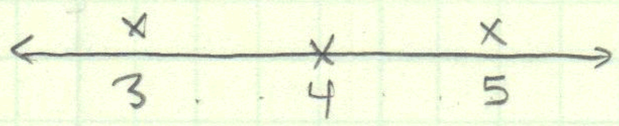
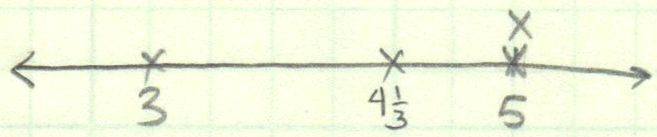
Chapter 4 Exercise Set A.

1a



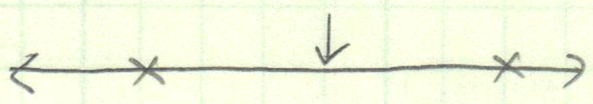
$\frac{3+5}{2} = 4$

1b



$\frac{3+5+5}{3} =$

1c



average is midpoint between a list of two #'s.

2 All 1's $(1+1+1+1+1+1+1+1+1+1)/10 = 1$ only way it can happen

All 3's $(3+3+3+3+3+3+3+3+3+3)/10 = 3$ same as above.

No! An average cannot be greater than the list of numbers it comes from.

3 ii has the bigger average because it adds 11 to i's list. 11 is the biggest number so the average gets bigger.

4 5'6" = 66" × 10 people = 660 inches
6'5" = 77" × 1 person = 77 inches

$(660+77)/11$ people = 67" or 5'7"

5 5'6" = 66" × 21 people = 1386"
6'5" = 77" × 1 person = 77"

$(1386+77)/22$ people = 66.5" or $5'6\frac{1}{2}"$

The result is smaller because we had more people with lesser heights.

6 The new person would have to be average plus one inch per person in the room so

5'6" = 66" + 22" = 88" or 7'4" WOW!

8 False. HANES is not a longitudinal study, its cross sectional. Men around 45 or younger tend to be heavier because they didn't live in such hard times. This affects blood pressure.

9 During recessions those w/ low paying jobs typically get laid off. That increases the average at the start. They get rehired at the end which explains the dip.

Chapter 4 Exercise Set B

1 a) 50
b) 25
c) 40 (average follows tail) but 50 is even too much because that is where it looks like it balances.

2 a) equal to, the histogram is symmetrical
b) same as a
c) Left of average because its skewed we know that the average will follow the tail, so in this case the median will follow the hump or left of average.

3 20

4 25 Skewed to right so average goes up.

5 Average because the histogram will have a drastic right skew due to re-entry students

6 a) 1
b) 10
c) 5
d) 1 (With negatives)

Chapter 4 Exercise Set C

1a Ave: $\frac{1+(-3)+5+(-6)+3}{5} = 0$

RMS: $\frac{1^2+(-3)^2+(5)^2+(-6)^2+(3)^2}{5} = \sqrt{16} = 4$

1b Ave: $\frac{(-11)+8+(-9)+(-3)+15}{5} = 0$

RMS: $\frac{(-11)^2+(8)^2+(-9)^2+(-3)^2+15^2}{5} = \sqrt{100} = 10$

2
a) 10
b) 20
c) 1

3a RMS: $\frac{7^2+7^2+7^2+7^2}{4} = \sqrt{49} = 7$

3b RMS: $\frac{(-7)^2+(-7)^2+(-7)^2+(-7)^2}{4} = \sqrt{49} = 7$

4 $\frac{(103-100)^2+(96-100)^2+(101-100)^2+(104-100)^2}{4} = \frac{(3)^2+(-4)^2+(1)^2+(4)^2}{4}$

$= \sqrt{10.5} = 3.2$

5 $\frac{103+96+101+104}{4} = 101 = \text{ave.}$

$\frac{(103-101)^2+(96-101)^2+(101-101)^2+(104-101)^2}{4} = \frac{(2)^2+(5)^2+0^2+(3)^2}{4}$

$= \sqrt{9.5} = 3.08$

6 Prediction Errors are what we want

$[(90-88)^2+(90-70)^2+(87-81)^2+(80-85)^2+(42-63)^2+(70-77)^2+$
$(67-66)^2+(60-49)^2+(83-71)^2+(94-69)] / 10$

$= \frac{(2)^2+(20)^2+6^2+(-5)^2+(-21)^2+(-7)^2+1^2+11^2+12^2+25^2}{10}$

$= \frac{4+400+36+25+441+49+1+121+144+625}{10} = \sqrt{184.6} = 13.5$

NO! our R.M.S. is way bigger so something is wrong w/ the program.

Chapter 4 Exercise Set D

1a 170 - 146 = 24 so 3 SD's fit into 24.

1b 148 - 146 = 2 so $\frac{1}{4}$ SD's fit into 2

1c 1.5 SD's is 12 (1.5×8) he was shorter than average so 146 - 12 = 134

1d 2.25 SD's is 18 (2.25×8) if he is shorter than average than he is 146 - 18 = 128" tall
If he is taller than 146 + 18 = 164" tall

2a
150 about average
130 unusually short
165 unusually tall (more than 1-2 SD's away)
140 about average

2b 138 ≤ 154 corresponds to 1 SD above and below ave; so 68% of the boys are between these heights.
130 ≤ 162 corresponds to 2 SD's above and below ave. so 95% of the boys are between these heights.

3 iii is biggest (look at range / spread)
ii is smallest

4
a) 1
b) 2
c) 2
d) 2
e) 10

5 25 years because 5 is too small for the 2 SD rule and 50 is too big.

6
a) i ave looks right and going up & down 2 SD's looks like 95% of the data
b) iii ave looks right and SD is smaller than in i
c) v ave shifted but SD stayed the same.

7 In Experiment i the differences in ave weight are very distant even though the SD's are similar this means the treatment group is heavier to start with

8a Be about the same if he is sampling at random.

8b Be about the same for the same reason above.

8c The bigger the sample the bigger the range of values will be so he will have the tallest men.

8d The bigger the sample the bigger the range of values will be so he will have the shortest men too.

9 3 inches. 1 SD away is 68% ≈ 2/3 to be right and 1/3 chance to be off.

10 3 inches this is the definition of the SD.

Chapter 4 Exercise Set E

1. ii because it's spread is greater.

   SD of i) 1
   SD of ii) 2

2. No! You must find the R.M.S. of the deviations.

3. Yes! We followed the procedure correctly

4. a) they are all the same ☺
   b) Class B because the points tended to be farthest from average compared to A & C.
   c) All Classes ranged from 1 to 99, they are the same

5. i ave: 4
   dev: -3, -1, 1, 3
   SD: 2

   ii ave: 9
   dev: -3, -1, 1, 3
   SD: 2

   list ii is list (i + 5) only ave changes. SD's are the same.

6. i ave: 4
   dev: -3, -1, 1, 3
   SD: 2

   ii ave: 12
   dev: -9, -3, 3, 9
   SD: 6

   list ii is list i × 3 ave and SD are multplied by 3.

7. i ave: 2
   dev: 3, -6, 1, -3, 5
   SD: 4

   ii ave: -2
   dev: 3, -6, 1, -3, 5
   SD: 4

   list ii is list -i ave has opposite sign but SD stays the same.

8a. Increase the average by $250 dollars.
The SD would stay the same.

8b. Increase the average salary by 5%.
The SD would increase by 5% too.

9 RMS = $\frac{(17)^2+(17)^2+(17)^2+(17)^2+(17)^2}{5} = \sqrt{17^2} = 17$

SD = 0

10 RMS because SD will subtract the values from average where the RMS will not.

11 No because of the squaring procedure. In the process of finding the RMS of the deviations.

12 Yes If the list is 1, 1, 1, 1, 16 the average is 3.6
But the SD is 6.

Chapter 4 Review Exercises

1a ave: 50 SD: 5

1b .5 SD's is 2.5 so 48, 50, 50 are within .5 SD's.
1.5 SD's is 7.5 so 48, 50, 50, 54, & 57 are within that.

2a ii because more points are closer to average that causes the SD to decrease.

2b i because more points are far away from average in ii and that causes the SD to increase.

3 a) 5
b) 3 (1 is too small & 6 is too big for our SD rules)

4 income: average is bigger because it is right skewed and average follows the tail
education: average is smaller because it is left skewed.

5

80 mm	unusually low
115 mm	about average
120 mm	about average
210 mm	unusually high

6a

i	60	a bit away from median toward tail
ii	50	
iii	40	same as a.

6b
i the median is bigger than average.
ii the median is about equal to the average.
iii the median is less than average

6c 15 (process of elimination, other two are too big/small)

6d False, they will be about the same since they almost are mirror images of each other.

7a Multiplying by constants. Everything is multiplied by 2.2

Men	ave	145.2	SD	19.8
Women	ave	121	SD	19.8

7b The numbers in question are about 1 SD above and below average so 68%

7c It would be bigger because you are increasing the overall range.

8a For the average to stay at 151 for all children, the average of the girls has to be 151 too.

8b $\frac{137+151}{2} = 144$

9a Yes it becomes larger to chase the extreme value.

9b No, the middle # will be the same no matter how the highest number is entered.

10 a) 163 because its the average

b) 8 due to the fact that 68 percent of data is within 8 points (the SD) so 32% is outside about 1 in 3 chance.

11 8 because we'd expect the losses to be about the same as the dev. from average or SD.

12 This study is cross sectional, not longitudinal so we can't make any conclusions about people over time