Quiz (1) **STAT 101** **First Semester (1438/1439)** **No. Section:**

Student Name: **Student ID:**

(4 marks)

Question: Classify each variable as Qualitative or Quantitative.	
Blood group of people.	**(Qualitative)**
Time to get home.	**(Quantitative)**
Height of students.	**(Quantitative)**
Colors of flowers.	**(Qualitative)**

(4 marks)

Question: Classify each variable as Continuous or Discrete.	
Wight of children.	**(Continuous)**
Numbers of seating (or chairs) in garden.	**(Discrete)**
Age of cats.	**(Continuous)**
Type of cars.	**(Discrete** ÷1 **)**

(4 marks)

Question: Answer with true or false to the following sentences.	
Mode is defined for qualitative data.	**(true)**
The mean is sensitive to extreme values.	**(true)**
For a skewed distribution of data we have: Mode = Median = Mean	**(false)**
Histogram with two peaks is multimodal.	**(false)**

(4 marks)

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

sample, variable, statistic , bar chart, mode. Descriptive Statistics

The Descriptive Statistics is those statistical methods or techniques which are used for presenting and summarizing data in either tables or graphs form.

A statistic is a function of a sample.

A variable is a characteristic, feature or factor that varies from one individual to another in a population.

In a bar chart , the frequency of each class is represented by a bar. The height of the bar corresponds to the frequency of the class. The width of the bar doesn't matter

(14 marks) **(9 marks)**

We conceder the following data:

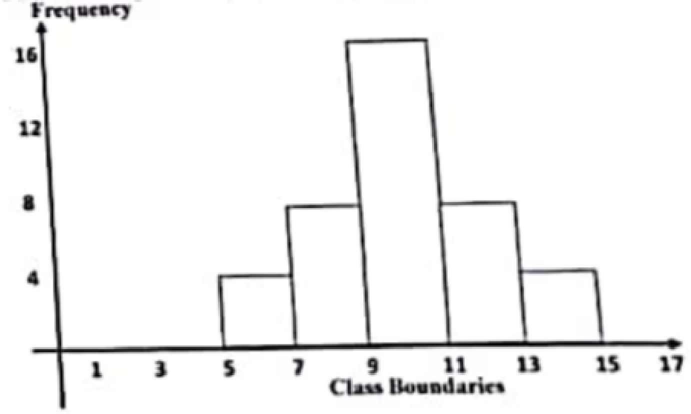
5.5	7.5	6	6.5	7	6.75	7	7.25	7.5	7.75	8
8.25	9	9.75	10	10.25	10.5	10.75	9	9.25	9.5	9.75
10.25	10.5	11	12	12.5	11.5	11.25	11.75	12.75	12.99	13.01
13.25	13.5	14.88	9.01	9.55	10.10	10.88				

a) Complete the following frequency distribution

Delete a quarter mark for each error

Class Boundaries	**Midpoint**	**Frequency**	**Relative Frequency**	**Percentage %**	**A.C.F**
5 → 7	6	4	4/40 = 0.1	0.1×100 =10	4
7 → 9	8	8	0.2	20	4+8 =12
9 → 11	10	16	0.4	40	28
11 → 13	12	8	0.2	20	36
13 → 15	14	4	0.1	10	40
Total		40	1	100	——

b) Draw the histogram for the data of above frequency distribution table. (5 mark



أجب عن جميع الأسئلة الآتية في الفراغات المخصَّصة لها

(1.5 marks) 1.5

Question 1: Classify each variable as Qualitative or Quantitative.	**The answer**
The variable that record ID of students in an exam. ✓	Qualitative ← ~~Quantitative~~
The variable that record weights of children in a school. ✓	Quantitative
The variable that record colors of cars. ✓	Qualitative

(1.5 marks) 1.5

Question 2: Classify each variable as Continuous or Discrete.	**The answer**
The variable that record heights of people. ✓	continuous
The variable that record numbers of children in schools of Riyadh city. ✓	Discrete
The variable that record weights of books. ✓	continuous

(1.5 marks) 0.5

Question 3: Determine whether of the following statements is True or False.	**The answer**
$\lim_{x \to \infty} F_X(x) = 0$ ✓	Falsa
The range of data is sensitive to extreme values. −0.5 ✗	Falsa
Two events A and B are independent if $P(A \cup B) = P(A) + P(B)$. −0.5 ✗	True

(1.5 marks) 1.5

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

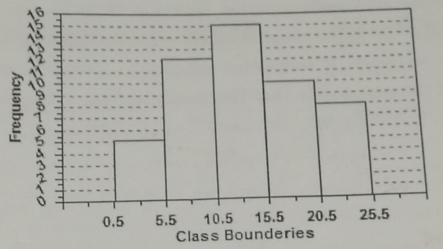
discrete space, continuous space, parameter, statistic , permutation, combination, mutually independent, mutually exclusive.

Two events A and B are ..mutually..exclusive if they cannot occur at the same time. ✓

Any an arrangement of r distinct objects from a set of n different objects, is called a ..Permutation.. ✓

If a space Ω consists uncountable number of outcomes, then Ω is called a .continuous..Space. ✓

Question 7: If we have data with the following histogram:



Then:

a) Complete the following frequency distribution table for the given data in the previous figure:

3.5

Class Limit	Class Boundaries	Midpoint $\frac{U+L}{2}$	Frequency	Relative Frequency $\frac{f}{n}$	Percentage % RF×100	A.C.F.
1 - 5	0.5 → 5.5	3	5	0.1	10 %	5
6 - 10	5.5 → 10.5	8	12	0,24	24 %	5+12 =17
11 - 15	10,5 → 15,5	13	15	0,3	30 %	5+12+15=32 ← median
16 - 20	15,5 → 20,5	18	10	0,2	20 %	32+10=42
21 - 25	20,5 → 25.5	23	8	0.16	16 %	42+8=50
Sum			50	1	100 %	

b) Calculate the median for the given data.

$\frac{n}{2} = \frac{50}{2} = 25$ $\quad \tilde{x} = L + \frac{\frac{\Sigma f}{2} - (\tilde{F} - \tilde{f})}{\tilde{f}} \times C$

$C = 15,5 - 10,5 = 5$ $\quad \tilde{X} = 10,5 + \frac{25 - (32-15)}{15} \times 5$

$\tilde{x} = 13,16$

.5

d) Calculate the range for the given data.

$R = X_k - X_{first} \Rightarrow R = 23 - 3 = 20$

(4 marks) 4

Question 8: If we have Ω a space of elementary evens, A and $B \in 2^{\Omega}$ with $P(A \setminus B) = 0.25$, $P(B \setminus A) = 0.30$ and $P(A \cap B) = 0.15$. Then calculate the following probabilities:

الفرق الفرق

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

1 **a)** $P(A) = P(A \setminus B) + P(A \cap B) = 0,25 + 0,15 = 0,4$

1 **b)** $P(B) = P(B \setminus A) + P(A \cap B) = 0,30 + 0,15 = 0,45$

0.5 **c)** $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0,4 + 0,45 - 0,15 = 0,7$

.5 **d)** $P(\bar{A} \cap \bar{B}) =$ ~~P(A∪B) − P(A∩B) = 0,4 − 0,15 = 0,25~~ $P(\overline{A \cup B}) = 1 - P($
$= 1 - 0,7 = 0$

.5 **e)** $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0,15}{0,45} = 0,33$

.5 **f)** Are the events A and B independent, and why?

$P(A \cap B) = P(A) \cdot P(B) \Rightarrow 0,15 \neq (0,4)(0,45) = 0,18$

the events A and B not independent

(6 marks) 6

Question 5: Let 3, 7, 4, 6, 5, 12, 5, 6 be data of a sample. Then:

a) Calculate the mean for the given data.

$\bar{X} = \frac{\sum X}{n}$

0.75 $\bar{X} = \frac{3+7+4+6+5+12+5+6}{8} = \frac{48}{8} = 6$ the mean = 6

b) Calculate the median for the given data.

1.25

3, 4, 5, 5, 6, 6, 7, 12

$\tilde{X} = \frac{5+6}{2} = \frac{11}{2} = 5.5$ the median = 5.5

1 **c)** How much of modes we have in the given data, and then determine them.

The modes = 5 and 6 (have two modes)

e) Calculate Q_1, D_6 and P_{85} for the given data. $\overset{x_1}{3}, \overset{x_2}{4}, \overset{x_3}{5}, \overset{x_4}{5}, \overset{x_5}{6}, \overset{x_6}{6}, \overset{x_7}{7}, \overset{x_8}{12}$

2.25

For Q_1: $q_1 =$ $q_r = \frac{r(n+1)}{4} = \frac{1(8+1)}{4} = 2,25$ / $Q_r = X_k + S(X_{k+1} - X_k)$

$Q_1 = X_2 + 0,25(X_3 - X_2) = 4 + 0,25(5-4) = 4,25$

For D_6: $d_r = \frac{r(n+1)}{10} = d_6 = \frac{6(8+1)}{10} = 5,4$ / $D_r = X_k + S(X_{k+1} - X_k)$

$D_6 = X_5 + 0,4(X_6 - X_5) = 6 + 0,4(6-6) = 6$

For P_{85}: $q_r = \frac{r(n+1)}{100} = q_{85} = \frac{85(8+1)}{100} = 7,65$ / $P_r = X_k + S(X_{k+1} - X_k)$

$P_{85} = X_7 + 0,65(X_8 - X_7) = 7 + 0,65(12-7) = 10,25$

0.75 **f)** If the variance of the given data is $S^2 = 8.6436$, then calculate the standard score for the value 7. $S = \sqrt{8.64}$

$S = 2,94$

$Z = \frac{X - \bar{X}}{S} \Longrightarrow Z = \frac{7-6}{2,94} = 0,34$

(2 mark) 1.5

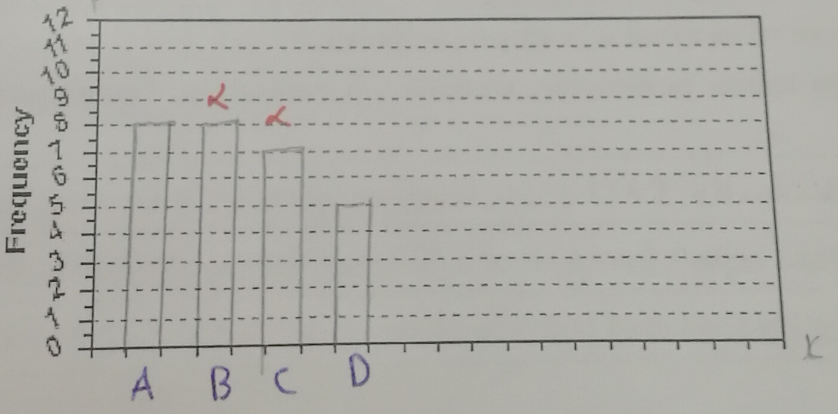
Question 6: Consider the following data:

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

Draw the bar graph for the given data.

X	F
A	8
B	8
C	7
D	5

1/2



0.5

(4 marks) 3.25

Question 9: In a particular population, 30% of people drive Korean cars, 15% of people drive Japanese cars and the rest (55%) of people drive cars made in other countries. It is known that 10% of people driving Korean cars have accidents, 07% of people driving Japanese cars have accidents, and 12% of people driving cars made other countries have accidents. If we elected randomly a person of this population, and we find that he had an accident, what is the probability that this person driving a Korean car?

$P(C) = \sum_{i=1}^{n} P(A) \cdot P(C|A)$ 0.5

$= P(A) \cdot P(C|A) + P(B) \cdot P(C|B) + P(D) \cdot P(C|D)$

$= 0.3 \times 0.1 + 0.15 \times 0.07 + 0.55 \times 0.12$

$P(C) = \underline{\underline{0.1065}}$ 0.75

$P(A) = 0.3$ $\frac{1}{4}$, $P(B) = 0.15$ $\frac{1}{4}$, $P(D) = 0.55$ $\frac{1}{4}$

$P(C|A) = 0.1$ $\frac{1}{4}$, $P(C|B) = 0.07$ $\frac{1}{4}$

$P(C|D) = 0.12$ $\frac{1}{4}$

$P(C \wedge A) = P(C|A) \cdot P(A) = 0.1 \times 0.3 = \underline{\underline{0.03}}$ ✓

$\underline{\underline{P(A|C)}} = \frac{P(A \wedge C)}{P(C)} = \frac{0.03}{0.1065} = \underline{\underline{0.28}}$ 0.5

4

(3 marks) 1.5

Question 10: Suppose that $\Omega = \{HH, HT, TH, TT\}$, $\mathscr{A} = 2^{\Omega}$ and $P(A) = \frac{|A|}{|\Omega|}$. Now, let X be a random variable on the probability space $[\Omega, \mathscr{A}, P]$ defined by $X(\omega) = \begin{cases} 0 & \text{for } \omega = HH \\ 1 & \text{for } \omega = HT, TH \\ 2 & \text{for } \omega = TT \end{cases}$. Then determine the distribution function F_X.

2

$F_X \begin{cases} \Phi & x < 0 \\ \{HH\} & 0 \leq x < 1 \\ \{HT, TH, TT\} & 1 \leq x < 2 \\ \{\{HH, HT, TH, HH\} & x < 2 \end{cases}$

$\Omega = \{HH, HT, TH, TT\} = |\Omega| = 4$

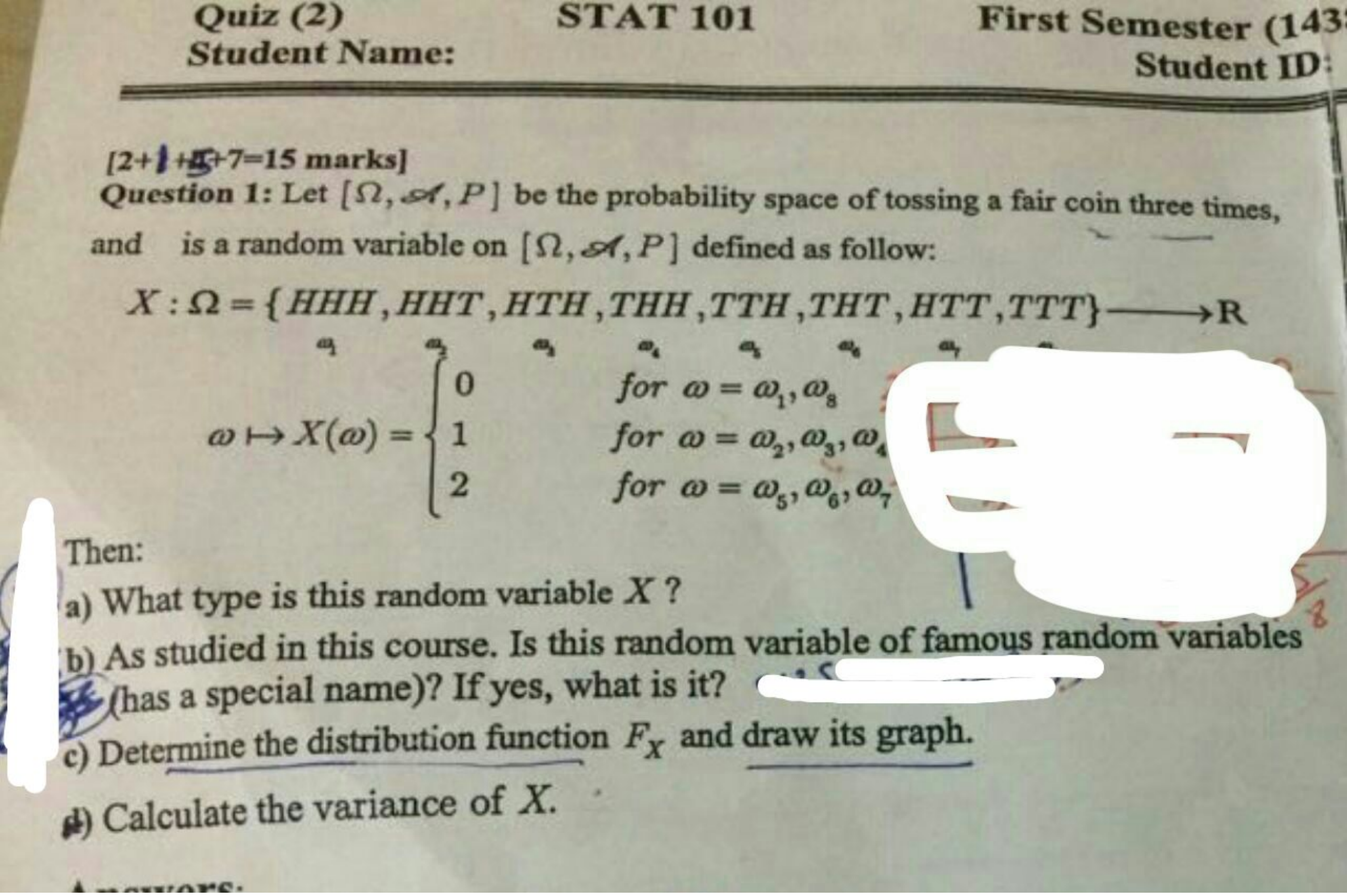
$\{HH\}$ $P(A) = \frac{|A|}{|\Omega|} = \frac{1}{4}$ ✓

0.5

$\{HT, TH\} = P(A) = \frac{|A|}{|\Omega|} = \frac{2}{4}$?

$\{TT\} = P(A) = \frac{|A|}{|\Omega|} = \frac{1}{4}$?

End of Exam



Quiz (2) **STAT 101** **First Semester (143**

Student Name: **Student ID:**

[2+1+5+7=15 marks]

Question 1: Let $[\Omega, \mathscr{A}, P]$ be the probability space of tossing a fair coin three times, and is a random variable on $[\Omega, \mathscr{A}, P]$ defined as follow:

$$X : \Omega = \{\underset{\omega_1}{HHH}, \underset{\omega_2}{HHT}, \underset{\omega_3}{HTH}, \underset{\omega_4}{THH}, \underset{\omega_5}{TTH}, \underset{\omega_6}{THT}, \underset{\omega_7}{HTT}, TTT\} \longrightarrow \mathrm{R}$$

$$\omega \mapsto X(\omega) = \begin{cases} 0 & for\ \omega = \omega_1, \omega_8 \\ 1 & for\ \omega = \omega_2, \omega_3, \omega_4 \\ 2 & for\ \omega = \omega_5, \omega_6, \omega_7 \end{cases}$$

[redacted]

Then:

[redacted]

a) What type is this random variable X ?

b) As studied in this course. Is this random variable of famous random variables (has a special name)? If yes, what is it? [redacted]

c) Determine the distribution function F_X and draw its graph.

d) Calculate the variance of X.

5/8

Quiz (2)

Th Probability Space of tossing a fair coin three time

$$X = \Omega = \{ \underset{\omega_1}{HHH}, \underset{\omega_2}{HH\cancel{T}}, \underset{\omega_3}{HTH}, \underset{\omega_4}{THH}, \underset{\omega_5}{TTH}, \underset{\omega_6}{THT}, \underset{\omega_7}{HTT}, \underset{\omega_8}{TTT} \}$$

$$\omega \to X(\omega) = \begin{cases} 0 & \text{for } \omega = \omega_1, \omega_2 \\ 1 & \text{for } \omega = \omega_2, \omega_3, \omega_4 \\ 2 & \text{for } \omega = \omega_5, \omega_6, \omega_7 \end{cases}$$

ⓐ What type is this random variable X?

discrete r.v

لانها اعداد صحيحة

ⓑ As studied random variable of famuse random variable?

Binomial

لان $x = 0, 1, 2$

لكن لو $x = 0, 1$ يصبح Bernoulli

او لو كان خلال فترة يصبح Poisson.

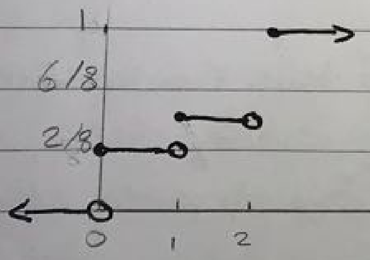
ⓒ determine the distribution function F_x and draw?

$$F_x(x) = \begin{cases} 0 & , x < 0 \\ 2/8 & , 0 \leq x < 1 \\ 5/8 & , 1 \leq x < 2 \\ 8/8 = 1 & , x \geq 2 \end{cases}$$

x	0	1	2
$P(x=x) = f_x$	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{3}{8}$
F_x	$\frac{2}{8}$	$\frac{5}{8}$	$\frac{8}{8} = 1$

⇑

للتوضيح فقط غير مطلوبة



$$* \mu = E(x) = [x_1 . P(x=x) + x_2 . P(x=x) + x_3 P(x=x)]$$
$$= 0\left(\frac{2}{8}\right) + 1\left(\frac{3}{8}\right) + 2\left(\frac{3}{8}\right) = \frac{9}{8}$$

$$* E(x^2) = 0^2\left(\frac{2}{8}\right) + 1^2\left(\frac{3}{8}\right) + 2^2\left(\frac{3}{8}\right) = \frac{15}{8}$$

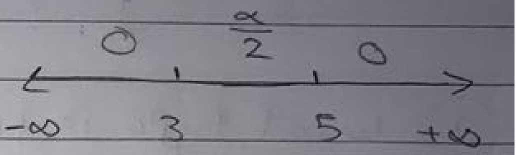
ⓓ Calculate the variance of X

$$Var(x) = \sigma^2 = E(x^2) - \mu^2$$
$$= \frac{15}{8} - \left(\frac{9}{8}\right)^2 = \frac{15}{8} - \frac{81}{64} = \boxed{0.6093}$$

qestion 2: let x be arandom Variable with density function f_x given by the following relation:

$$f_x(x) = \begin{cases} \frac{\alpha}{2} & \text{for } 3 \leq x \leq 5 \\ 0 & \text{otherwise.} \end{cases}$$

ⓐ determine the constant α:



$$\int_{-\infty}^{+\infty} f(x)\, dt = 1$$

$$\cancel{\int_{-\infty}^{3} f(x)\, dt} + \int_{3}^{5} \overset{\frac{\alpha}{2}}{f(x)}\, dt + \cancel{\int_{5}^{\infty} f(x)\, dt} = 1$$

$$\quad 0 \qquad\qquad\qquad\qquad\qquad\qquad 0$$

$$= \int_{3}^{5} \frac{\alpha}{2}\, dt = \boxed{\left. \frac{\alpha x}{2} \right|_{3}^{5} = 1} \longrightarrow$$

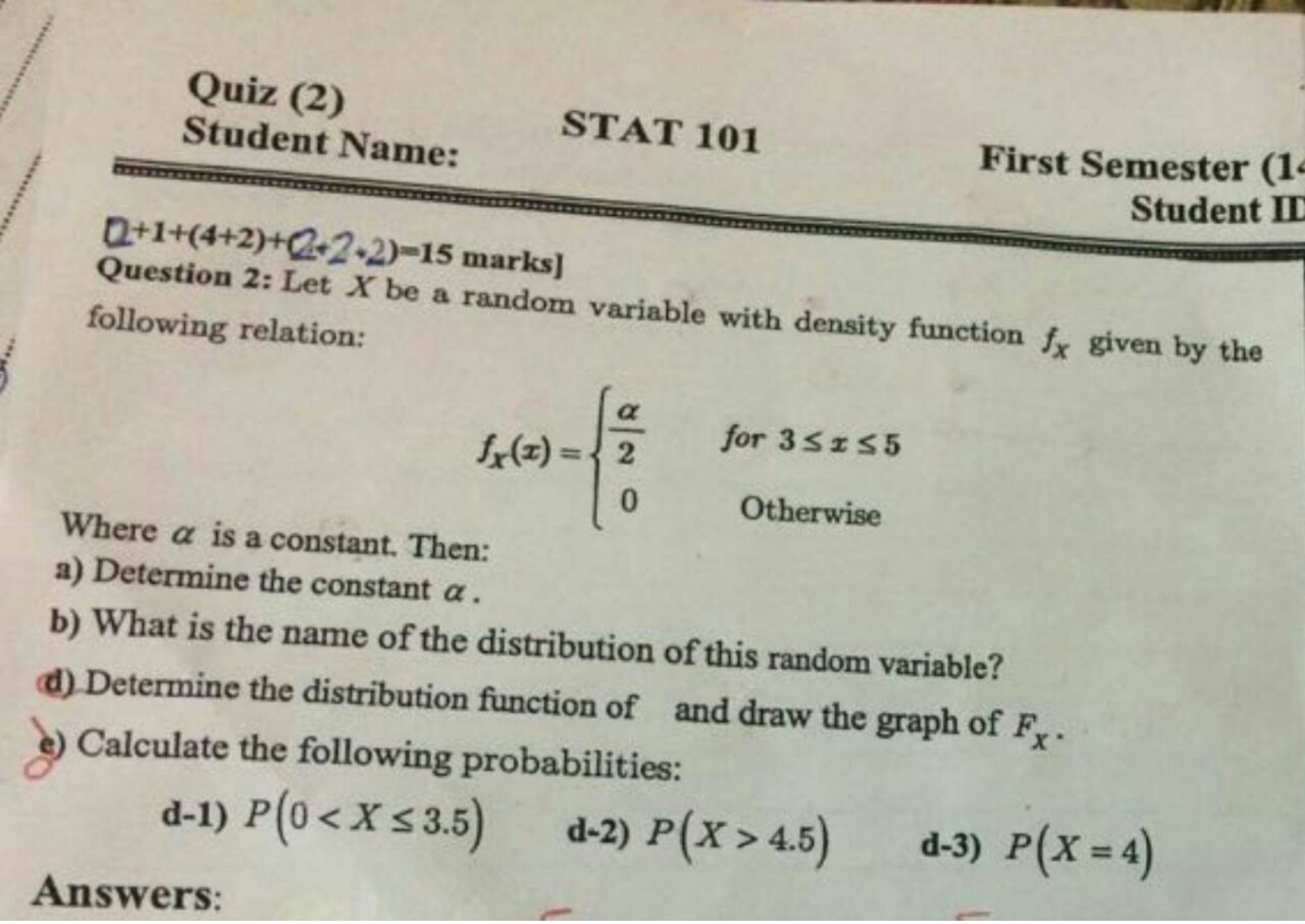
اعوض ثم اضرب
وسطين في طرفين

$$\frac{\alpha \left[F_x(b) - F_x(a) \right]}{2} = 1$$

$$\frac{\alpha (5-3)}{2} = 1$$

$$\frac{\cancel{2}\alpha}{\cancel{2}} = 1 \qquad \boxed{\alpha = 1}$$

ⓑ What is the name of the distrution of this randomVariab
Unifor continuou r.v اذا اوجدتي F_x راح تعرفين السبب
وعند الرسم راح يوضح
لانه
اصبحت عندي زي شكل $\frac{x-a}{b-a}$ الكتاب ص 121



Quiz (2)

Student Name: **STAT 101** **First Semester (1**

Student I

[2+1+(4+2)+(2+2+2)=15 marks]

Question 2: Let X be a random variable with density function f_X given by the following relation:

$$f_X(x)=\begin{cases} \frac{\alpha}{2} & for\ 3\le x\le 5 \\ 0 & \text{Otherwise} \end{cases}$$

Where α is a constant. Then:

a) Determine the constant α.

b) What is the name of the distribution of this random variable?

d) Determine the distribution function of and draw the graph of F_X.

e) Calculate the following probabilities:

d-1) $P(0 < X \le 3.5)$ **d-2)** $P(X > 4.5)$ **d-3)** $P(X = 4)$

Answers:

② $P(x > 4.5)$

$\underbrace{1 - P(x \leq 4.5)}$

تقع بنفس الفترة لعوض عن $\frac{x-3}{2}$ طول بالي

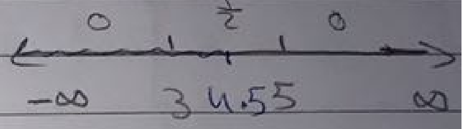
$= 1 - f(4.5)$

$= 1 - \frac{x-3}{2}$

$= 1 - \frac{4.5-3}{2} = \boxed{\frac{1}{4}}$

او بالتكامل $\boxed{\text{التكامل} - 1}$

$$\int_{-\infty}^{4.3} f(x)\,dt = \cancel{\int_{-\infty}^{3} f(x)\,dt}_{\,0} + \int_{3}^{4.5} f(x)^{\frac{1}{2}}\,dt$$



$$\left[\frac{x}{2}\right]_3^{4.5} = \frac{4.5}{2} - \frac{3}{2} = \frac{1}{4} - \frac{3}{4} = \boxed{\frac{1}{4}}$$

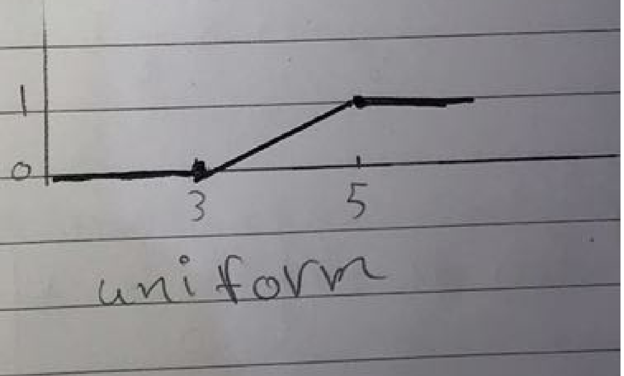
③ $P(x=4) = 0$ → لانه بالمستمر هكذا

* draw F_x

X	3	5
y	0	1

اعوض بالدالة ← y

$\frac{x-3}{2}$



uniform

ⓓ determine the distribution function and draw F_x

$$F_x(x) = \begin{cases} 0, & x < 3 \\ \boxed{}, & 3 \leq x \leq 5 \\ 1, & x \geq 5 \end{cases}$$

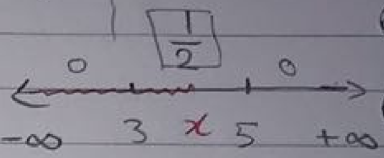
→ ثابتة

غير ثابتة

→ ثابتة

هنا نعوض بقيمة

α خلاص اوجدناها



$$\underset{0}{\cancel{\int_{-\infty}^{3} f(x)\,dt}} + \int_{3}^{x} \overset{\frac{1}{2}}{f(x)}\,dt$$

نعوض مكان كل x بـ x

نعوض مكان كل x بـ 3

$$= \int_{3}^{x} \frac{1}{2}\,dt = \frac{x}{2}\Big]_{3}^{x} \rightarrow F_x(x) - F_x(3)$$

$$\frac{x}{2} - \frac{3}{2}$$

D.F نكمل الآن $= \dfrac{x-3}{2}$

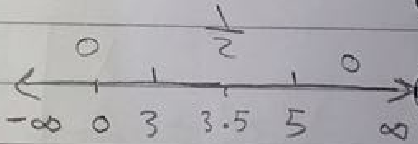
$$F_x(x) = \begin{cases} 0, & x < 3 \\ \frac{x-3}{2}, & 3 \leq x \leq 5 \\ 1, & x \geq 5 \end{cases} \Rightarrow$$

ناقص الرسم

و ١/ .

ⓔ Calculate

① $P(0 < X \leq 3.5)$



قيمة الـ x تقع في نفس الفترة $(3 \leq x \leq 5)$

اختصاراً للوقت نعوض مباشرة في الدالة التي اوجدتها

$$\frac{x-3}{2} \rightarrow F_x(3.5) - F_x(0)$$

$$= \left(\frac{3.5-3}{2}\right) - 0 = \frac{1}{4}$$

أو حلها بالتكامل:

$$\int_{0}^{3.5} f(x)\,dt = \underset{0}{\cancel{\int_{0}^{3} f(x)\,dt}} + \int_{3}^{3.5} \overset{\frac{1}{2}}{f(x)}\,dt$$

$$\frac{x}{2}\Big]_{3}^{3.5} = F_x(3.5) - F_x(3)$$

$$= \left(\frac{3.5-3}{2}\right) - \left(\frac{3-3}{2}\right) = \frac{1}{4}$$