

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

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

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

1. (10pts) A middle school basketball team played 8 games. The numbers of points they scored in those games are 36, 76, 45, 46, 113, 63, 34 and 35.

- Find the team's median score.
- Find the team's mean score.
- Find the standard deviation of scores.

a) In increasing order: 34, 35, 36, 45, 46, 63, 76, 113

$$\text{median} = \frac{45 + 46}{2} = 45.5$$

middle two

$$b) \mu = \frac{34 + 35 + 36 + 45 + 46 + 63 + 76 + 113}{8} = \frac{448}{8} = 56$$

$$c) s^2 = \frac{(34-56)^2 + (35-56)^2 + \cdots + (76-56)^2 + (113-56)^2}{8}$$

$$= \frac{5244}{8} = 655.5$$

$$s = 25.6$$

2. (13pts) A Calculus 1 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).

- What is the mode grade? A
- Find the median.
- Find the mean.
- Find the standard deviation.

Grade	Frequency
A 4	6
B 3	3
C 2	5
D 1	4
E 0	4

22

11th 12th  
 $\downarrow \downarrow$   
 0:  $\frac{0, \overbrace{0}, \overbrace{1}, \overbrace{1}, \overbrace{2}, \overbrace{2}}{5}, \overbrace{3}, \overbrace{3}, \overbrace{3}}{3}, \overbrace{4}, \overbrace{4}}{6}$

Need 11th: 2      median =  $\frac{2+2}{2} = 2$   
 12th: 2

c)  $\mu = \frac{6 \cdot 4 + 3 \cdot 3 + 5 \cdot 2 + 4 \cdot 1 + 4 \cdot 0}{22} = 2.14$

d)  $\sigma^2 = \frac{6(4-2.14)^2 + 3(3-2.14)^2 + 5(2-2.14)^2 + 4(1-2.14)^2 + 4(0-2.14)^2}{22}$   
 $= \frac{46.59}{22} = 2.1177$

$\sigma = \sqrt{2.1177} \approx 1.46$

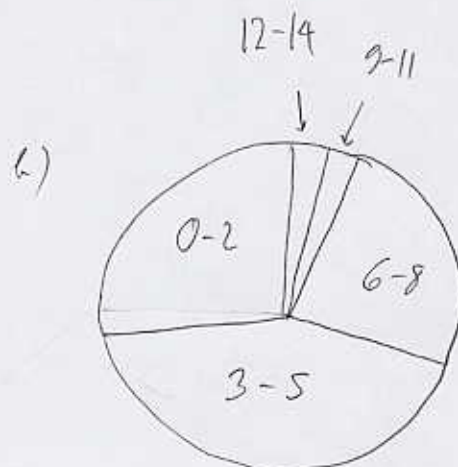
3. (10pts) The number of people living in each house of a particular neighborhood is shown below.

- Find the relative frequencies for each class.
- Find the appropriate angles and draw a pie chart for the data.
- Estimate the mean (find representative values first).

People in house	Number of houses	Relative frequency	Angle	Representative value
12-14	3	0.02	6.59	13
9-11	6	0.04	13.17	10
6-8	36	0.22	79.02	7
3-5	74	0.45	162.44	4
0-2	45	0.27	98.78	1

$$\bar{x} \approx \frac{3 \cdot 13 + 6 \cdot 10 + 36 \cdot 7 + 74 \cdot 4 + 45 \cdot 1}{164}$$

$$= 4.22$$



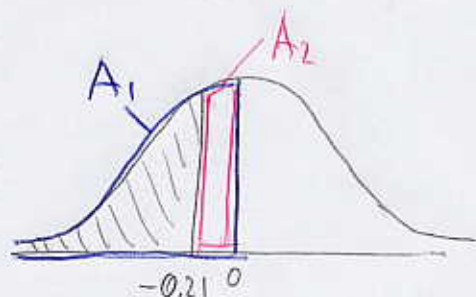
4. (10pts) Compute the following probabilities for a standard normal distribution. Draw a picture showing which area you are computing.

a)  $P(-0.4 \leq Z < 0.35) = A_1 + A_2 = 0.1554 + 0.1368$



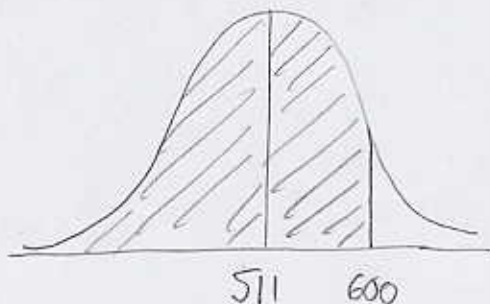
$$= 0.2922$$

b)  $P(Z \leq -0.21) = A_1 - A_2 = 0.5 - 0.0832$

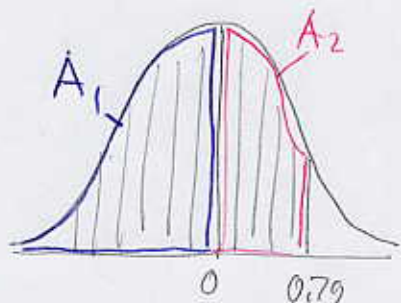


$$= 0.4168$$

5. (7pts) Scores on the mathematics SAT test in 1997 were approximately normally distributed with mean 511 and standard deviation 112. What percentage of test-takers scored less than 600? Draw a picture showing which area you are computing.

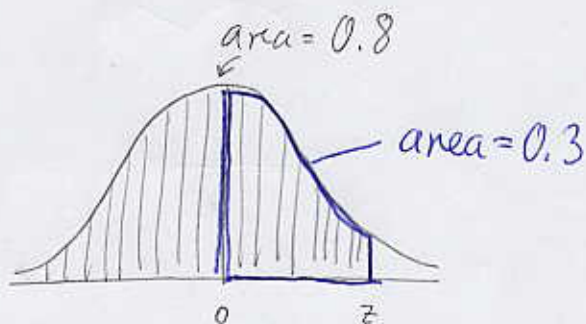


$$\begin{aligned}
 P(X \leq 600) \\
 &= P\left(Z \leq \frac{600 - 511}{112}\right) \\
 &= P(Z \leq 0.79)
 \end{aligned}$$



$$\begin{aligned}
 &= A_1 + A_2 \\
 &= 0.5 + 0.2852 \\
 &= 0.7852
 \end{aligned}$$

**Bonus.** (5pts) In a standard normal distribution, which score falls at the 80th percentile?



Closest number in table to 0.3  
is 0.2995, which  
corresponds to  $z = 0.84$

0.84 is the 80th percentile