1. [3 marks] a) Use your calculator to compute μ, σ and s for the following data set: 11, 14, 19, 25, 26. Round your values to two decimal places.

$\mu = 19$ $\quad \sigma \approx 5.90$ $\quad s \approx 6.60$

b) If the positive number b were added to each measurement in the data set, what would the new values of μ, σ and s be?

$\mu = 19 + b$ $\quad$ σ and s don't change:

$\sigma \approx 5.90$ $\quad s \approx 6.60$

2. [2 marks] If the data has a linear relationship, find the equation of the least squares regression line. Round your values to one decimal place. If the data does not have a linear relationship, write *nonlinear.*

x	0.2	0.4	0.6	0.8	1
y	2.6	3.1	3.7	4.4	4.8

$r \approx 0.997$ so it's linear

$y = bx + a$

$\boxed{y \approx 2.9x + 2.0}$

3. [2 marks] Consider the following data set, where x is unknown: $40, 28, 33, 31, x$. What is the smallest possible value of the median?

ordered: 28, 31, 33, 40, plus x

Smallest possible value of the median is 31.

If $x \leq 31$, median $= 31$

If $x > 31$, median > 31

4. [4 marks] Find $P(A \cup B)$ if $P(A) = 0.15, P(B) = 0.45$ and:

a) A and B are mutually exclusive

$P(A \cap B) = 0$

Recall

$\boxed{P(A \cup B) = P(A) + P(B) - P(A \cap B)}$

$P(A \cup B) = 0.15 + 0.45 - 0 = 0.6$

b) A and B are independent

$P(A \cap B) = P(A)P(B) = 0.0675$

$P(A \cup B) = 0.15 + 0.45 - 0.0675 = 0.5325$

c) $P(A \cap B) = 0.12$

$P(A \cup B) = 0.15 + 0.45 - 0.12 = 0.48$

5. [4 marks] Given $P(A) = 0.49, P(B) = 0.72$ and $P(A \cap B) = 0.32$, find the following. Round your answers to two decimal places.

a) The probability of A, given that B occurs

$P(A|B) = \dfrac{P(A \cap B)}{P(B)} \approx 0.44$

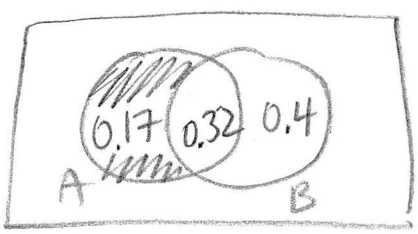
b) The probability of B, given that A occurs

$P(B|A) = \dfrac{P(B \cap A)}{P(A)} \approx 0.65$

Recall $B \cap A$ is the same as $A \cap B$

c) $P(\overline{B}\,|A)$

$P(\overline{B}|A) = \dfrac{P(\overline{B} \cap A)}{P(A)} \approx 0.35$



$P(\overline{B} \cap A) = 0.17$

6. [4 marks] Consider the following frequency table:

X	frequency
33	2
35	4
37	7
39	4
44	1

a) According to Tchebysheff's Theorem, what proportion of measurements should lie in the interval $\mu \pm 2\sigma$?

$\geq \frac{3}{4}$

b) According to the Empirical Rule, what proportion of measurements should lie in the interval $\mu \pm 2\sigma$?

approx. 95%

c) What is the actual proportion of measurements in the interval $\mu \pm 2\sigma$?

Calculator $\rightarrow$ $\mu \approx 36.94$ $\sigma \approx 2.50$

$\mu - 2\sigma \approx 31.94$

$\mu + 2\sigma \approx 41.94$

actual proportion of measurements in $31.94 \leq x \leq 41.94$ (see table) is $\frac{17}{18} \approx 94\%$

7. [3 marks] A shipment contains 28 good and 12 defective items. Twenty items are chosen for further examination. Find the probability that at most two of the twenty chosen items are defective. Round your answer to three decimal places.

40 items total $n(S) = {}_{40}C_{20}$ unordered

ways to choose at most 2 defective

= # 0 defective and 20 good + # 1 defective and 19 good

+ # 2 defective and 18 good

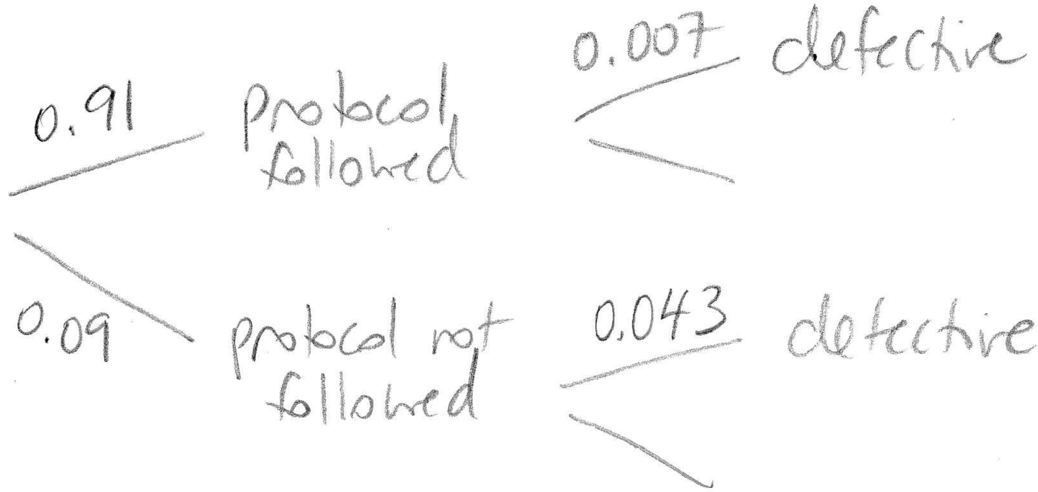
$$= ({}_{12}C_0)({}_{28}C_{20}) + ({}_{12}C_1)({}_{28}C_{19}) + ({}_{12}C_2)({}_{28}C_{18})$$

$$= 952{,}116{,}165$$

$$\text{Probability} = \frac{952{,}116{,}165}{{}_{40}C_{20}}$$

$$\approx 0.007$$

8. [3 marks] Employees at a certain factory follow protocol 91% of the time. When protocol is followed, 0.7% of manufactured items are defective. When protocol is not followed, 4.3% of manufactured items are defective. What is the probability that protocol was followed when a defective item was manufactured? Round your answer to three decimal places.



$$P(\text{protocol followed} \mid \text{defective})$$

$$= \frac{P(\text{protocol followed and defective})}{P(\text{defective})}$$

$$= \frac{0.91(0.007)}{\left(0.91(0.007) + 0.09(0.043)\right)}$$

$$\approx 0.622$$