1. 0.86, 0.63, 0.15, 0.48

2, 3.

Number	Boundaries	Precision	g.p.e.	r.e.
(a) 8.24	8.235 < 8.24 < 8.45	0.01	0.005	0.0006
(b) 522	521.5 < 522 < 522.5	1	0.5	0.001
(c) 6.3 x 10	625 < 630 < 635	10	5	0.002
(d) 0.02	0.015 < 0.02 < 0.025	0.01	0.005	0.3

4. 2.84×10^2, 22, 0.64, 0.8937, 0.9

5. 66.4, 379.1, 5, 4.652, 6.2×10^2

6.

7.
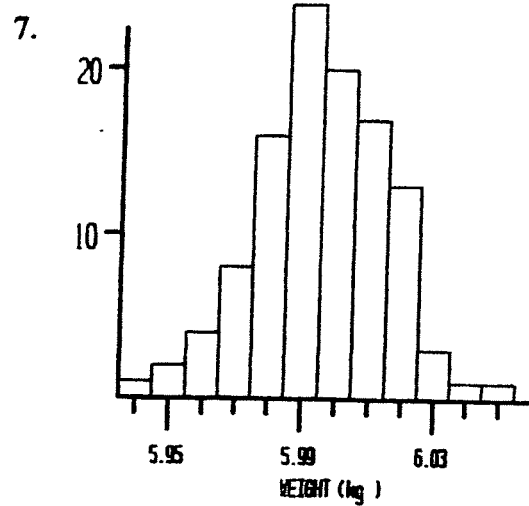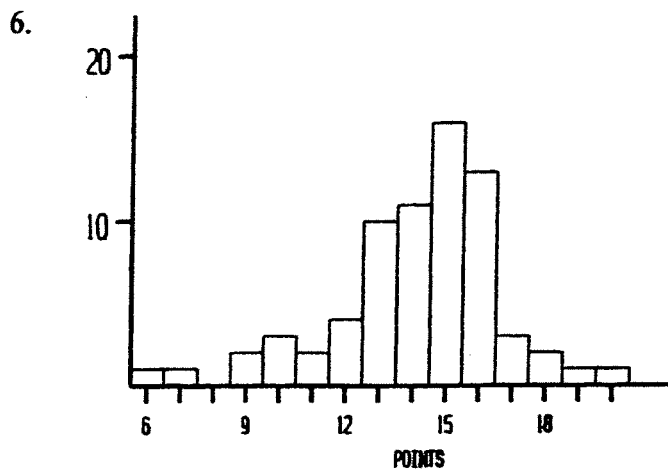
8.

Cell Boundaries	Cell Midpoint	Frequency
1.72-1.76	1.74	5
1.77-1.81	1.79	9
1.82-1.86	1.84	6
1.87-1.91	1.89	27
1.92-1.96	1.94	26
1.97-2.01	1.99	29
2.02-2.06	2.04	13
2.07-2.11	2.09	5
2.12-2.16	2.14	3
2.17-2.21	2.19	1
2.22-2.26	2.24	0
2.27-2.31	2.29	1
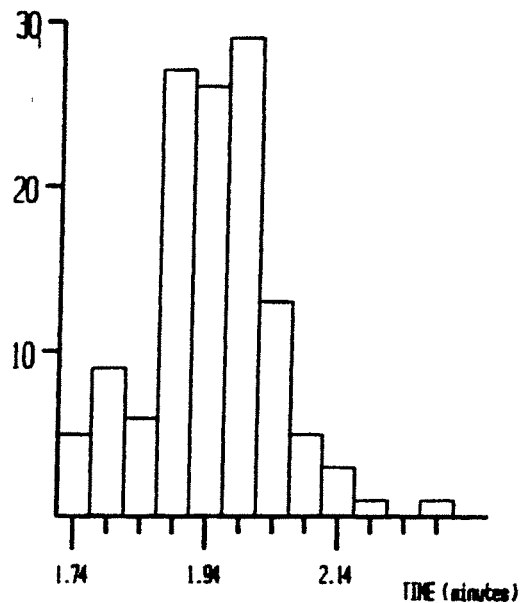
9.

Cell Boundaries	Cell Midpoints	Frequency
0.05-0.54	0.3	3
0.55-1.04	0.8	15
1.05-1.54	1.3	34
1.55-2.04	1.8	29
2.05-2.54	2.3	30
2.55-3.04	2.8	22
3.05-3.54	3.3	15
3.55-4.04	3.8	2
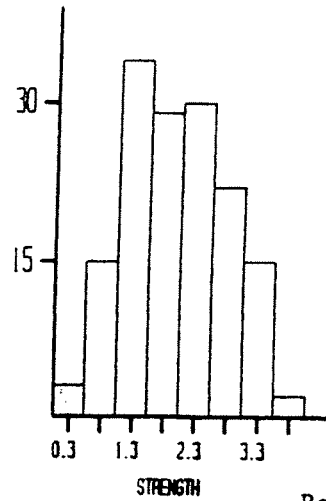
10.

Scores	Freq.	Relative Freq.	Cumulative Freq.	Relative Cumulative Freq.
6	1	1/70 = 0.014	0+1 = 1	1/70 = 0.014
7	1	1/70 = 0.014	1+1 = 2	2/70 = 0.029
8	0	0/70 = 0	2+0 = 2	2/70 = 0.029
9	2	2/70 = 0.029	2+2 = 4	4/70 = 0.057
10	3	3/70 = 0.043	4+3 = 7	7/70 = 0.100
11	2	2/70 = 0.029	7+2 = 9	9/70 = 0.129
12	4	4/70 = 0.057	9+4 = 13	13/70 = 0.186
13	10	10/70 = 0.143	13+10 = 23	23/70 = 0.329
14	11	11/70 = 0.157	23+11 = 34	34/70 = 0.486
15	16	16/70 = 0.229	34+16 = 50	50/70 = 0.714
16	13	13/70 = 0.186	50+13 = 63	63/70 = 0.900
17	3	3/70 = 0.043	63+3 = 66	66/70 = 0.943
18	2	2/70 = 0.029	66+2 = 68	68/70 = 0.971
19	1	1/70 = 0.014	68+1 = 69	69/70 = 0.986
20	1	1/70 = 0.014	69+1 = 70	70/70 = 1.000
	70	1.00		

Graph not shown, but similar to Problem 13

11.

Weights	Freq.	Relative Freq.	Cumulative Freq.	Relative Cumulative Freq.
5.94	1	1/110 = 0.9%	0+1 = 1	1/110 = 0.9%
5.95	2	2/110 = 1.8	1+2 = 3	3/110 = 2.7
5.96	4	4/110 = 3.6	3+4 = 7	7/110 = 6.4
5.97	8	8/110 = 7.3	7+8 = 15	15/110 = 13.6
5.98	16	16/110 = 14.5	15+16 = 31	31/110 = 28.2
5.99	24	24/110 = 21.8	31+24 = 55	55/110 = 50.0
6.00	20	20/110 = 18.2	55+20 = 75	75/110 = 68.2
6.01	17	17/110 = 15.5	75+17 = 92	92/110 = 83.6
6.02	13	13/110 = 11.8	92+13 = 105	105/110 = 95.4
6.03	3	3/110 = 2.7	105+3 = 108	108/110 = 98.2
6.04	1	1/110 = 0.9	108+1 = 109	109/110 = 99.1
6.05	1	1/110 = 0.9	109+1 = 110	110/110 = 100.0%
	110	99.9%		

Graph not shown, but similar to Problem 13

12.

Cell Midpoint	Freq.	Relative Freq.	Cumulative Freq.	Relative Cumulative Freq.
1.74	5	5/125 = 0.040	0+5 = 5	5/125 = 0.040
1.79	9	9/125 = 0.72	5+9 = 14	14/125 = 0.112
1.84	6	6/125 = 0.048	14+6 = 20	20/125 = 0.160
1.89	27	27/125 = 0.216	20+27 = 47	47/125 = 0.376
1.94	26	26/125 = 0.208	47+26 = 73	73/125 = 0.584
1.99	29	29/125 = 0.232	73+29 = 102	102/125 = 0.816
2.04	13	13/125 = 0.104	102+13 = 115	115/125 = 0.920
2.09	5	5/125 = 0.040	115+5 = 120	120/125 = 0.960
2.14	3	3/125 = 0.024	120+3 = 123	123/125 = 0.984
2.19	1	1/125 = 0.008	123+1 = 124	124/125 = 0.992
2.24	0	0/125 = 0	124+0 = 124	124/125 = 0.992
2.29	1	1/125 = 0.008	124+1 = 125	125/125 = 1.000
	125	1.000		

Graph not shown, but similar to Problem 13

13.

Cell Midpoint	Freq.	Relative Freq.	Cumulative Freq.	Relative Cumulative Freq.
0.3	3	3/150 = 0.020	0+3 = 3	3/150 = 0.020
0.8	15	15/150 = 0.100	3+15 = 18	18/150 = 0.120
1.3	34	34/150 = 0.227	18+34 = 52	52/150 = 0.347
1.8	29	29/150 = 0.193	52+29 = 81	81/150 = 0.540
2.3	30	30/150 = 0.200	81+30 = 111	111/150 = 0.740
2.8	22	22/150 = 0.147	111+22 = 133	133/150 = 0.888
3.3	15	15/150 = 0.100	133+15 = 148	148/150 = 0.987
3.8	2	2/150 = 0.013	148+2 = 150	150/150 = 1.000
	150	1.000		

13a

13b

13c

14a

14b

15a

15b

9

16a

30

15

0

0.3   1.8   3.3

STRENGTH

16b

150

100

50

0

0.5   2.0   3.5

STRENGTH
(upper boundaries)
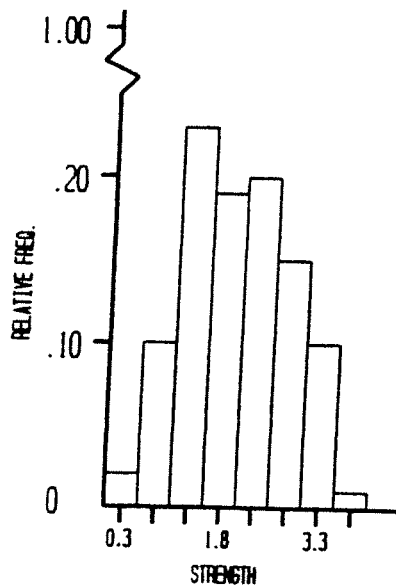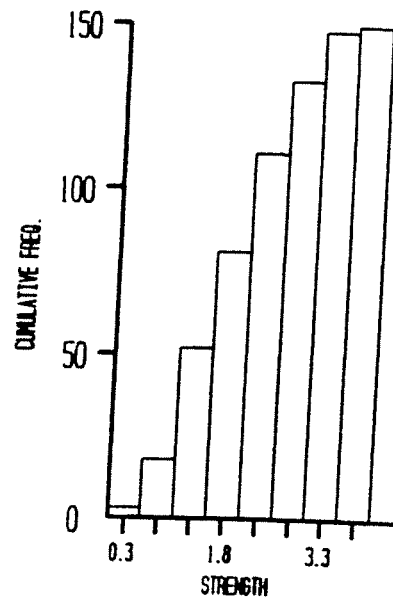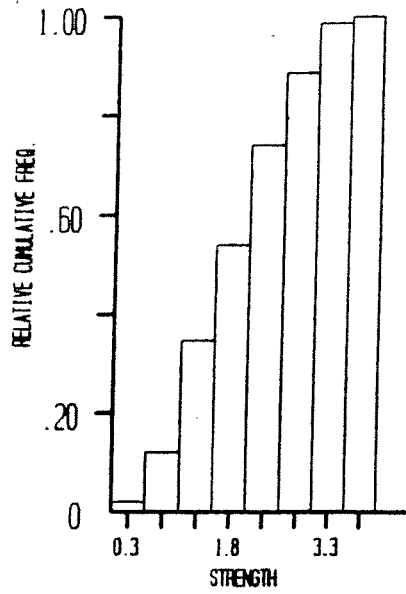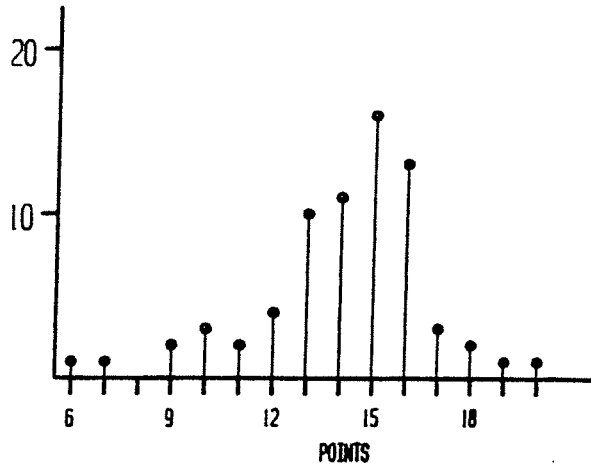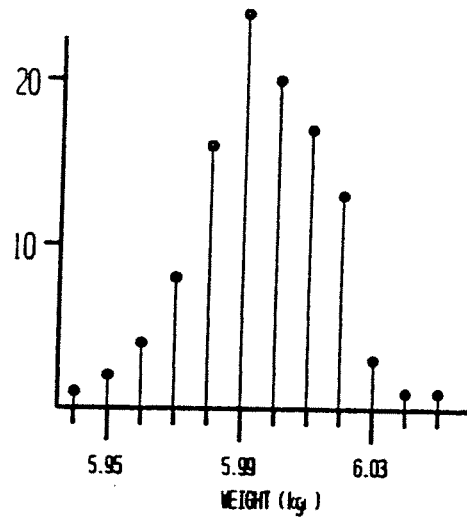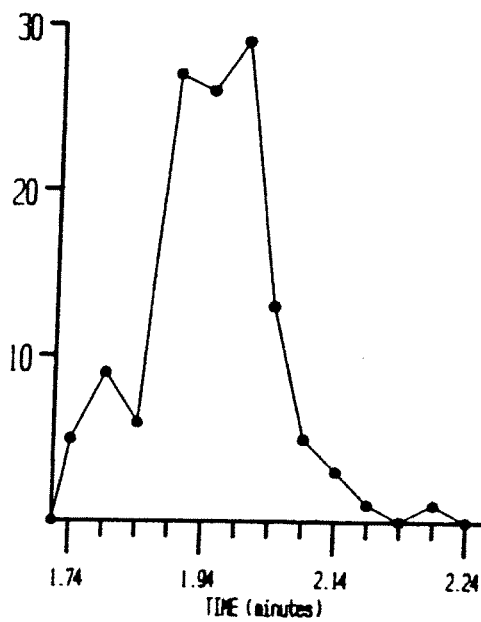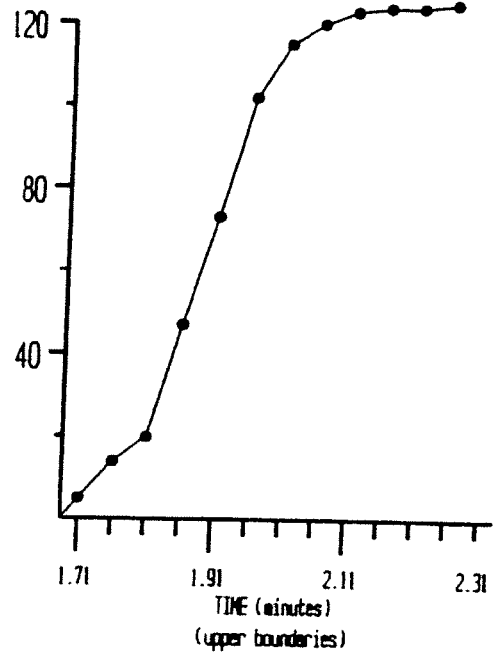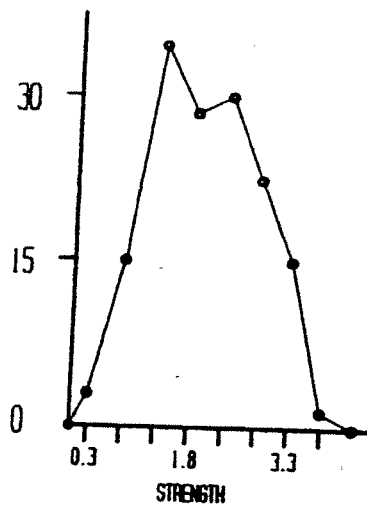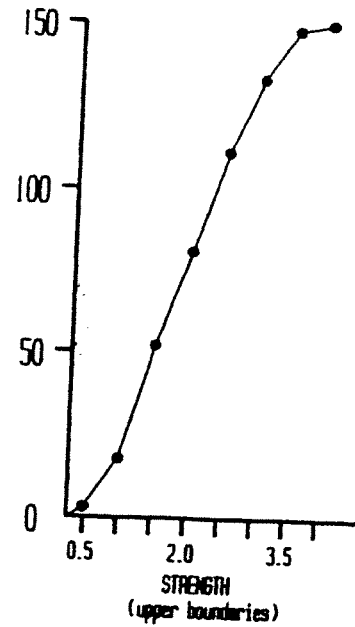
17. $\overline{X} = \Sigma x/n = \dfrac{115 + 113 + 121 + 115 + 116}{5} = 116$ volts

18. $\overline{X} = \dfrac{\Sigma x}{n} = \dfrac{25.6 + 24.8 + 22.6 + 21.3 + 19.6 + 18.5 + 16.2 + 15.5}{8} = 20.5$ m

19.

X	f	fX
148	2	296
139	3	417
130	8	1,040
121	11	1,331
112	27	3,024
103	35	3,605
94	43	4,042
85	33	2,805
76	20	1,520
67	12	804
58	6	348
49	4	196
40	2	80
	206	19,508

$\overline{X} = \dfrac{\Sigma fX}{n}$

$= \dfrac{19,508}{206}$

$= 95$ db

20.

X	f	fX
3.5	6	21.0
3.8	9	34.2
4.1	18	73.8
4.4	14	61.6
4.7	13	61.1
5.0	5	25.0
	65	276.7

$\overline{X} = \dfrac{\Sigma fX}{n}$

$= \dfrac{276.7}{65}$

$= 4.3$ kg

21. $\overline{X}_w = \Sigma w\overline{X}/\Sigma w$

$= \dfrac{(3)\ (3320) + (2)\ (3180)}{3 + 2}$

$= 3264$ h

22. $\bar{x}_w = \Sigma w \bar{x} / \Sigma w$

$$= \frac{(24)(1.75) + (18)(1.79) + (29)(1.68)}{24 + 18 + 29}$$

$$= 1.73 \text{ m}$$

23. a. 8, 11, 15, 18, 22; Md = 15

   b. 28, 33, 35, 36, 38, 43; Md = $\frac{35 + 36}{2}$ = 35.5

24. a. Md = $L + \left(\dfrac{\frac{n}{2} - cf}{f}\right) i$ = $1.915 + \left(\dfrac{\frac{125}{2} - 47}{26}\right) 0.05$ = 1.94

   b. Md = $= 1.55 + \left(\dfrac{\frac{150}{2} - 52}{29}\right) 0.5$ = 1.95

   c. Md = $= 90 + \left(\dfrac{\frac{206}{2} - 77}{43}\right) 9$ = 95 db

   d. Md = $= 4.0 + \left(\dfrac{\frac{65}{2} - 15}{18}\right) .3$ = 4.3

   e. Md = $= 1.60 + \left(\dfrac{\frac{88}{2} - 39}{12}\right) 0.3$ = 1.73

   f. Md = $= 1450 + \left(\dfrac{\frac{77}{2} - 19}{22}\right) 300$ = 1716

25. 55, none, 14 and 17

26. 15, 5.99, 1.99, 1.3, 94, 4.1

27. a. R = H − L = 25 − 14 = 11   c. R = H − L = 20 − 6 = 14
    b. R = = 45 − 39 = 6   d. R = = 6.05 − 5.94 = 0.11

28. $s = \sqrt{\dfrac{n \Sigma x^2 - (\Sigma x)^2}{n(n-1)}} = \sqrt{\dfrac{5(7152350) - (5980)^2}{5(5-1)}}$ = 8.2 vib/sec

29. $s = $ $= \sqrt{\dfrac{4(0.024) - (.308)^2}{4(4-1)}}$ = 0.004 mm

30.

Mid-point (x)	Freq. (f)	(f$_x$)	(f$_x^2$)
.5	1	.5	0.3
.8	16	12.8	10.2
1.1	12	13.2	14.5
1.4	10	14.0	19.6
1.7	12	20.4	34.7
2.0	18	36.0	72.0
2.3	16	36.8	84.6
2.6	3	7.8	20.3
	88	141.5	256.2

$$s = \sqrt{\frac{n\sum f X^2 - (\sum f X)^2}{n(n-1)}}$$

$$= \sqrt{\frac{88(256.2) - (141.5)^2}{88(88-1)}}$$

$$= .57\%$$

31a.

Mid-point (x)	Freq. (f)	(fx)	(fx^2)
0.3	3	0.9	0.27
0.8	15	12.0	9.60
1.3	34	44.2	57.46
1.8	29	52.2	93.96
2.3	30	69.0	158.70
2.8	22	61.6	172.48
3.3	15	49.5	163.35
3.8	2	7.6	28.88
	150	297.0	684.70

$$s = \sqrt{\frac{n\sum f X^2 - (\sum f X)^2}{n(n-1)}}$$

$$= \sqrt{\frac{150(684.7) - (297.0)^2}{150(150-1)}}$$

$$= 0.8$$

31b

Mid-point (x)	Freq. (f)	(fx)	(fx^2)
148	2	296	43,808
139	3	417	57,963
130	8	1,040	135,200
121	11	1,331	161,051
112	27	3,024	338,688
103	35	3,605	371,315
94	43	4,042	379,948
85	33	2,805	238,425
76	20	1,520	115,520
67	12	804	53,868
58	6	348	20,184
49	4	196	9,604
40	2	80	3,200
	206	19,508	1,928,774

$$s = \sqrt{\frac{n\sum f X^2 - (\sum f X)^2}{n(n-1)}}$$

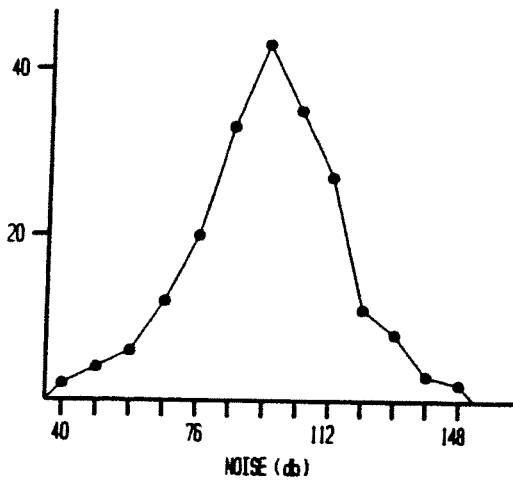$$= \sqrt{\frac{206(1,928,774) - (19,508)^2}{206(206-1)}}$$

$$= 20 \text{ db}$$

32.

Mid-point (χ)	Freq. (f)	$(f\chi)$	$(f\chi^2)$
1000	6	6000	6.00×10^6
1300	13	16900	21.97×10^6
1600	22	35200	56.32×10^6
1900	17	32300	61.37×10^6
2200	11	24200	53.24×10^6
2500	8	20000	50.00×10^6
	77	134.6×10^3	248.9×10^6

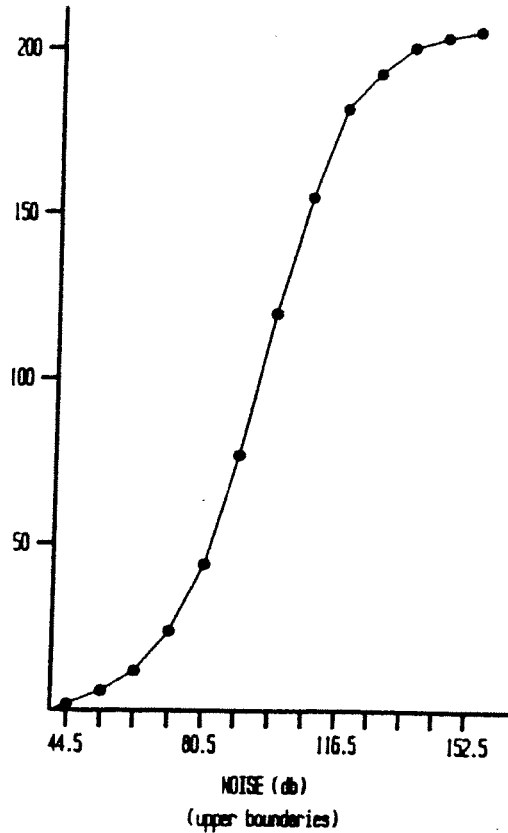$$\overline{\chi} = \Sigma f\chi/n = 134.6 \times 10^3/77 = 1748 \text{ inspections}$$

$$s = \sqrt{\frac{n\Sigma f\chi^2 - (\Sigma f\chi)^2}{n(n-1)}} = \sqrt{\frac{77(248.9 \times 10^6) - (134.6 \times 10^3)^2}{77(77 - 1)}} = 423$$
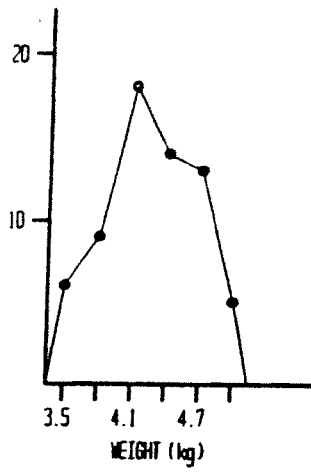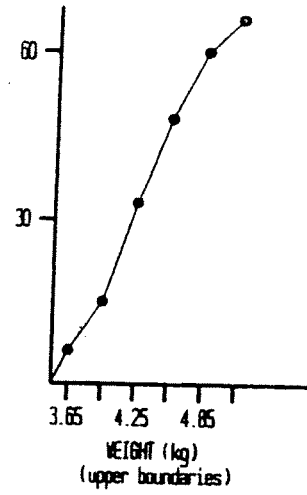
33a

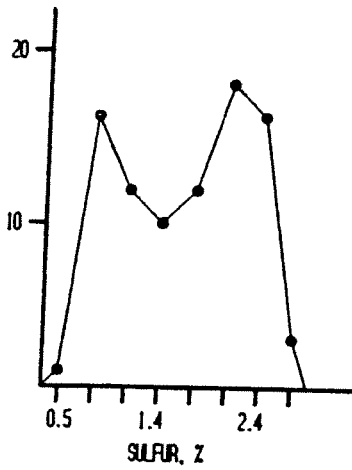NOISE (db)

33b

NOISE (db)
(upper boundaries)

34a

20

10

3.5   4.1   4.7

WEIGHT (kg)

34b ·

60

30

3.65   4.25   4.85

WEIGHT (kg)
(upper boundaries)

35a ·

20

10

0.5   1.4   2.4

SULFUR, Z

35b

90

60

30

0.65   1.55   2.55

SULFUR, Z
(upper boundaries)

36a

20

10

10   16   22

OF INSPECTIONS (x100)

36b

60

30

11.5   17.5   23.5

OF INSPECTIONS (x100)
(upper boundaries)

37.
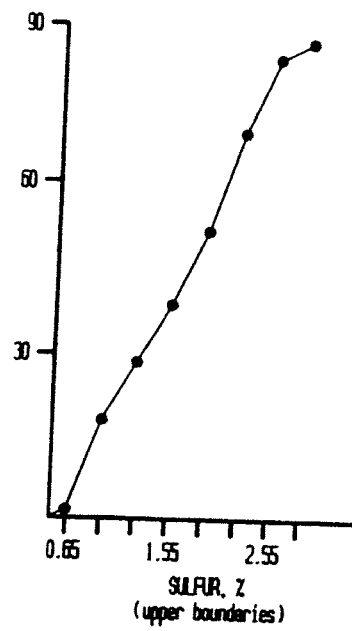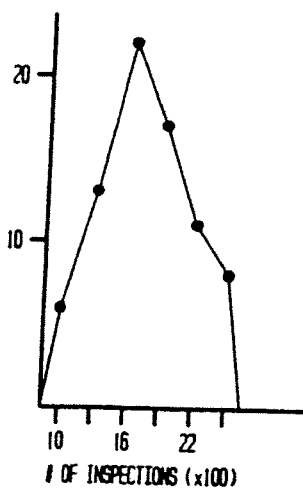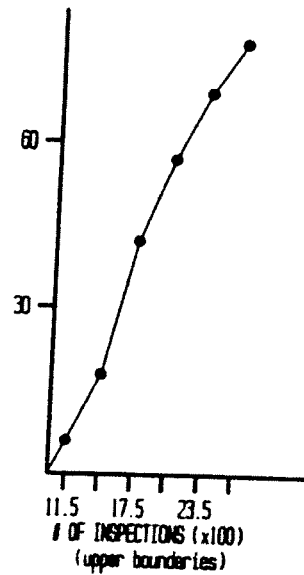
Cell Mid-point	Freq.	Relative Freq.	Cumulative Freq.	Relative Cumulative Freq.
40	2	2/206 = 0.010	0+2 = 2	2/206 = 0.010
49	4	4/206 = 0.019	2+4 = 6	6/206 = 0.029
58	6	6/206 = 0.029	6+6 = 12	12/206 = 0.058
67	12	12/206 = 0.058	12+12 = 24	24/206 = 0.117
76	20	20/206 = 0.097	24+20 = 44	44/206 = 0.214
85	33	33/206 = 0.160	44+33 = 77	77/206 = 0.374
94	43	43/206 = 0.209	77+43 = 120	120/206 = 0.583
103	35	35/206 = 0.170	120+35 = 155	155/206 = 0.752
112	27	27/206 = 0.131	155+27 = 182	182/206 = 0.883
121	11	11/206 = 0.053	182+11 = 193	193/206 = 0.937
130	8	8/206 = 0.039	193+8 = 201	201/206 = 0.976
139	3	3/206 = 0.015	201+3 = 204	204/206 = 0.990
148	2	2/206 = 0.010	204+2 = 206	206/206 = 1.000
	206	1.000		

38.

Cell Mid-point	Freq.	Relative Freq.	Cumulative Freq.	Relative Cumulative Freq.
3.5	6	6/65 = 0.092	0+6 = 6	6/65 = 0.092
3.8	9	9/65 = 0.138	6+9 = 15	15/65 = 0.231
4.1	18	18/65 = 0.277	15+18 = 33	33/65 = 0.508
4.4	14	14/65 = 0.215	33+14 = 47	47/65 = 0.723
4.7	13	13/65 = 0.200	47+13 = 60	60/65 = 0.923
5.0	5	5/65 = 0.077	60+5 = 65	65/65 = 1.000
	65	0.999		

39.

Cell Mid-point	Freq.	Relative Freq.	Cumulative Freq.	Relative Cumulative Freq.
0.5	1	1/88 = 0.011	0+1 = 1	1/88 = 0.010
0.8	16	16/88 = 0.182	1+16 = 17	17/88 = 0.156
1.1	12	12/88 = 0.136	17+12 = 29	29/88 = 0.330
1.4	10	10/88 = 0.114	29+10 = 39	39/88 = 0.443
1.7	12	12/88 = 0.136	39+12 = 51	51/88 = 0.580
2.0	18	18/88 = 0.205	51+18 = 69	69/88 = 0.784
2.3	16	16/88 = 0.182	69+16 = 85	85/88 = 0.966
2.6	3	3/88 = 0.034	85+3 = 88	88/88 = 1.000
	88	1.000		

40.

Cell Mid-point	Freq.	Relative Freq.	Cumulative Freq.	Relative Cumulative Freq.
1000	6	6/77 = 0.078	0+6 = 6	6/77 = 0.078
1300	13	13/77 = 0.169	6+13 = 19	19/77 = 0.247
1600	22	22/77 = 0.286	19+22 = 41	41/77 = 0.532
1900	17	17/77 = 0.221	41+17 = 58	58/77 = 0.753
2200	11	11/77 = 0.143	58+11 = 69	69/77 = 0.896
2500	8	8/77 = 0.104	69+8 = 77	77/77 = 1.000
	77	1.001		

41a

X	f	$(x_i - \bar{x})$	$f(x_i - \bar{x})^3$	$f(x_i - \bar{x})^4$
6	1	-8.13	-537.37	4,368.80
7	1	-7.13	-362.47	2,584.39
8	0	-6.13	0	0
9	2	-5.13	-270.01	1,385.16
10	3	-4.13	-211.33	872.81
11	2	-3.13	- 61.33	191.96
12	4	-2.13	- 38.65	82.33
13	10	-1.13	- 14.43	16.30
14	11	-0.13	- 0.02	0
15	16	0.87	10.54	9.17
16	13	1.87	85.01	158.97
17	3	2.87	70.92	203.54
18	2	3.87	115.92	448.62
19	1	4.87	115.50	562.49
20	1	5.87	202.26	1,187.28
	70		-895.46	12,071.82

$$\bar{x} = 14.13 \qquad s = 2.53$$

$$a_3 = \frac{\Sigma f(x_i - \bar{x})^3/n}{s^3} = \frac{-895.46/70}{2.53^3} = -0.79$$

$$a_4 = \frac{\Sigma f(x_i - \bar{x})^4/n}{s^4} = \frac{12071.82/70}{2.53^4} = 4.21$$

Distribution is very peaked and quite skewed to the left.

41b.

X	f	$(x_i - \bar{x})$	$f(x_i - \bar{x})^3$	$f(x_i - \bar{x})^4$
-6	1	-5.54	-170.03	941.97
-5	2	-4.54	-187.15	849.68
-4	4	-3.54	-177.45	628.16
-3	8	-2.54	-131.10	332.99
-2	16	-1.54	- 58.44	89.99
-1	24	-0.54	- 3.78	2.04
0	20	.46	1.95	.90
1	17	1.46	40.45	59.06
2	13	2.46	193.53	476.08
3	3	3.46	124.26	429.96
4	1	4.46	88.72	395.68
5	1	5.46	162.77	888.73
	110		-116.27	5,171.72

Note: χ is coded from 6.00.

$$\bar{x} = -0.46 \qquad \text{True } \bar{x} = 5.9954 \qquad s = 1.97$$

$$a_3 = \frac{\Sigma f(x_i - \bar{x})^3/n}{s^3} = \frac{-116.27/110}{1.97^3} = -0.14$$

$$a_4 = \frac{\Sigma f(x_i - \bar{x})^4/n}{s^4} = \frac{5171.72/110}{1.97^4} = 3.11$$

Distribution is slightly skewed to the left and not quite as peaked as normal.

41c

X	f	$(x_i - \bar{x})$	$f(x_i - \bar{x})^3 \times 10^3$	$f(x_i - \bar{x})^4 \times 10^3$
1.74	5	-.2032	-41.9509	8.5244
1.79	9	-.1532	-32.3608	4.9577
1.84	6	-.1032	- 6.5946	.6806
1.89	27	-.0532	- 4.0654	.2163
1.94	26	-.0032	- .0009	nil
1.99	29	.0468	2.9726	.1391
2.04	13	.0968	11.7915	1.1414
2.09	5	.1468	15.8179	2.3221
2.14	3	.1968	12.8663	4.5001
2.19	1	.2468	15.0326	3.7101
2.24	0	.2968	0	0
2.29	1	.3468	41.7097	14.4649
	125		$+25.218 \times 10^3$	40.6567×10^3

$\bar{x} = 1.9432$ $\quad\quad$ $s = .096249$

$$a_3 = \frac{\Sigma f(x_i - \bar{x})^3/n}{s^3} = \frac{25.218 \times 10^3/125}{.096249^3} = +0.23$$

$$a_4 = \frac{\Sigma f(x_i - \bar{x})^4/n}{s^4} = \frac{40.6567 \times 10^3/125}{.096249^4} = 3.79$$

Distribution is slightly skewed to the right and somewhat peaked.

41d

X	f	$(x_i - \bar{x})$	$f(x_i - \bar{x})^3$	$f(x_i - \bar{x})^4$
0.3	3	-1.68	-14.2249	23.8978
0.8	15	-1.18	-24.6455	29.0816
1.3	34	-0.68	-10.6907	7.2697
1.8	29	-0.18	- .1691	.0304
2.3	30	.32	.9830	.3146
2.8	22	.82	12.1301	9.9467
3.3	15	1.32	34.4995	45.5394
3.8	2	1.82	12.0571	21.9439
	150		9.9395	138.0242

$\bar{x} = 1.98$ $\quad\quad$ $s = 0.8053512$

$$a_3 = \frac{\Sigma f(x_i - \bar{x})^3/n}{s^3} = \frac{9.9395/150}{.8053512^3} = +.13$$

$$a_4 = \frac{\Sigma f(x_i - \bar{x})^4/n}{s^4} = \frac{138.0242/150}{.8053512^4} = 2.19$$

Slightly skewed to the right and flatter than normal.

41e

X	f	$(x_i - \bar{x})$	$f(x_i - \bar{x})^3$	$f(x_i - \bar{x})^4$
3.5	6	-0.7569	-2.6018	1.96927
3.8	9	-0.4569	- .8584	.3922
4.1	18	-0.1569	- .0695	.0109
4.4	14	0.1431	.0410	.0059
4.7	13	0.4431	1.1310	.5011
5.0	5	0.7431	2.0517	1.5246
	65		-0.306	4.4040

$\bar{x} = 4.2569$ $\qquad\qquad$ $s = 0.4212961$

$$a_3 = \frac{\Sigma f(x_i - \bar{x})^3/n}{s^3} = \frac{-.306/65}{0.4212961^3} = -0.06$$

$$a_4 = \frac{\Sigma f(x_i - \bar{x})^4/n}{s^4} = \frac{4.4040/65}{0.4212961^4} = 2.15$$

Distribution is essentially symmetrical and much flatter than normal.

41f

X	f	$(x_i - \bar{x})$	$f(x_i - \bar{x})^3 \times 10^6$	$f(x_i - \bar{x})^4 \times 10^9$
1000	6	-748	-2511	1878
1300	13	-448	-1169	523
1600	22	-148	- 71	11
1900	17	+152	60	9
2200	11	+452	1015	459
2500	8	+752	3402	2558
	77		$+ 726 \times 10^6$	5438×10^9

$\bar{x} = 1748$ $\qquad\qquad$ $s = 423$

$$a_3 = \frac{\Sigma f(x_i - \bar{x})^3/n}{s^3} = \frac{726 \times 10^6/77}{423^3} = +0.10$$

$$a_4 = \frac{\Sigma f(x_i - \bar{x})^4/n}{s^4} = \frac{5438 \times 10^9/77}{423^4} = 2.21$$

Distribution is essentially symmetrical and much flatter than normal.

42. Max. of 134.5 db (X_i)

 from 17 $\bar{X} = 94.7$

$\sigma = 19.925$

$z_1 = \dfrac{X_i - \mu}{\sigma}$

$z_1 = \dfrac{134.5 - 94.7}{19.925}$

$z_1 = 2.00$

$Area_1 = 0.9773$

$Area_2 = 1.000 - Area_1$

$Area_2 = 1.00 - 0.9773$

$Area_2 = 0.0227$ or 2.8%
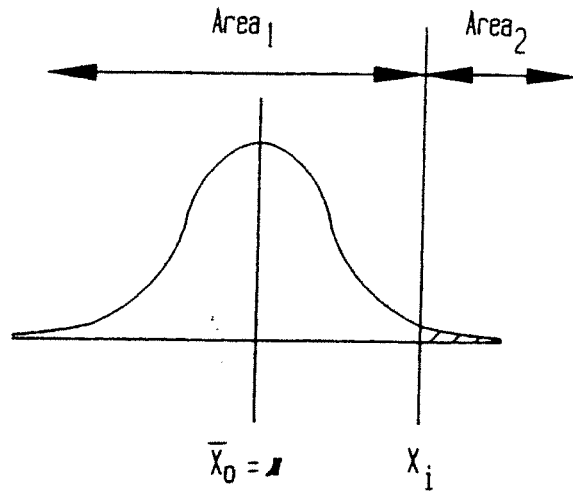
43. Min. of 3.65 (X_i)

 Max. of 4.85 (X_i)

 from 18 $\bar{X} = 4.25$

$\sigma = .4213$

$z_1 = \dfrac{X_i - \mu}{\sigma}$

$z_1 = \dfrac{3.65 - 4.26}{.4213}$

$z_1 = -1.45$

$Area_1 = 0.0734$

$z_2 = \dfrac{X_i - \mu}{\sigma}$

$z_2 = \dfrac{4.85 - 4.26}{.4213}$

$z_2 = 1.40$ $Area_2 = 0.9192$

$Area_3 = Area_2 - Area_1$

$Area_3 = 0.9192 - 0.0735$

$Area_3 = 0.8457$ or 84.6%
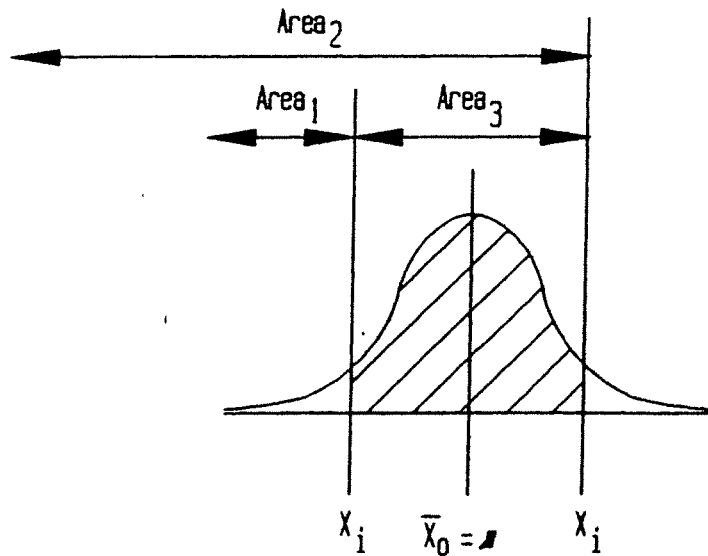
44. Max. of 2.25 (x_i)

From 28 $\bar{x} = 1.65$

$\sigma = 0.617$

$z_1 = \dfrac{x_i - \mu}{\sigma}$

$z_1 = \dfrac{2.25 - 1.65}{0.617}$

$z_1 = 0.97$

Area$_1$ = 0.8340

Area$_2$ = 1.000 - Area$_1$

Area$_2$ = 1.000 - 0.8340

Area$_2$ = 0.166 or 16.6%
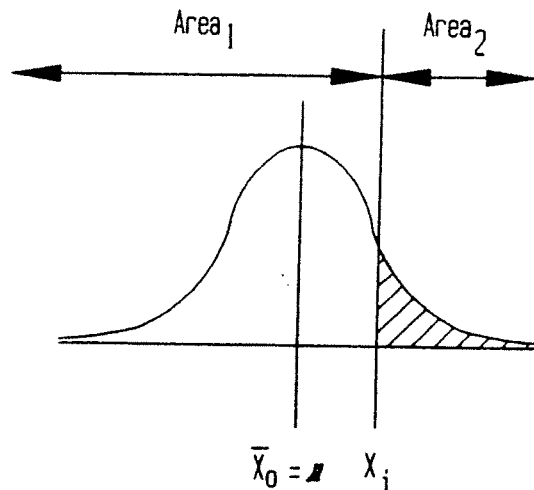
45a $z = \dfrac{x_i - \mu}{\sigma}$

$z = \dfrac{8.30 - 9.07}{0.40}$

$z = -1.93$ Rounded

From Table A$_1$

Area$_1$ = 0.0268 or 2.68%
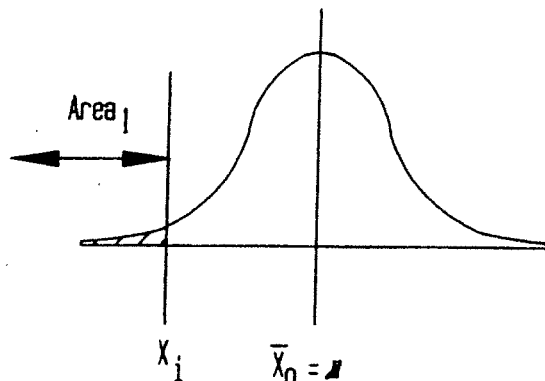
45b $z_1 = \dfrac{x_i - \mu}{\sigma}$

$z_1 = \dfrac{10.00 - 9.07}{0.40}$

$z_1 = +2.33$ Rounded

Area$_1$ = 0.9901

Area$_2$ = 1.000 - Area$_1$

Area$_2$ = 1.000 - 0.9901

Area$_2$ = 0.0099 or 0.99%
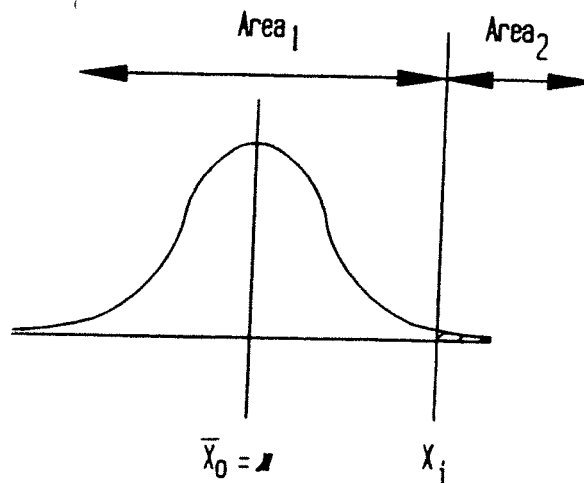
45c $z_1 = \dfrac{X_i - \mu}{\sigma}$

$z_1 = \dfrac{8.00 - 9.07}{0.40}$

$z_1 = -2.68$

$\text{Area}_1 = 0.0037$

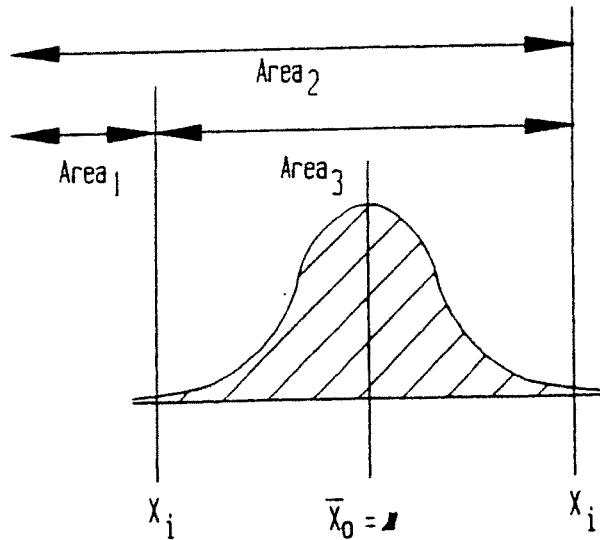$z_2 = \dfrac{X_i - \mu}{\sigma}$

$z_2 = \dfrac{10.10 - 9.07}{0.40}$

$z_2 = +2.58$

$\text{Area}_2 = 0.9951$

$\text{Area}_3 = \text{Area}_2 - \text{Area}_1$

$\text{Area}_3 = 0.9951 - 0.0037$

$\text{Area}_3 = 0.9914 \text{ or } 99.14\%$

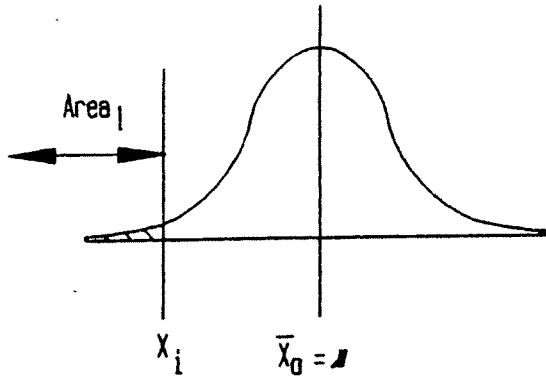46a. $z_1 = \dfrac{X_i - \mu}{\sigma}$

$z_1 = \dfrac{13 - 16}{1.5}$

$z_1 = -2.00$

$\text{Area}_1 = 0.0228 \text{ or } 2.28\%$

46b. $z_1 = \dfrac{X_i - \mu}{\sigma}$

$z_1 = \dfrac{20 - 16}{1.5}$
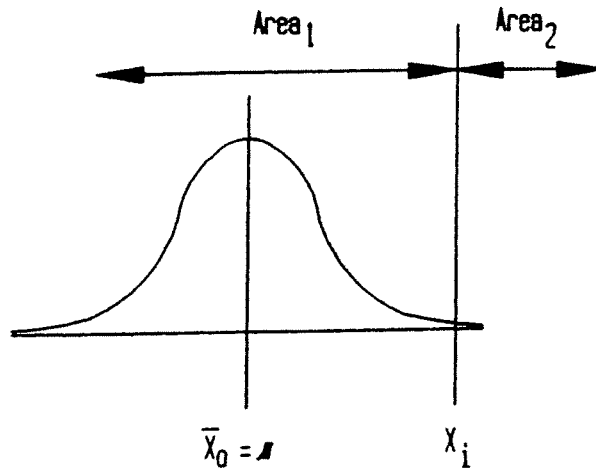
$z_1 = +2.67$

$\text{Area}_1 = 0.9962$

$\text{Area}_2 = 1.000 - \text{Area}_1$

$\text{Area}_2 = 1.000 - 0.9962$

$\text{Area}_2 = 0.0038 \text{ or } 0.38\%$

46c $\text{Area}_1 = 0.0228$

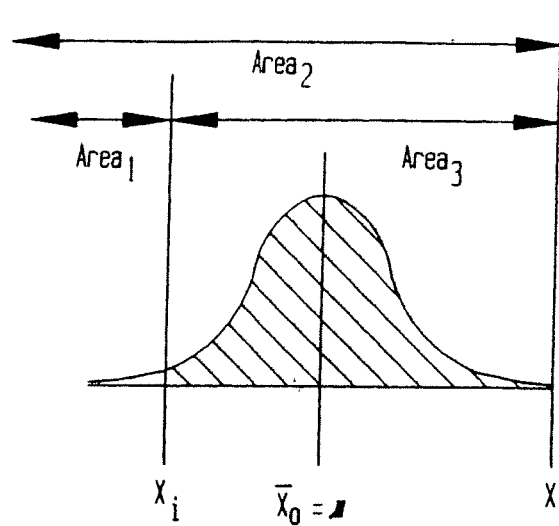$z_2 = \dfrac{X_i - \mu}{\sigma}$

$z_2 = \dfrac{20.5 - 16}{1.5}$

$z_2 = +3.00$

$\text{Area}_2 = 0.99865$

$\text{Area}_3 = \text{Area}_2 - \text{Area}_1$

$\text{Area}_3 = 0.99865 - 0.0228$

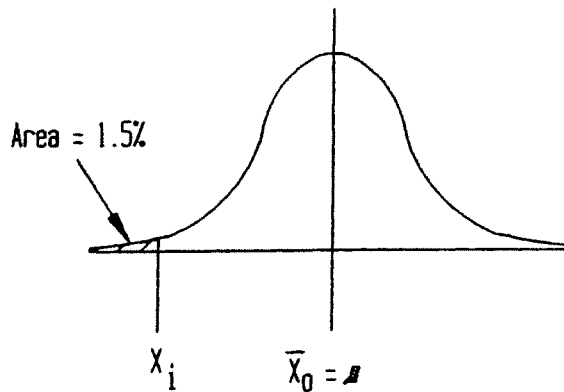$\text{Area}_3 = 0.9759 \text{ or } 97.59\%$

47.   From Table A

For 1.5%, $z_1 = -2.17$

$z_1 = \dfrac{X_i - \mu}{\sigma}$

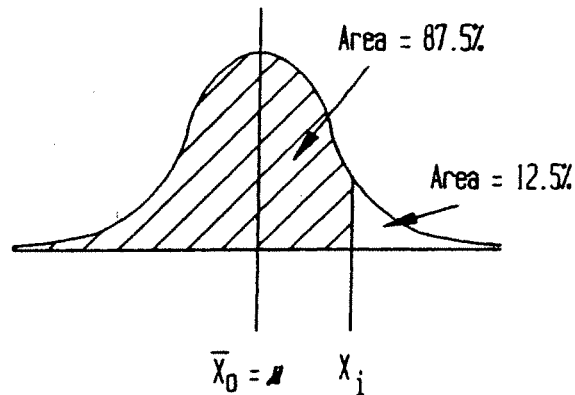$-2.17 = \dfrac{0.567 - \overline{X_0}}{0.018}$

$\overline{X}_0 = .606 \text{ g}$

48.   If rework % is 12.5%, Area to the left is 87.5% and has a Z value of +1.15.

$z_1 = \dfrac{X_i - \mu}{\sigma}$

$1.15 = \dfrac{25.38 - \overline{X_0}}{0.01}$

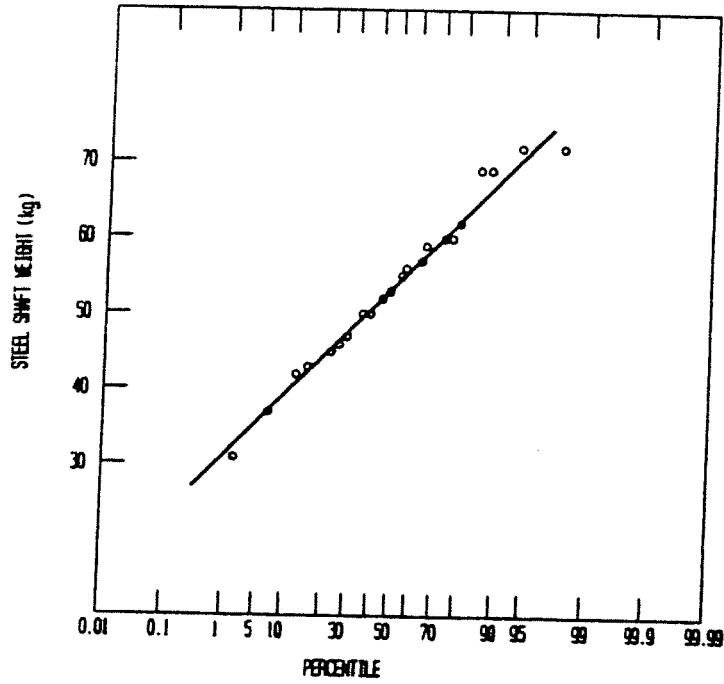$\overline{X}_0 = 25.37 \text{ mm}$

49a   Not normal

49b   Normal

49c   Not normal

49d   Not normal, but symmetrical

49e   Not normal, but symmetrical

49f   Not normal, but symmetrical

50a

X	i	PP	X	i	PP
31	1	2.3	55	12	52.3
37	2	6.8	56	13	56.8
42	3	11.4	57	14	61.4
43	4	15.9	59	15	65.9
45	5	20.5	60	16	70.5
46	6	25.0	60	17	75.0
47	7	29.5	62	18	79.5
50	8	34.1	69	19	84.1
50	9	38.6	69	20	88.6
52	10	43.2	72	21	93.2
53	11	47.7	72	22	97.7

50b

X	i	PP	X	i	PP
5.96	1	1.7	6.00	16	51.7
5.97	2	5.0	6.00	17	55.0
5.97	3	8.3	6.00	18	58.3
5.98	4	11.7	6.00	19	61.7
5.98	5	15.0	6.00	20	65.0
5.98	6	18.3	6.01	21	68.3
5.98	7	21.7	6.01	22	71.7
5.98	8	25.0	6.01	23	75.0
5.99	9	28.3	6.01	24	78.3
5.99	10	31.7	6.01	25	81.7
5.99	11	35.0	6.01	26	85.0
5.99	12	38.3	6.02	27	88.3
5.99	13	41.7	6.03	28	91.7
6.00	14	45.0	6.04	29	95.0
6.00	15	48.3	6.05	30	98.3
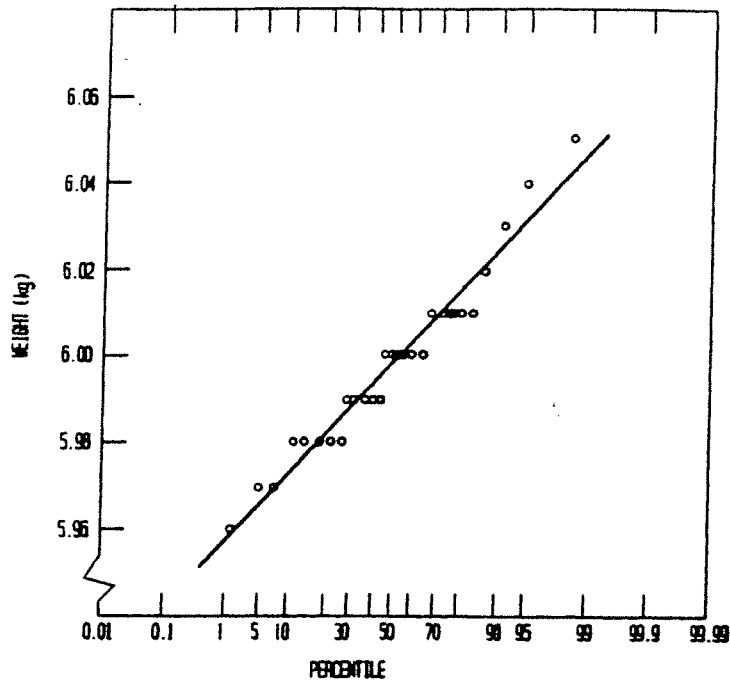
50c

X	i	PP	X	i	PP
1.78	1	2.0	1.91	14	54.0
1.80	2	6.0	1.91	15	48.0
1.81	3	10.0	1.92	16	62.0
1.82	4	14.0	1.93	17	66.0
1.83	5	18.0	1.94	18	70.0
1.83	6	22.0	1.95	19	74.0
1.87	7	26.0	1.95	20	78.0
1.88	8	30.0	1.95	21	82.0
1.89	9	34.0	1.96	22	86.0
1.89	10	38.0	1.97	23	90.0
1.90	11	42.0	1.99	24	94.0
1.90	12	46.0	2.00	25	98.0
1.90	13	50.0			

Chapter 5

51

% Foam vs Temperature (°F)

52

Amt - Off Target vs Hours of Use

53

Volume (liters) vs Gas Pressure (kg/cm^2)

54

Hardness vs Tensile Strength

55

Yield of Alfalfa (tons per acre) vs Water Applied (inches)