
52	52-54	12
55-	55-57	3



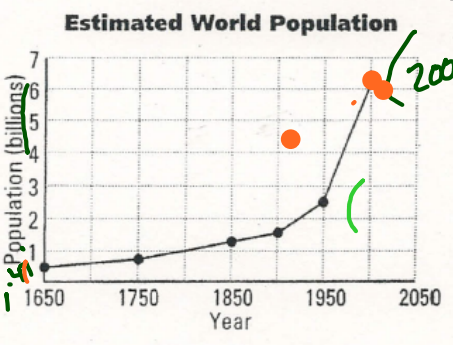
2.

Score (x)	freq (f)	Cumul. freq
40–42	2	2
43–45	1	3
46–48	5	8
49–51	6	14
52–54	12	26
55–57	3	29



3.

Estimated World Population	
Year	Population (billions)
1650	0.470
1750	0.790
1850	1.260
1900	1.650
1950	2.520
2000	6.090



a. Data are given for six years. Between which two of these years is the rate of population growth the greatest?

1. a. 1950–2000

b. Calculate the average rate of change of the world population over the time interval in part a.

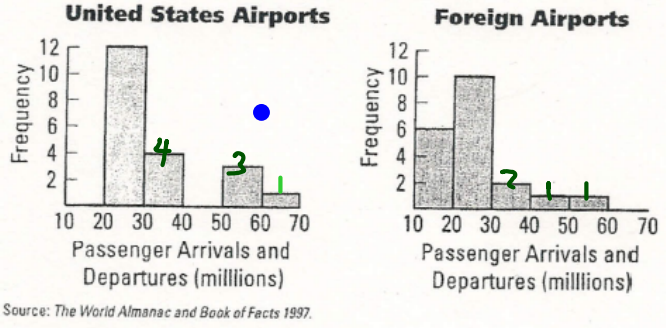
b. _____

Find the average rate of change of the world population per year between 1650 and 2000.

2. _____

$$\frac{6.090 - .470}{2000 - 1650} = \frac{5.62}{350} = .016\,69 \text{ or } 16.057 \text{ mil/year}$$

4. use the histograms below, which show the distributions of passenger traffic during 1995 at the busiest United States and foreign airports. There are twenty airports in each group. Each interval includes the left endpoint, but not the right.



Source: *The World Almanac and Book of Facts 1997.*

In which interval does the first quartile for foreign airports lie? between 5th & 6th place of data

7. 10-20 mil

In 1995, how many more United States airports than foreign airports had at least 30 million passenger arrivals and departures?

8. 4 more

8 - 4 = 4

5. The birth weights, in kilograms, of 27 babies are given in the diagram below.

$\frac{27+1}{2} = 14$

1	7, 8, 9	key 1|7 = 1.7 kg
2	1, 2, 2, 3, 5, 5, 7, 8, 9	
3	0, (1) 3, 4, 5, 5, 6, 6, 7, 9	
4	1, 1, 2, 3, 7	

Write down:

(i) the median weight, 3.1 kg

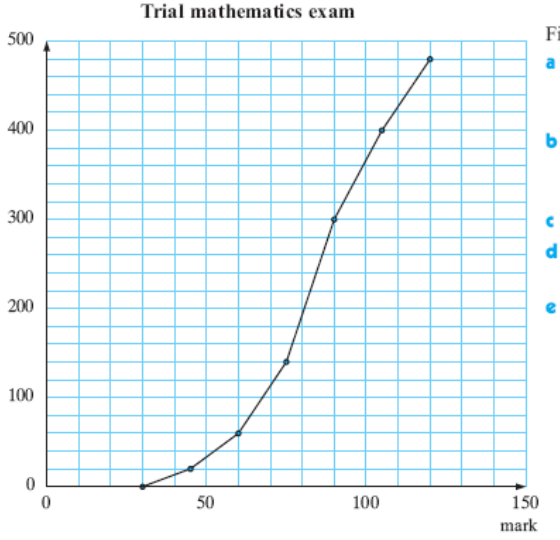
(ii) the upper quartile. 3.7 kg

(iii) Find the weight closest to the 60th percentile.

60% of 27 positions $\simeq$ 16.2 $\simeq$ 16th position $\rightarrow$ 3.4 kg

6

The cumulative frequency graph below displays the marks scored by year 12 students from a cluster of schools in a common trial mathematics exam.



Find:

a how many students sat for the examination

b the probable maximum possible mark for the exam

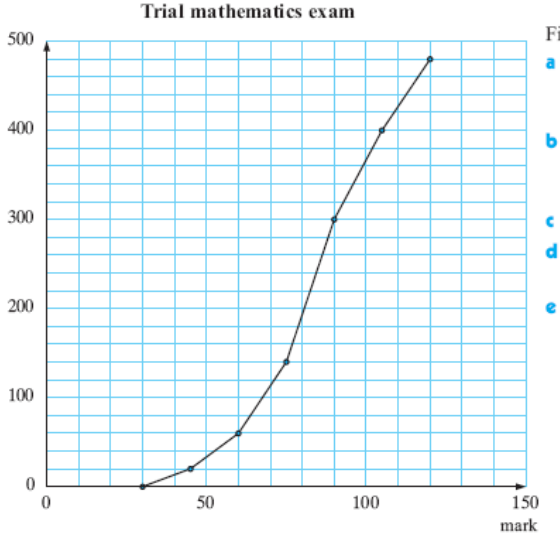
c the median mark

d the interquartile range

e an estimate of the 85th percentile.

6

The cumulative frequency graph below displays the marks scored by year 12 students from a cluster of schools in a common trial mathematics exam.



Find:

a how many students sat for the examination

b the probable maximum possible mark for the exam

c the median mark

d the interquartile range

e an estimate of the 85th percentile.

1-6 #19

10 students, 40 rolls each = 400 rolls total

Mean heads per student = 18.2 heads

for all students, multiply by 10

= 182 heads