ENGR 115
Test No. 1
(SHOW YOUR WORK)

75/100

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1-Consider the following observations on shear strength of a joint bonded in a particular manner:

1	2	3	4	5	6	7	8	9	10	11	
~~5~~	~~9~~	~~15~~	76	~~21~~	~~28~~	~~40~~	~~19~~	~~17~~	~~18~~	~~75~~	
5	9	15	17	18	19	21	28	40	75	76	n = 11

a. Determine the value of the sample median and explain what it means. (10 pts)

19 is the median which means we can use it to calculate data.

The median is the middle value of a set numbers.

b. What is the value of the 64th percentile of the shear strength? (10 pts)

$\frac{64(11+1)}{100} = 7.68$

7.04

≈ 21.28

Value = 21 + 0.68(28 − 21)

≈ 25.8

21 + .04(25 − 21)

2- A sample of 20 glass bottles of a particular type was selected, and the internal pressure strength of each bottle was determined. Considering the following partial sample information:

Median = 202.2, Q_{25} = 196.0, Q_{75} = 216.8

Three smallest observations: 125.8, 188.1, 193.7
Three largest observations: 221.3, 230.5, 250.2

Identify all mild and extreme outliers and comment on the skewness of the distribution. (10 pts)

nner 1.5(216.8 − 196.0) = 31.2

uter 3.0(216.8 − 196.0) = 62.4

Mild observation below are 196.0 − 31.2 = 164.8 or above 216.8 + 31.2 = 248

Extreme observation below are 196.0 − 62.4 = 133.6 or above 216.8 + 62.4 = 279.2

The extreme outlier is 125.8 to the right

The mild outlier is 250.2

Nice (2)

3-For a sample of size 5, if $x_1 - \bar{x} = 7$, $x_2 - \bar{x} = -4$, $x_3 - \bar{x} = 4$, $x_4 - \bar{x} = 0$, what is the sample variance? (10 pts)

$x_1 - \bar{x} = 7$ $(x - \bar{x})^2$

$x_2 - \bar{x} = -4$ 49

$x_3 - \bar{x} = 4$ 16

$x_4 - \bar{x} = 0$ 16

$x_5 - \bar{x} = ?$ 0

1

$x_5 - x = 1$

≈ 32.5

$\frac{7^2 + (-4)^2 + (4)^2 + (0)^2 + (7)^2}{5-1}$

$\frac{82}{4} \approx 20.5$

3

4-Given that $n=8$, $\sum x_i = 25$, and $\sum x_i^2 = 512$, what is the sample standard deviation? (10 pts)

$$s^2 = \frac{5K - \frac{(25)^2}{8}}{7} = 24.446 \qquad \sqrt{24.446} \approx \boxed{4.92}$$

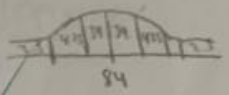
5-The grade distribution of a recent exam follows a normal distribution with the following summary:

Mean = 84 pts
Median = 84 pts
Variance = 25 pts

$$\frac{\frac{5}{1} - \frac{625}{8}}{7} \qquad \frac{\frac{40}{8} - \frac{625}{8}}{7}$$

a) Approximately what percentage of students scored less than "mean plus 2 standard deviations"? $[P < (\mu + 2\sigma)]$ (10 pts)

$$1 - \frac{1}{2^2} = .75 \qquad .75(100) \approx \boxed{75\%}$$



b) About what percentage of students scored more than the" mean - one standard deviations?" $[P > (\mu - 1\sigma)]$ (10 pts)

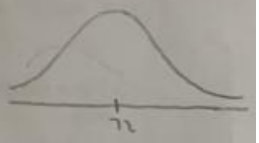
$$50\% + 34\% = 84\% \qquad 100 - 84 \approx \boxed{16\%}$$

c) Suppose the median changed to 60 points, and the mean and standard deviation remained the same as before. If 100 students took the test, what is the minimum number of students that scored within plus or minus one standard deviations from the mean? (10 pts)

$$1 - \frac{1}{2^k} \qquad 1 - \frac{1}{2^1} = \frac{1}{1} - \frac{1}{2} = \frac{2}{2} - \frac{1}{2} \qquad .50(100) = \boxed{50}$$

6-The number of contaminating particles on a silicon wafer prior to a certain rinsing process was determined for each wafer in a sample size 100, resulting in the following frequencies:

Number of Particles	Cumulative Frequency	Number of Particles	Cumulative Frequency
0	1	8	84
1	3	9	88
2	6	10	93
3	18	11	96
4	29	12	97
5	44	13	99
6	62	14	100
7	72		



a) What proportion of the sampled wafers had ($P \geq 10$)? (10 pts)

$$100 - f(10) = 100 - 88 = 12$$

$$\frac{12}{100} = \boxed{12}$$

b) What proportion of the sampled wafers had between ($4 < P \leq 7$)? (10 pts)

$$f(k) - f(4) = 72 - 29 = 43$$

$$\frac{43}{100} = \boxed{43 \text{ out of } 100 \text{ wafers}}$$