1. [3 marks] Consider the following data set.

X	Relative Frequency
125	0.17
145	0.19
165	0.08
185	0.43
205	0.13

a) Calculate the mean.

$\mu = 125(0.17) + 145(0.19) + \ldots + 205(0.13)$

$= 168.2$

b) Calculate the median.

(the middle measurement)

median = 185

c) Based on the mean and the median, in which direction is the data skewed?

mean < median

Data is skewed to the left

2. [4 marks] Consider the following sample: $-6, -1, 2, 7, 8$. Compute the sample standard deviation. Show all your work. Round your answer to two decimal places.

X	$X - \bar{x}$	$(X - \bar{x})^2$
-6	-8	64
-1	-3	9
2	0	0
7	5	25
8	6	36

sample mean

$\bar{x} = 2$

sample variance

$s^2 = \frac{64+9+0+25+36}{4}$ ($n-1$)

$s^2 = 33.5$

sample SD $s \approx 5.79$

3. [5 marks] Consider the following data set.

X	Frequency
1	0.05
3	0.42
5	0.49
9	0.04

a) Compute μ and σ using your calculator. Round your values to two decimal places.

$\mu = 4.12 \quad \sigma \approx 1.53$ (2)

b) What does Tchebysheff's Theorem predict for the proportion of measurements in $\mu \pm 2.5\sigma$?

$\geq 1 - \frac{1}{k^2}$ of data in $\mu \pm k\sigma$

$\geq 1 - \frac{1}{2.5^2}$ of data in $\mu \pm 2.5$

$\geq 84\%$ of data in $\mu \pm 2.5\sigma$ (2)

(-1) for missing/incorrect inequality

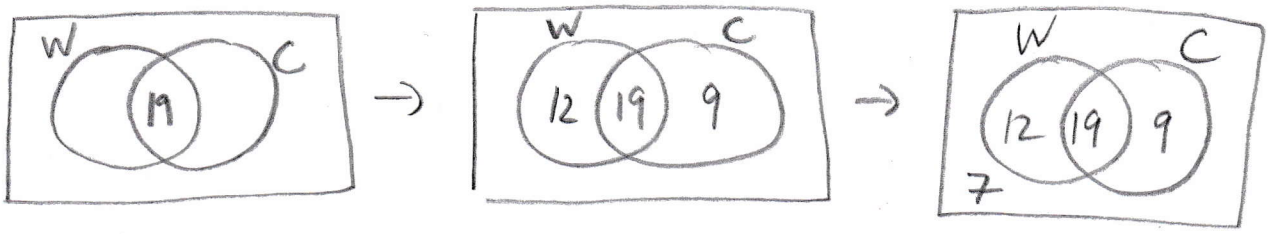
c) What is the actual proportion of measurements in $\mu \pm 2.5\sigma$?

$\mu \pm 2.5\sigma$: $0.295 \leq x \leq 7.945$

actual proportion = 0.96 (1)

96%

4. [2 marks] In a class of 47 students, 31 work and 28 have a car. Of those who have a car, 19 work. What is the probability that a student works or has a car?



$P(\text{works or car}) = \frac{40}{47} \approx 85\%$

5. [5 marks] A password consists of 4 digits, where each digit can be chosen from $1, 2, 3, 4, 5$. Find the probability that a password:

a) starts with 4

$n(S) = 5^4 \quad n(A) = 5^3$ 4___

$P(A) = \frac{5^3}{5^4} = 0.2$

b) ends with 55

$n(A) = 5^2$ __55

$P(A) = \frac{5^2}{5^4} = 0.04$

c) has no repeated digits

$n(A) = 5P4$ or $5 \times 4 \times 3 \times 2$

$P(A) = \frac{5P4}{5^4} = 0.192$

d) has at least one repeated digit

$1 - P(\text{no repeated})$

$= 1 - 0.192$

$= 0.808$

6. [3 marks] Are events A and B independent? State yes or no for each scenario.

a) $P(A) = 0.2, P(B) = 0.6, P(A \cap B) = 0.2$

No $P(A \cap B) \neq P(A)P(B)$

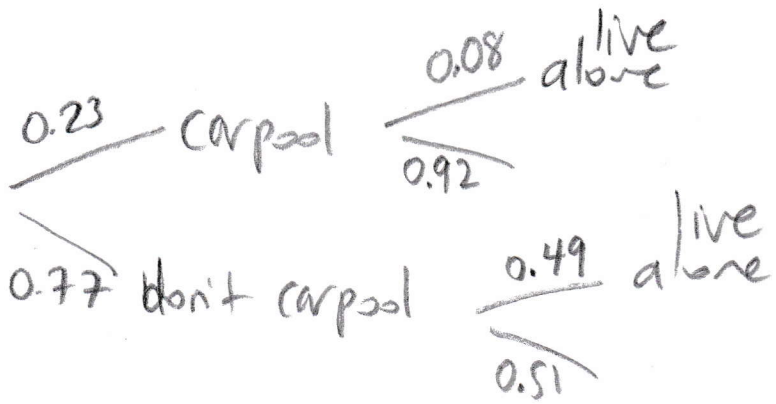
b) $P(A) = 0.2, P(B) = 0.6, P(A \cap B) = 0$

No $P(A \cap B) \neq P(A)P(B)$

c) $P(A) = 0.2, P(B) = 0.6, P(B|A) = 0.6$

YES $P(B|A) = P(B)$

7. [3 marks] 23% of students carpool. Of the students who carpool, 8% live alone. Of the students who don't carpool, 49% live alone. Find the probability that a student who lives alone carpools. Round your answer to two decimal places.



$$P(\text{carpool} \mid \text{lives alone}) = \frac{P(\text{carpool and alone})}{P(\text{alone})}$$

$$= \frac{0.23(0.08)}{[0.23(0.08) + 0.77(0.49)]}$$

$$\approx 0.05$$

8. [5 marks] A shipment contains 33 good and 7 defective parts. Three parts are randomly selected from the shipment. Let X be the number of defective parts selected.

a) Find the probability distribution of X. Round the probabilities to three decimal places.

33G
7D

X = #D	Outcome	#ways	P(x)
0	3G	33C3 = 5456	0.552
1	2G and 1D	33C2 x 7C1 = 3696	0.374
2	1G and 2D	33C1 x 7C2 = 693	0.070
3	3D	7C3 = 35	0.004
		9880	

b) Find the expected value of X

μ or $E(X) = 0(0.552) + 1(0.374) + 2(0.070) + 3(0.004)$

$= 0.526$