

$$\text{angle} = (\text{relative frequency}) \cdot 360^\circ \quad Z = \frac{X - \mu}{\sigma}$$

$$\mu = \frac{x_1 + x_2 + \cdots + x_n}{n} \quad \sigma = \sqrt{\frac{(x_1 - \mu)^2 + (x_2 - \mu)^2 + \cdots + (x_n - \mu)^2}{n}}$$

$$\mu = \frac{f_1 x_1 + f_2 x_2 + \cdots + f_n x_n}{f_1 + f_2 + \cdots + f_n} \quad \sigma = \sqrt{\frac{f_1 (x_1 - \mu)^2 + f_2 (x_2 - \mu)^2 + \cdots + f_n (x_n - \mu)^2}{f_1 + f_2 + \cdots + f_n}}$$

1. (12pts) The National Hurricane Center reported that the number of North Atlantic tropical storms reaching the U.S. coast in each of the years 1986-1995 were 6, 7, 12, 11, 14, 8, 7, 8, 7, 19, in order by years.

- Find the range.
- Find the median.
- Find the mean.
- Find the standard deviation.

a) range is  $19 - 6 = 13$

b) 6, 7, 7, 7, 8, 8, 11, 12, 14, 19

$\uparrow \quad \uparrow$   
 5th 6th (of 10)  
 median =  $\frac{8+8}{2} = 8$

c)  $\mu = \frac{6 + 3 \cdot 7 + 2 \cdot 8 + 11 + 12 + 14 + 19}{10}$

$$= \frac{99}{10} = 9.9$$

d)  $\sigma^2 = \frac{(6-9.9)^2 + 3 \cdot (7-9.9)^2 + 2 \cdot (8-9.9)^2 + (11-9.9)^2 + (12-9.9)^2 + (14-9.9)^2 + (19-9.9)^2}{10}$

$$\sigma^2 = \frac{152.91}{10} = 15.291$$

$$\sigma = 3.91$$

2. (13pts) A calculus 3 class had the final grades given in the table. Assume the usual association of grades with numbers (A=4, B=3, C=2, D=1, E=0).

- Find the median.
- Find the mean.
- Find the standard deviation.

Grade	Frequency
A 4	6
B 3	10
C 2	5
D 1	1
E 0	1
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a)  $\overbrace{4, \dots, 4}^6, \overbrace{3, \dots, 3}^{10}, \overbrace{2, \dots, 2}^5, \overbrace{1}^1, \overbrace{0}^1$   
 $\uparrow$   
 13th number is here, so median = 3

b)  $\frac{6 \cdot 4 + 10 \cdot 3 + 5 \cdot 2 + 1 \cdot 1 + 1 \cdot 0}{23} = \frac{65}{23} = 2.83$

c)  $\sigma^2 = \frac{6(4-2.83)^2 + 10(3-2.83)^2 + 5(2-2.83)^2 + 1(1-2.83)^2 + 1(0-2.83)^2}{23}$   
 $\sigma^2 = \frac{23.304}{23} = 1.013\dots$   
 $\sigma = 1.01$

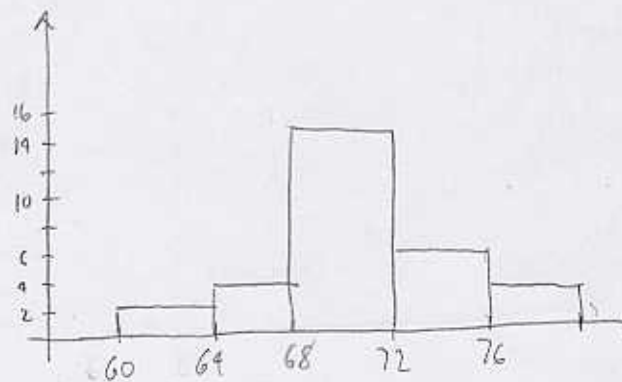
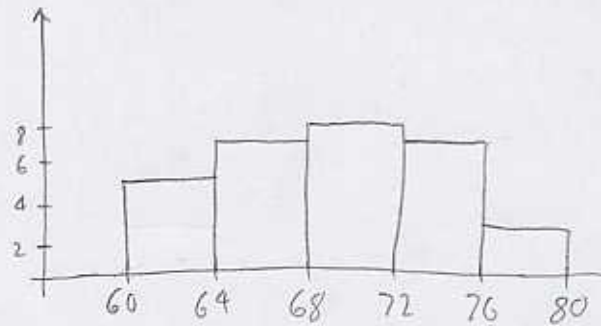
3. (8pts) The two tables below represent heights, in inches, of college students in two classes.

a) Draw a histogram for each class.

b) By looking at the histograms, which table should give you a bigger standard deviation? Explain why.

Height	Students
60-64	5
64-68	7
68-72	8
72-76	7
76-80	3

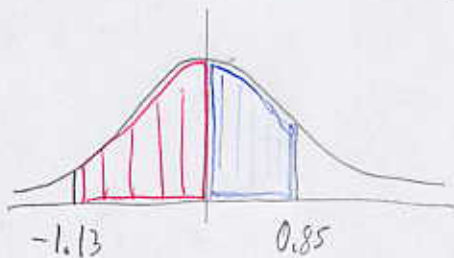
Height	Students
60-64	2
64-68	4
68-72	15
72-76	6
76-80	3



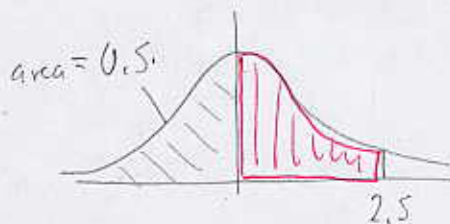
e) The upper table has a greater stand. dev. since data is more spread out

4. (10pts) Compute the following probabilities for a standard normal distribution. Draw a picture showing which area you are computing.

$$a) P(-1.13 < Z < 0.85) = \text{red area} + \text{blue area} = 0.3708 + 0.3023 = 0.6731$$



$$b) P(Z \leq 2.5) = 0.5 + \text{red area} = 0.5 + 0.4938$$



$$= 0.9938$$

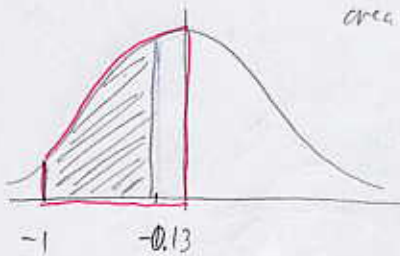
5. (7pts) Suppose the scores for an IQ test are normally distributed with mean 100 and standard deviation 15. If a random test taker is chosen, what is the probability their score is between 85 and 98? Draw a picture showing which area you are computing.

$$P(85 \leq X \leq 98) = P\left(\frac{85-100}{15} \leq Z \leq \frac{98-100}{15}\right)$$

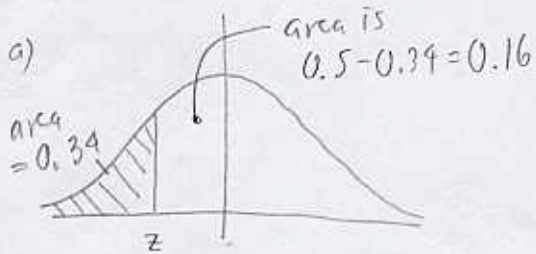
$$= P(-1 \leq Z \leq -0.13)$$

$$= \text{red area} - \text{blue area} = 0.3413 - 0.0517$$

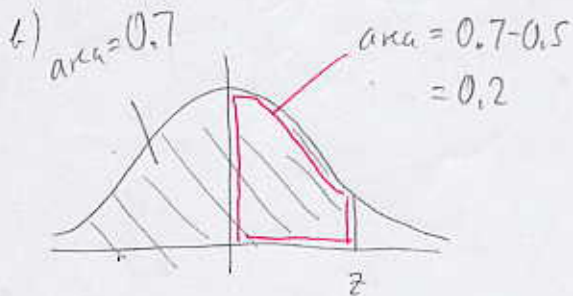
$$= 0.2896$$



**Bonus.** (5pts) In a standard normal distribution, which score falls at the  
 a) 34th percentile?  
 b) 70th percentile?



closest number to 0.16  
 in table occurs for 0.41  
 so  $z = -0.41$



closest number to 0.2  
 in table occurs for 0.52  
 so  $z = 0.52$