3.7. An article in Quality Engineering (Vol. 4, 1992, ss pp. 487-495) presents viscosity data from a batch chemical process. A sample of these data is presented in Table 3E.3 (read down, then across).

a. Construct a stem-and-leaf display for the viscosity data.

Stem-and-leaf display:

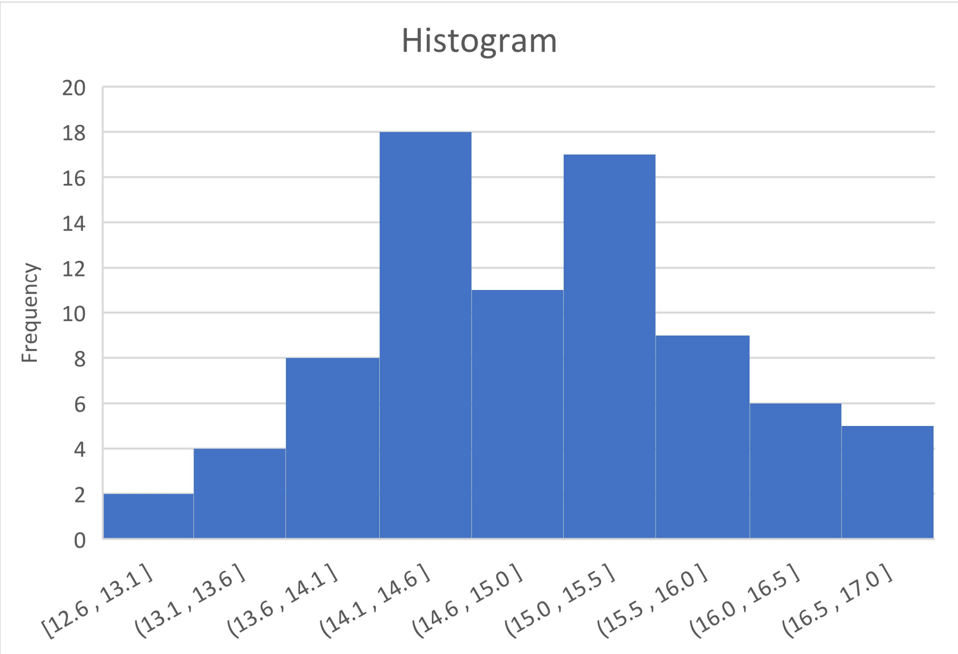
N = 80   Leaf Unit = 0.1

2	12	|	6 8
6	13	|	3 1 3 4
12	13	|	7 7 6 9 7 8
28	14	|	3 1 3 3 1 0 1 3 3 2 4 2 3 4 0 4
(15)	14	|	5 8 5 6 6 9 5 8 9 8 8 9 6 9 5
37	15	|	3 3 2 4 2 2 3 4 2 2 1 1 2 2 3 2
21	15	|	5 6 8 9 8 7 6 6 6
12	16	|	1 4 4 0 1 1
6	16	|	8 5 9 9 6
1	17	|	0

b. Construct a frequency distribution and histogram.

$\sqrt{80} \cong 9$

W = (17 – 12.6) / 9 = 0.48889



c. Convert the stem-and-leaf plot in part (a) into an ordered stem-and-leaf plot. Use this graph to assist in locating the median and the upper and lower quartiles of the viscosity data.

Stem-and-leaf display:

N = 80 Leaf Unit = 0.1

2	12	|	6 8
6	13	|	1 3 3 4
12	13	|	6 7 7 7 8 9
28	14	|	0 0 1 1 1 2 2 3 3 3 3 3 3 4 4 4
(15)	14	|	5 5 5 5 6 6 6 8 8 8 8 9 9 9 9
37	15	|	1 1 2 2 2 2 2 2 2 2 3 3 3 3 4 4
21	15	|	5 6 6 6 6 7 8 8 9
12	16	|	0 1 1 1 4 4
6	16	|	5 6 8 9 9
1	17	|	0

d. What are the tenth and ninetieth percentiles of viscosity?

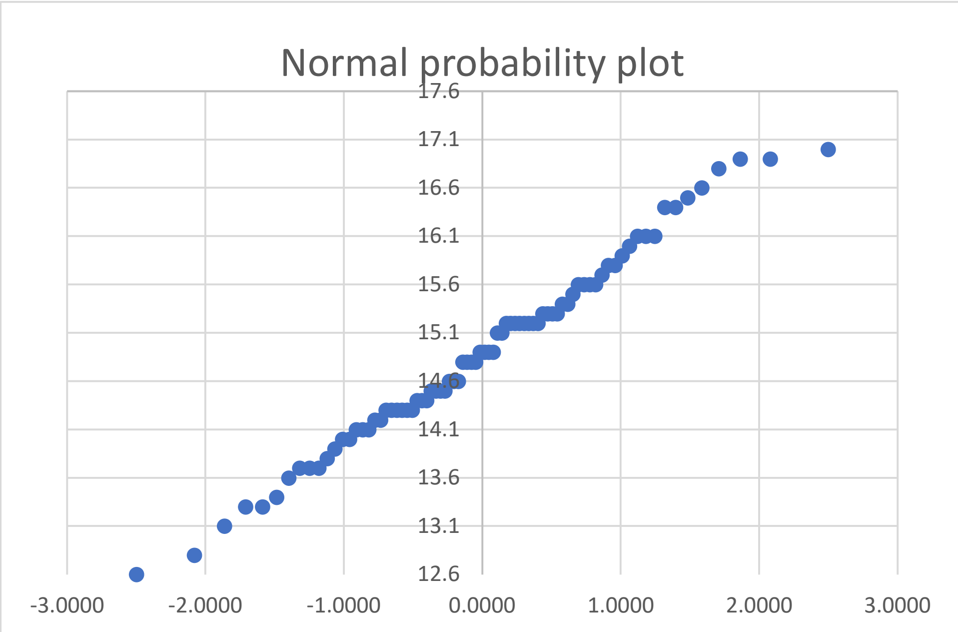
$10^{th} = (0.1)(80) + 0.5 = 8.5$

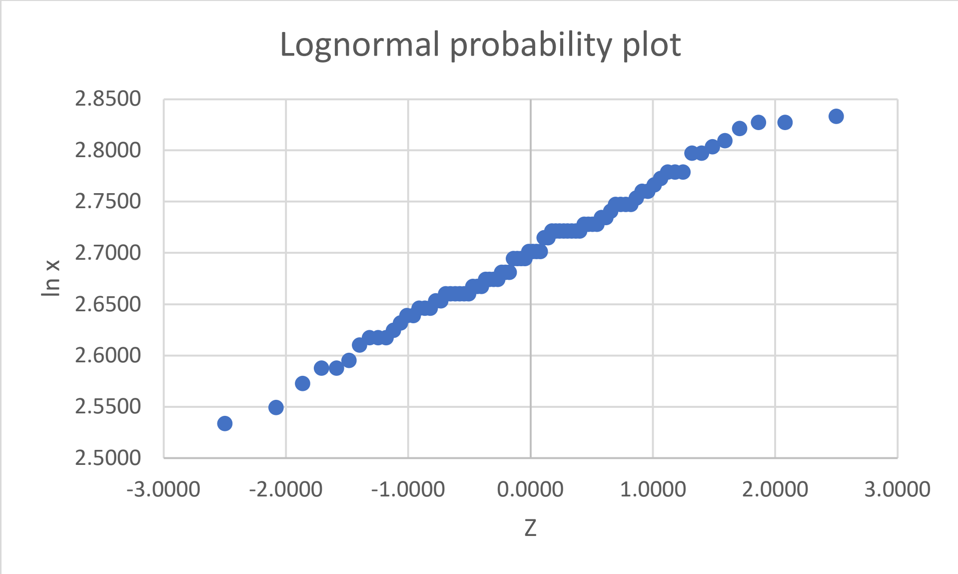
$(13.7 + 13.7) / 2 = 13.7$

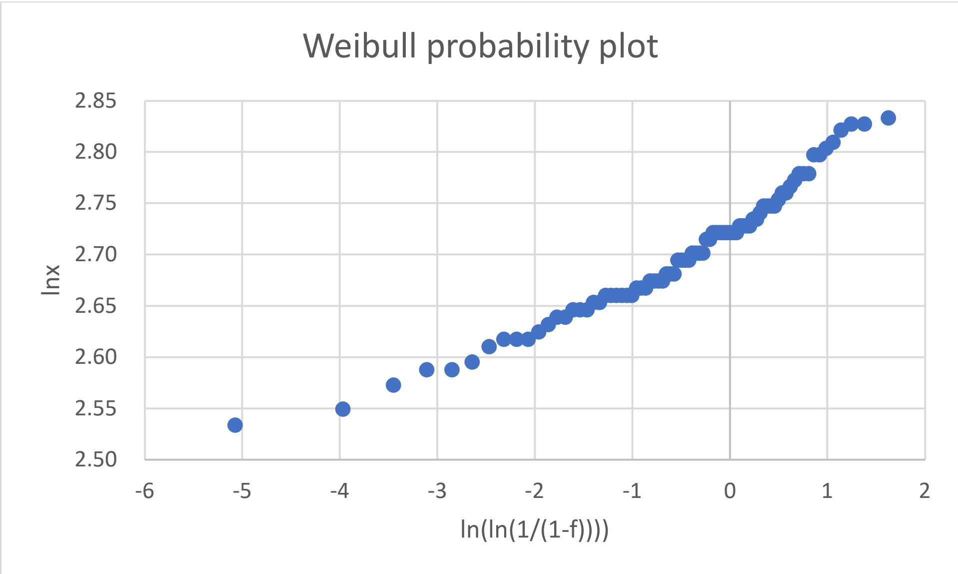
$90^{th} = (0.9)(80) + 0.5 = 72.5$

$(16.1 + 16.4) / 2 = 16.25$

3.11. Consider the viscosity data in Exercise 3.7. Construct a normal probability plot, a lognormal probability plot, and a Weibull probability plot for these data. Based on the plots, which distribution seems to be the best model for the viscosity data?







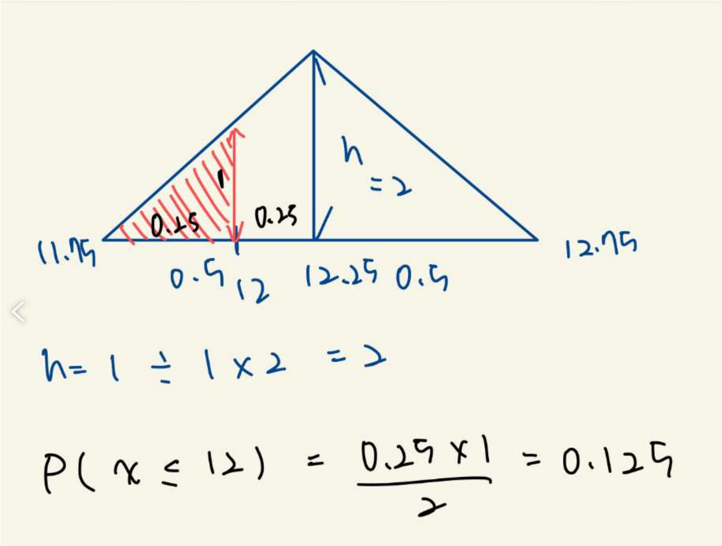
Normal distribution and Lognormal probability plot both seem to be the best model for the viscosity data

3.22.

The net contents in ounces of canned soup is a random variable with probability distribution

f(x)=4(x-11.75) 11.75 ≤x≤ 12.254(12.75-x) 12.25 ≤x≤ 12.75

Find the probability that a can contains less than 12 ounces of product.



3.23.

A random sample of 50 units is drawn from a production process every half hour. The fraction of nonconforming product manufactured is 0.02. What is the probability that { p̂ } ≤0.04 if the fraction nonconforming really is 0.02?

50 * 0.04 = 2

$\Sigma_0^2 \binom{50}{x} * 0.02^x * (0.98)^{50-x}$ = 0.92157

3.38.

The specifications on an electronic component in a target-acquisition system are that its life must be between 5000 and 10,000 h. The life is normally distributed with mean 7500 h. The manufacturer realizes a price of $10 per unit produced; however, defective units must be replaced at a cost of $5 to the manufacturer. Two different manufacturing processes can be used, both of which have the same mean life. However, the standard deviation of life for process 1 is 1000 h, whereas for process 2 it to is only 500 h. Production costs for process 2 are twice those for process 1. What value of production costs will determine the selection between processes 1 and 2?

X1~N(7500,σ_1^2 = 1000^2)

X2~N(7500,σ 2^2 = 500^2)

Process 1

P1 = 1 – Pr(Z1 ≤ (10000 - 7500) / 1000) + Pr(Z1 ≤ (5000 - 7500) / 1000)

= 1 – 0.9938 + 0.0062 = 0.0124

Profit = 10 (1 – 0.0124) + 5 (0.0124) – c1 = 9.9380 – c1

Process 2

P2 = 1 – Pr(Z2 ≤ (10000 - 7500) / 500) + Pr(Z2 ≤ (5000 - 7500) / 500)

$= 1 – 1 + 0 = 0$

Profit $= 10 (1 - 0) = 5 (0) – c2 = 10 – c2$

如果 $c2 > c1 + 0.0620$，就選 process 1