(2 marks)

Question 1: Classify each variable as Qualitative or Quantitative.	The answer
The variable that records the number of cities in countries.	
The variable that records heights of people.	
The variable that records ID of students.	
The variable that records age of chickens in a farm.	

(2 marks)

| Question 2: Classify each variable as Continuous or Discrete.	The answer
The variable that records weights of children.	
The variable that records heights of people.	
The variable that records numbers of cars in cities.	
The variable that records numbers of books in libraries.	

(2 marks)

Question 3: Determine whether of the following statements is True or False.	The answer
$100(1 - \alpha)\%$ confidence interval for the population mean μ is $\bar{x} \pm z_{1-\alpha} \dfrac{\sigma}{\sqrt{n}}$.	
The interquartile range is the best measure for dispersion.	
Two events A and B of 2^{Ω} are mutually exclusive if $P(A \cap B) = P(A) \cdot P(B)$.	
The statistic S^2 is an estimator for the variance σ^2 of a normal population.	

(2 marks)

Question 4: Put the right word or symbol in its proper position:

$$x_s - x_\ell, \; x_\ell - x_s, \; A \cap B = \varnothing, \; A \cup B = \varnothing, \; P(A \cap B) = P(A) \cdot P(B), \; P(A \cup B) = P(A) + P(B),$$

$$z_0 = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}, \; Z = \frac{\bar{X} - \mu_0}{\sigma / \sqrt{n}}, \; z_0 = \frac{\hat{p} - p_0}{\sqrt{p_0(1 - p_0) / n}}, \; Z = \frac{\hat{P} - p_0}{\sqrt{p_0(1 - p_0) / n}}$$

Two events A and B are mutual exclusive if ....

The range of raw data $x_1, x_2, ..., x_n$ is ....

For two events A and B, if .... Then A and B are independent.

The value of test statistic for the mean of normal population is ....

Question 5: Consider data given by the following frequency polygon:
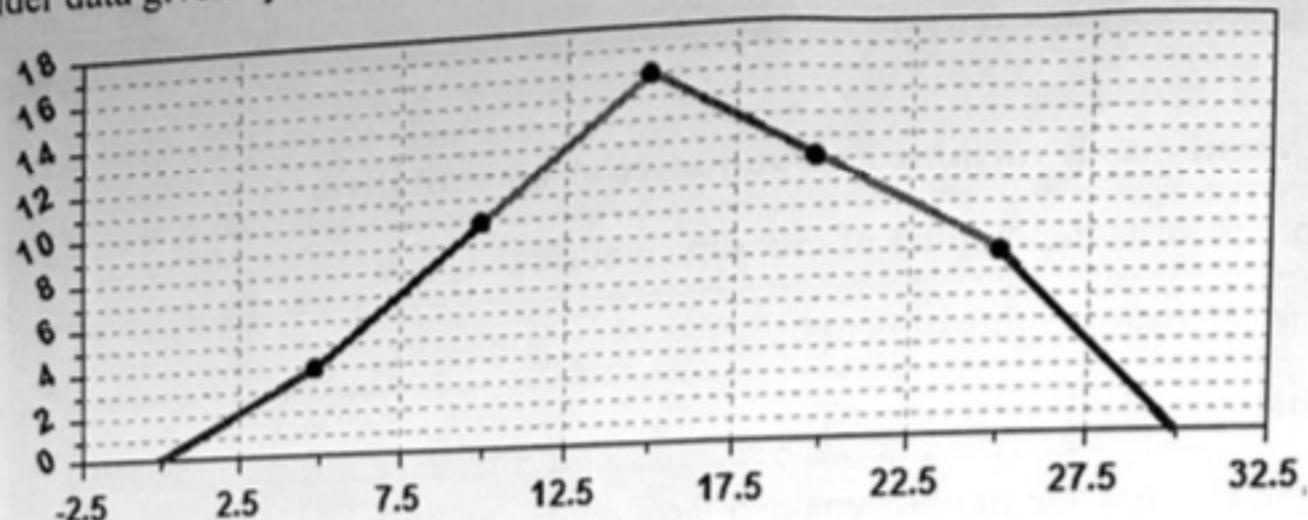
Then:

a) Complete the following frequency distribution table for the above polygon.

Class Limit	Class Boundaries	Midpoint	Frequency	Relative Frequency	Ascending Cumulative Frequency (ACF)
Sum					

b) Calculate the **mean** for the data of above frequency distribution table.

....

....

....

c) Calculate the **range** of data for the above frequency distribution table.

....

d) Draw the **ogive** (ascending cumulative frequency polygon) of the above frequency distribution table.

ACF
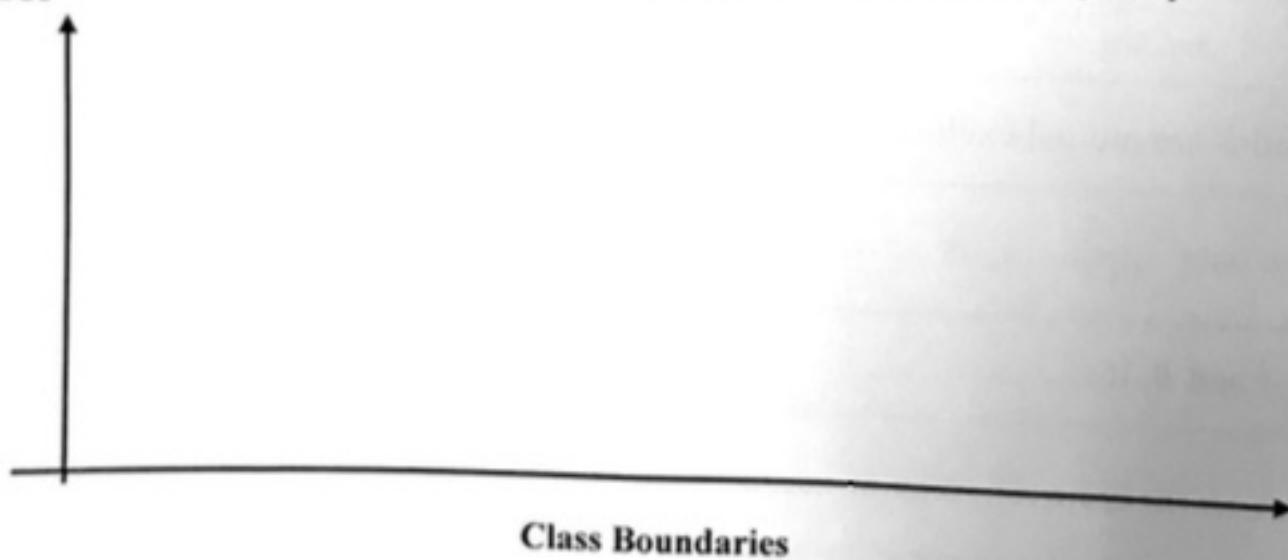
Class Boundaries

(10 marks)

Question 6: Consider the data: $7, 9, 8, 6, 2, 7, 15, 7, 3, 6, 5, 3$. Then:

a) Calculate the **mean** for the given data.

....

....

b) Calculate the **median** for the given data.

....

....

....

c) Find the **mode** of the given data.

....

....

d) If the variance of the given data is $S^2 = 11.73$, then calculate the **standard score** for the value 5.

....

e) Calculate the **coefficient of variation** for the given data.

....

f) Calculate Q_1, Q_3, LF and HF for the given data.

For Q_1: ....

....

For Q_3: ....

....

For LF: ....

For HF: ....

g) Check if the given data have **outliers**.

....

....

h) Draw the **box plot** for the given data and determine the five numbers on the graph:
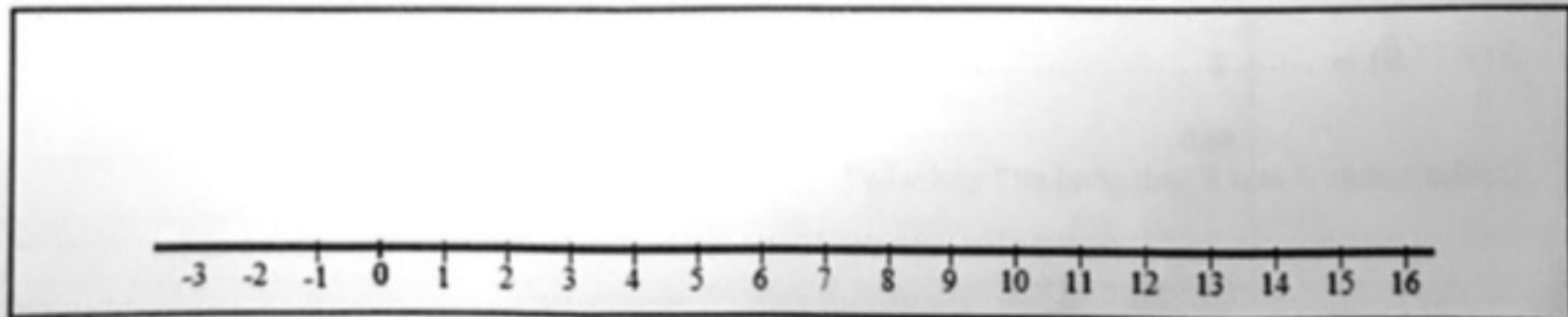
Question 7: The following data represent the grades of students:

D	B	A	D	B	A	C	A	D	C	B	B
A	C	C	B	A	A	A	C	C	A	B	C
D	B	A	B	A	D	C	B	B	C	D	B
B	A	B	A	A	A						

Then:
a) Write the frequencies of these grades and represent them graphical.

Grade	Frequency
A	
B	
C	
D	
sum	
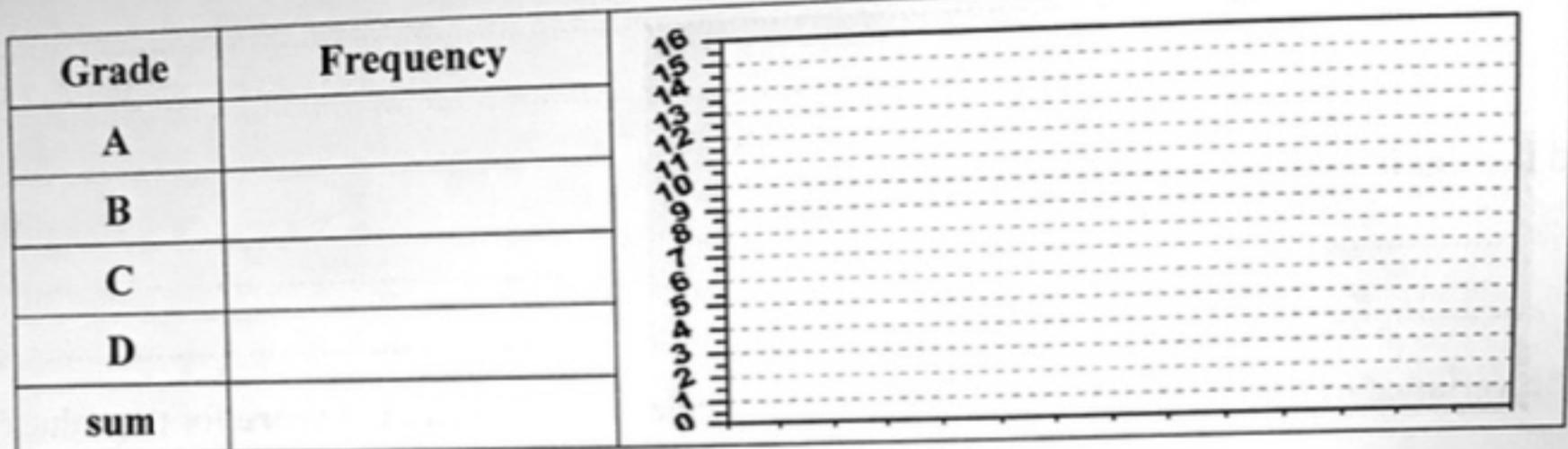
(3 marks)

Question 8: If $[\Omega, \mathscr{A}, P]$ is a probability space of rolling a **fair die** one time, then:

a) Determine Ω, $\mathscr{A}$ and P for this random experiment.

....

b) Calculate the probability of getting an even number.

....

c) If we getting an even number, what is the probability that we have the number **2** ?

....

....

....

(2.5 marks)

Question 9: If we have Ω a space of elementary evens, A and $B \in 2^{\Omega}$ with $P(A \cap B) = 0.15$, $P(A \setminus B) = 0.25$ $P(B \setminus A) = 0.35$. Then calculate the following probabilities:

a) $P(A) =$ ....

b) $P(B) =$ ....

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

d) $P(\bar{A} \cap \bar{B}) =$ ....

e) Are the events A and B independent? and why?

....

....

(3 marks)

Question 10: We select **three** balls randomly (one after another) of a box contains 5 black and 4 green balls. If all balls have the same chance at selecting. Now:

a) If A is the event that the selected balls are green, then calculate $P(A)$.

....

....

....

b) If B is the event that the selected balls have the same colors, then calculate $P(B)$.

....

....

....

c) What is the probability that the selected balls have different colors?

....

....

(4.5 marks)

Question 11: Suppose that $\Omega = \{1,2,3,4,5,6\}$, $\mathscr{A} = 2^{\Omega}$ and $P(A) = \dfrac{|A|}{|\Omega|}$. Now, let $X : \Omega \longrightarrow \mathbb{R}$ be a random variable on the probability space $[\Omega, \mathscr{A}, P]$ defined by

$$X(\omega) = \begin{cases} -1 & for\ \omega = 1,2 \\ 0 & for\ \omega = 3,4 \\ +1 & for\ \omega = 5,6 \end{cases}$$

Then:

**a)** What is the name of this random variable and calculate the probability $P(X \le 0.5)$?

....

....

b) Determine the event in the relation: $\{\omega \in \Omega\; ; X(\omega) \le x\} = \begin{cases} \text{................} & for\ x < -1 \\ \text{................} & for\ -1 \le x < 0 \\ \text{................} & for\ 0 \le x < 1 \\ \text{................} & for\ x \ge 1 \end{cases}$

c) Determine the distribution function F_X and draw it.

....

....

....

....
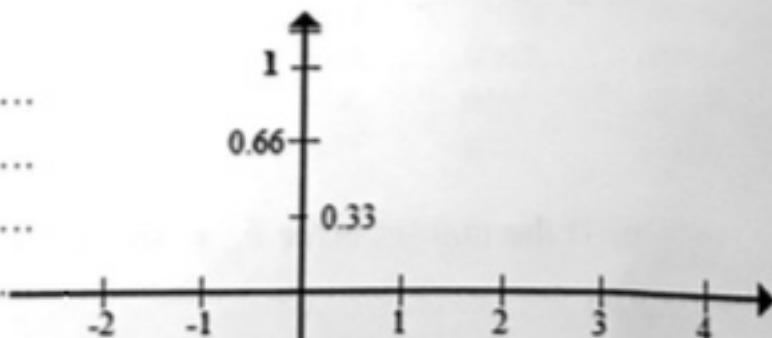
Question 12: Consider the following data:

X	1	2	3	4	5	5	6	7	8	9
Y	10	9	8	7	6	5	5	4	3	2

a) Represent this data on the scatter plot.
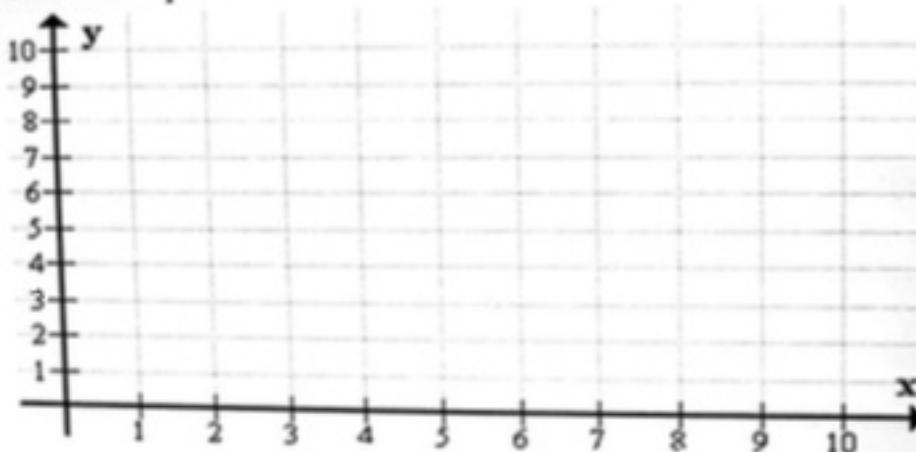
b) If you know that $\sum_{i=1}^{10} x_i = 50$, $\sum_{i=1}^{10} y_i = 59$, $\sum_{i=1}^{10} x_i^2 = 310$, $\sum_{i=1}^{10} y_i^2 = 409$, $\sum_{i=1}^{10} x_i y_i = 235$, $\sum_{i=1}^{10} (x_i - \bar{x})^2 = 61.6$, $\sum_{i=1}^{10} (y_i - \bar{y})^2 = 65.8$ and $\sum_{i=1}^{10} (x_i - \bar{x})(y_i - \bar{y}) = -57.2$. Then calculate the coefficient of correlation (r).

....

....

....

....

c) Is there a linear relationship between X and Y? Is it positive or negative? Is it strong or weak?

....

....

Question 13: Assume that a medical researcher collected a random sample of size 625 from Saudi adults and found 125 of them are diabetics. Then:

a) Determine 95% confidence interval for the proportion of diabetics.

....

....

....

....

b) If the point estimation $\hat{p}$ is used to estimate p, what is the margin error (for 95% confidence level)?

....

....

c) If the margin error $\delta_p =$ (for 95% confidence level), what is the sample size n?

....

(2.5 marks)

Question 14: Suppose we would like to breakfast if the typical amount spent per customer for breakfast at a new restaurant is more than 10 SR. A sample of 64 customers over a two-week was randomly selected and the average amount spent was 9.4 SR. Assume that the standard deviation is known to be 1.8 SR. Then using the significance level $\alpha = 0.0036$ for testing the null hypothesis $H_0 : \mu = 10$ versus the alternative hypothesis $H_1 : \mu < 10$.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

End of Exam