

1. [4 marks] Consider the following data set:

X	Frequency
-9	6
-2	15
-1	8
1	10
9	3

a) Use your calculator to find μ and σ . Round values to one decimal place.

$$\mu \approx -1.3 \quad \sigma \approx 4.2$$

①

b) What does Tchebysheff's Theorem say about the proportion of data in the interval $\mu \pm 1.7\sigma$?

$$\geq 1 - \frac{1}{1.7^2} \text{ of data lies in } \mu \pm 1.7\sigma$$

At least 65% of data lies in $\mu \pm 1.7\sigma$

②

c) What is the actual proportion of data in the interval $\mu \pm 1.7\sigma$?

$$\mu \pm 1.7\sigma: -8.44 \leq X \leq 5.84$$

Look at table

$$\text{Actual \%} = \frac{33}{42}$$

$$\approx 79\%$$

③

2. [3 marks] Calculate the sample standard deviation for the following data set. Show all your work.

-6, -4, 2, 5

X	$X - \bar{x}$	$(X - \bar{x})^2$
-6	-5.25	27.5625
-4	-3.25	10.5625
2	2.75	7.5625
5	5.75	33.0625

$$\bar{x} = -0.75$$

$$s^2 = \frac{\text{sum}}{n-1} = 26.25$$

$$s \approx 5.1$$

3. [2 marks] An engineering firm interviewed 62 applicants: 37 were interviewed by Skype and the rest were interviewed in-person. Twelve people in total were hired. Of these twelve, eight had Skype interviews. Find the probability that an applicant was interviewed in-person or was hired.

	Skype	In-Person
Hired	8	4
Not Hired	29	21

$$P(\text{In-Person or Hired}) = \frac{33}{62} \approx 53\%$$

4. [3 marks] $P(A) = 0.7$ and $P(B) = 0.6$. For each situation below, state whether events A and B are independent or dependent.

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

Dependent $P(A \cap B) \neq P(A)P(B)$

(1)

b) $P(B|A) = 0.6$

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

(1)

c) $P(A \cup B) = 0.88$

Independent

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

$$0.88 = 1.3 - P(A \cap B)$$

$$P(A \cap B) = 0.42$$

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

(1)

5. [3 marks] A shipment contains 40 parts: 33 parts are good and 7 are defective. Six parts are randomly selected from the shipment. Find the probability that between 2 and 4 defective parts (inclusive) are selected. Round your answer to two decimal places.

$$n(S) = 40C6 = 3838380$$

(1)

$$n(A) = 7C2 \times 33C4 + 7C3 \times 33C3 + 7C4 \times 33C2$$

2 def and 4 good or 3 def and 3 good or 4 def and 2 good

(2)

$$= 1068760$$

$$P(A) \approx 0.28$$

6. [3 marks] The college bookstore makes an average of 32 sales per hour. Find the probability that the bookstore makes at least four sales in the next 15 minutes. Round your answer to two decimal places.

Poisson $X = \# \text{ sales in next 15 mins.}$

$$\frac{32 \text{ sales}}{60 \text{ mins}} = \frac{8 \text{ sales}}{15 \text{ mins}} \quad \boxed{\text{Use } \mu = 8}$$

(1)

$$P(X \geq 4) = 1 - P(X=0) - P(X=1) - P(X=2) - P(X=3)$$

(1)

$$= 1 - e^{-8} \left(\frac{8^0}{0!} + \frac{8^1}{1!} + \frac{8^2}{2!} + \frac{8^3}{3!} \right)$$

$$\approx 0.96$$

(1)

7. [3 marks] At a large engineering firm, each project has an 87% probability of being completed on time. Find the probability that at least 40 of the firm's next 43 projects will be completed on time. Round your answer to two decimal places.

Binomial $p = 0.87$ $q = 1 - p = 0.13$ $n = 43$

(1)

$X = \# \text{ projects completed on time.}$

$$P(X \geq 40) = P(X=40) + P(X=41) + P(X=42) + P(X=43)$$

(1)

$$= {}^{43}C_{40} (0.87)^{40} (0.13)^3 + {}^{43}C_{41} (0.87)^{41} (0.13)^2 + {}^{43}C_{42} (0.87)^{42} (0.13)^1 + {}^{43}C_{43} (0.87)^{43} (0.13)^0$$

$$\approx 0.17$$

(1)

8. [4 marks] The random variable X only takes on three values: 1, 10 and 100. The probability that $X = 10$ is eight times the probability that $X = 100$. The probability that $X = 1$ is seven times the probability that $X = 100$. Find the probability distribution of X .

$$P(X=10) = 8 P(X=100)$$

$$P(X=1) = 7 P(X=100)$$

$$P(X=1) + P(X=10) + P(X=100) = 1$$

$$7 P(X=100) + 8 P(X=100) + P(X=100) = 1$$

$$16 P(X=100) = 1$$

$$P(X=100) = \frac{1}{16}$$

So $P(X=10) = \frac{8}{16}$ and $P(X=1) = \frac{7}{16}$

X	$P(X)$
1	$\frac{7}{16}$
10	$\frac{8}{16}$
100	$\frac{1}{16}$