نماذج الاختبارات الشهرية

تجميع :

نور الجفري & فاطمة عاشور

HADHRAMOUT UNIVERSITY
COLLEGE OF COMPUTERS & INFORMATION TECHNOLOGY

Academic year: 2019/2020

Day and Date Monday ,28/12/2019
Examiner: Mr. Awad Bin Jobah
Time Allowed: 1 Hour

Test : First
Level: First
Department: IT
Subject: Discrete Structure

30/30

Question 1: (5Marks)

Construct the truth table of the following statement : $(p \vee q) \oplus (P \wedge q)$

P	q	p∨q	p∧q	(p∨q)⊕(p∧q)
T	T	T	T	F
T	F	T	F	T
F	T	T	F	T
F	F	F	F	F

5

Question 2: (4+6=10Marks)

(1)Find the negation of the following statement : $(\forall n \in \mathbb{R}\ n^2 - 3n \geq 10)$**and find the truth value of the negation statement?** $\neg(\forall n \in R\ n^2-3n \geq 10) \Rightarrow \exists n \in R\ n^2-3n<10)$
True, Because $1 \in R \Rightarrow 1^2-3\times1=1-3=-2<10$

4

(2)Which of these sentence are proposition ?Why?

(i)It is raining ✓ (ii)Who is there? (iii)Read this carefully

Because we can find the truth value of it and its statement.

6

Question 3: (5+5=10Marks)

(1)Show that the statement $\neg(p \wedge(\neg p \vee q)) \equiv p \rightarrow \neg q$ **by using logic laws**

خلف الورقة →

(2) $\forall x \in \mathbb{R}$ **we defined** $f(x) = x^3 + 2$ **show that** f **is surjective?**

Question4: (3+2=5Marks)

(1) ***If*** u ***and*** v **are even numbers** ***Then*** **the Sum(** $u + v$**) is even by using direct proof?** →

(2)Let $AXB = \{(1,1),(2,2),(3,1),(3,2),(1,2),(1,4),(2,1),(2,4),(3,4)\}$**find the power set of** $A, \mathcal{P}(A)$

solution:-

$A=\{1,2,3\}$

$p(A)=\{\varnothing,\{1\},\{2\},\{3\},\{1,2\},\{1,3\},\{2,3\},\{1,2,3\}\}$

2

HADHRAMOUT UNIVERSITY
COLLEGE OF COMPUTERS & INFORMATION TECHNOLOGY
FINAL EXAMINATION

Academic year:	2019/2020	**Test :**	First
Day and Date	Monday, 21/10/2019	**Level:**	First
Examiner:	Mr. Awad Bin Jobah	**Department:**	IT
Time Allowed:	1 Hour	**Subject**	Discrete Structures

24/25

Question 1: **[6 Marks]**

Construct a truth table for the compound proposition $(p \to (q \oplus \neg p))$.

solution.

p	q	¬p	q ⊕ ¬p	(p → (q ⊕ ¬p))
T	T	F	T	T
T	F	F	F	F
F	T	T	F	T
F	F	T	T	T

7

T → F = F

we have Two statment p, q

values $= 2^n$

$= 2^2$

$= 4$

Question 2: **[6 Marks]**

te

Show that the statement $(p \wedge q) \to (p \vee q)$ is a tautology by using logic laws.

we ~~proof this~~ ~~solution:~~

proof $(p \wedge q) \to (p \vee q) = T$ —— (tautology)

$(p \wedge q) \to (p \vee q) \equiv \neg(p \wedge q) \vee (p \vee q)$ ((~~Becaus~~ $p \to q = \neg p \vee q$))

$= (\neg p \vee \neg q) \vee (p \vee q)$ ((~~$\neg(p \wedge q) = \neg p \vee \neg q$~~)) laws

$= \neg p \vee \neg q \vee p \vee$

turn the page

Question 3: [6 Marks]

Give an indirect contrapositive proof of (if n > 10 then $n^2 > 100$.) $\neg(n^2 > 100)$

proof:

¬q) let $n^2 \le 100$ $\neg q \to \neg p$

5

$\therefore n^2 \le 100$ / $\sqrt{}$

$n \le 10$ ~~$n \le 10 = \neg(p)$~~

~~This mean~~ $n \le 10 = \neg(n > 10) \Rightarrow n \le 10 = n \le 10$

~~Therefor $\neg q \Rightarrow \neg p$~~

Question 4 :

solution:

Find the negation of the following statement :

$(\forall x \in \mathbb{Z}\ x^2 > x)$

6

$\neg(\forall x \in \mathbb{Z}\ x^2 > x)$

~~$= \exists x \in \mathbb{Z}\ x^2 \le x$~~

$= (\exists x \in \mathbb{Z}\ x^2 \le x)$

End of Questions

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Best of luck

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HADHRAMOUT UNIVERSITY
COLLEGE OF COMPUTERS & INFORMATION TECHNOLOGY
FINAL EXAMINATION

Academic year:	2019/2020	**Test:**	Second
Day and Date:	Monday, 25/11/2019	**Level:**	First
Examiner:	Mr. Awad Bin Jobah	**Department:**	IT
Time Allowed:	1 Hour	**Subject:**	Discrete Structure

25

25

Question 1: خلف الورقة   0.25   فيه توضيح خلف الورقة

Let U={a,b,c,d,e,f,g} is universal set ,A={a,b,c,d,e} and B={a,c,e,g} Calculate each of the following :

(a) $A^c \cap B^c$ (b) $B - A$ c) $P(B)$ is the power set of B.   (7Marks)

يكمل ان الاجابة قابلة

(a) $A^c \cap B^c = \{f, g\} \cap \{b, d, f\} = \{f\}$

(b) $B - A = \{a,c,e,g\} - \{a,b,c,d,e\} = \{g\}$

(c) $P(B) = P(\{a,c,e,g\}) = \boxed{2^n = 2^4 = 16}$, $n=4$ $= \{\{\emptyset\}, \{a\}, \{c\}, \{e\}, \{g\}, \{a,c\}, \{a,e\}, \{a,g\}, \{a,c,e\}, \{a,c,g\}, \{c,e,g\}, \{a,e,g\}, \{a,c,e,g\}, \{c,e\}, \{c,g\}, \{e,g\}\}$

Question 2 Le f be the function from {w,x,y,z} ,to {25,26,27,28} with $f(x) = 26, f(w) = 28$ $f(y) = 25$ and $f(z) = 27$ Is f onto? Why? (6Marks)

Codmine = {25,26,27,28}

f(solution)

f is onto Because: Range = {25, 26, 27, 28}

codmine = {25, 26, 27, 28} = range = {25, 26, 27, 28}

Thanks

Question 3:

Find gof ,where $f(x) = 3x^2 + x$ and $g(x) = \sqrt{x+2}$, are functions from ~~R to R~~ (6Marks)

solution

$\because f(x) = 3x^2 + x$, $g(x) = \sqrt{x+2}$, from R to R

$\therefore (g \circ f)(x) = g(f(x))(x) = g(3x^2 + x)(x) = \sqrt{3x^2 + x + 2}$

$\therefore g \circ f = \sqrt{3x^2 + x + 2}$

D_{gof} = $3x^2 + x + 2 \geq 0 = R$ there for all elements of gof have image.

Question 4: $3x^2 + x \geq -2$

Use builder notation and logical equivalences to show that $(A \cap B)^c = A^c \cup B^c$ (6Marks)

$3x^2 + x + 2 \geq 0$

End of Questions

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Best of luck

$3x^2 + x \geq -2$

$x(3x+1) \geq$

$x \geq -2$

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Question 1: (5Marks)

Construct the truth table of the following statement : $(p \oplus q) \wedge (P \oplus \neg q)$

P	q	¬q	P⊕q	P⊕¬q	(P⊕q)∧(P⊕¬q)
T	T	F	F	T	F
T	F	T	T	F	F
F	T	F	T	F	F
F	F	T	F	T	F

5

Question 2: (4+6=10Marks)

(1)Find the negation of the following statement : $(\exists\, n \in \mathbb{R}\; n^2 - 3n < 10)$and find the truth value of the negation statement? $\neg(\exists n \in R\, n^2 - 3n < 10) = (\forall n \in R\, n^2 - 3n \geq 10)$

3

(2)Which of these sentence are proposition ?Why?

Because answer T or F

$\boxed{\text{(i)It is raining}}$ (ii) Who is there? (iii)Read this carefully

6

Question 3: (5+5=10Marks)

(1) Show that the statement $\neg(p \vee (\neg p \wedge q)) \equiv \neg p \wedge \neg q$ by using logic laws

$\neg[P \vee (\neg P \wedge q)] \equiv \neg P \wedge (P \vee \neg q)$

$\equiv (\neg P \wedge P) \vee (\neg P \wedge \neg q) \equiv F \vee (\neg P \wedge \neg q) \equiv \neg P \wedge \neg q$

5

(2) $\forall x \in [0, \infty[$ we defined $f(x) = x^2 + 2$ show that f is injective?

② Assume $x_1, x_2 \in D_f$ such that $f(x_1) = f(x_2)$

$x_1^2 + 2 = x_2^2 + 2 \;/ -2$

$x_1^2 = x_2^2 \Rightarrow f(x_1) = f(x_2)$

5

Question4: (3+2=5Marks)

(1) *If* u *and* v are even numbers *Then*the dote product $(u \cdot v)$ is even by using direct proof?

(2)Let $AXB = \{(1,1), (2,2), (3,1), (3,2), (1,2), (1,4), (2,1), (2,4), (3,4)\}$find the power set of $B, \mathcal{P}(B)$

② $P(B) = \{\{1\}, \{2\}, \{4\}, \{1,2\}, \{2,4\}, \{1,4\}, \{1,2,4\}, \emptyset\}$

① u and v is true

u and v $\in \mathbb{Z}$

$u \cdot v = 2K \quad K \in \mathbb{Z}$

$2(u \cdot v) = 2L$

thus $u \cdot v$ is even

5

HADHRAMOUT UNIVERSITY
COLLEGE OF COMPUTERS & INFORMATION TECHNOLOGY
FINAL EXAMINATION

25/25

Academic year:	2019/2020	**Test:**	Second
Day and Date:	Monday, 25/11/2019	**Level:**	First
Examiner:	Mr. Awad Bin Jobah	**Department:**	IT
Time Allowed:	1 Hour	**Subject:**	Discrete Structure

Question 1:

Let U={a,b,c,d,e,f,g} is universal set ,A={a,b,c,d,e} and B={a,c,e,g} Calculate each of the following :

(a) $A^c \cap B^c$ **(b)** $B - A$ **c)** $P(B)$ **is the power set of B.** (7Marks)

a) $A^c = U - A = \{a,b,c,d,e,f,g\} - \{a,b,c,d,e\} = \{f,g\}$
$B^c = U - B = \{a,b,c,d,e,f,g\} - \{a,c,e,g\} = \{b,d,f\}$
(a) $A^c \cap B^c = \{f,g\} \cap \{b,d,f\} = \{f\}$
b) $B - A = \{a,c,e,g\} - \{a,b,c,d,e\} = \{g\}$

Question 2 Le f be the function from {w,x,y,z} ,to {25,26,27,28} with $f(x) = 26, f(w) = 28$ $f(y) = 25$ and $f(z) = 27$ Is f onto? Why? 6Marks)

Solution:- There for f is onto function, because
Codomain(f) = {25,26,27,28} = range(f) = {25,26,27,28}

Question 3:

Find gof ,where $f(x) = 3x^2 + x$ and $g(x) = \sqrt{x+2}$, are functions from $\mathbb{R}$ to $\mathbb{R}$ (6Marks)

Solution:-
$(g \circ f)(x) = g(f(x)) = g(3x^2+x) = \sqrt{(3x^2+x)+2} = \sqrt{3x^2+x+2}$

Question 4:

Use builder notation and logical equivalences to show that $(A \cap B)^c = A^c \cup B^c$ (6Marks)

HADHRAMOUT UNIVERSITY
COLLEGE OF COMPUTERS & INFORMATI[redacted]TECHNOLOGY
FINAL EXAMINATI'

Academic year:	2019/2020	Test:	Second
Day and Date:	Sunday, 24/11/2019	Level:	First
Examiner:	Mr. Awad Bin Jobah	Department:	مواري ب IT
Time Allowed:	1 Hour	Subject:	Discrete Structure

Question 1:

Let U={a,b,c,d,e,f,g} is universal set ,A={a,b,c,d,e} and B={a,c,e,g} Calculate each of the following : (7Marks)

(a) $A^c \cap B^c$

$A^c = U - A = \{f, g\}$

$B^c = U - B = \{b, d, f\}$

$A^c \cap B^c = \{f\}$

(b) B - A

B - A {g}

4

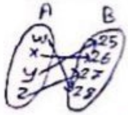
c) $P(B)$ is the power set of B .

$P(B) = \{\emptyset, \{a,c,e,g\}, \{a,c\},$
$\{a,e\}, \{a,g\}, \{c,e\}, \{c,g\}, \{e,g\}$
$\{e,c\}, \{e,a\}, \{g,e\}, \{g,c\}, \{g,a\}$
$\{c,a\}\}.$

Question 2 Le f be the function from {w,x,y,z} ,to {25,26,27,28} with $f(x) = 26, f(w) = 28$ (6Marks)

$f(y) = 25$ and $f(z) = 27$ Is f onto? Why?

Becouse codomian(f) = range(f)



6

range = {25, 26, 27, 28}

Question 3:

Find gof ,where $f(x) = 3x^2 + x$ and $g(x) = \sqrt{x+2}$, are functions from $\mathbb{R}$ to $\mathbb{R}$ (6Marks

$= (g \circ f) = g(f(x)) = \sqrt{(3x^2 + x) + 2}$

$= \sqrt{3x^2 + x + 2}$

6

Question 4:

Use builder notation and logical equivalences to show that $(A \cap B)^c = A^c \cup B^c$ (6Ma

$(A \cap B)^c = (x / x \in A \cap B) = (x / \neg(x \in A \cap x \in B)$

$(x / (\neg x \in A) \vee (\neg x \in B)$

$(x / (x \notin A) \vee (x \notin B))$

$(x / x \in A^c \cup x \in B^c$

$= (A^c \cup B^c)$

6

End of Questions

....

Best of luck

1) Find the Boolean product for **A** and **B**, where: (5 marks)

$$A = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \\ 1 & 0 \end{bmatrix}.$$

(3, 4) (4, 2) (3, 2)

---

2) Find the inverse function of $f(x)=x^3+1$. (5 marks)

$y = x^3 + 1$

$y - 1 = x^3$

$\sqrt[3]{y-1} = x$

$y = \sqrt[3]{x-1}$

---

3) Give a recursive defined by: (4 marks)

$f(0) = 1$, $f(n+1) = (n+1)f(n)$. Then fined f(1), f(2), f(3) and f(4).

$f(0) = 1 \quad f(n+1) = (n+1)f(n)$

Then fined f(1), f(2), f(3) and f(4)

---

4) Use the bubble sort to put 3, 1, 5, 7, 4 into increasing order. (6 marks)

first			second		third
3	1	1	1	1	1
1	3	3	3	3	3
5	5	5	5	4	4
7	7	4	4	5	5
4	4	7	7	7	7

then: 3therd

1
3
4
5
7

Good Luck

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1) Find the Boolean product for A and B, where:

$$A=\begin{bmatrix}0&1&0&1\\0&0&1&1\\1&1&1&1\end{bmatrix} \quad \text{and} \quad B=\begin{bmatrix}0&1\\1&0\\1&1\\0&1\end{bmatrix}=\begin{bmatrix}(0\wedge0)\vee(1\wedge1)\vee(0\wedge1)\vee(1\wedge0) & (0\wedge1)\vee(1\wedge0)\vee(0\wedge1)\vee(1\wedge1)\\(0\wedge0)\vee(0\wedge1)\vee(1\wedge1)\vee(1\wedge0) & (0\wedge1)\vee(0\wedge0)\vee(1\wedge1)\vee(1\wedge1)\\(0\wedge0)\vee(1\wedge1)\vee(1\wedge1)\vee(1\wedge0) & (1\wedge1)\vee(1\wedge0)\vee(1\wedge1)\vee(1\wedge1)\end{bmatrix}=\begin{bmatrix}1&1\\1&1\\1&1\end{bmatrix}$$

$A=(3\times4)$ $B=(4\times2)$

$$\begin{bmatrix}0\vee1\vee0\vee0 & 0\vee0\vee0\vee1\\0\vee0\vee1\vee0 & 0\vee0\vee1\vee1\\0\vee1\vee1\vee0 & 1\vee0\vee1\vee1\end{bmatrix}$$

5

---

2) Find the inverse function of $f(x)=x^3$. (5 marks)

is one to one f.

inverse: $y=x^3$

$\sqrt[3]{y}=x$

$\sqrt[3]{y}=g(x)$

$\sqrt[3]{x}=f$

5

---

3) Give a recursive defined by: (4 marks)

$f(0)=1$, $f(n+1)=(n+1)f(n)$. Then fined f(1), f(2), f(3) and f(4).

$F(1)=F(n+1)=(n+1)f(n)=F(0+1)=(0+1)f(0)=1\cdot1=1$

$F(2)=F(n+1)=(n+1)f(n)=F(1+1)=(1+1)f(1)=2\cdot1=2$

$F(3)=F(n+1)=(n+1)f(n)=F(2+1)=(2+1)\cdot f(2)=3\cdot2=6$

$F(4)=F(n+1)=(n+1)f(n)=F(3+1)=(3+1)\cdot f(3)=4\cdot6=24$

4

---

4) Use the bubble sort to put 3, 1, 5, 7, 4 into increasing order. (6 marks)

1st					2end				3ed	
3	1	1	1	1	1	1	1	1	1	∴ ~~then~~ 3ed
1	3	3	3	3	3	3	3	3	3	
5	5	5	5	5	5	5	5	4	4	
7	7	7	7	4	4	4	4	5	5	
4	4	4	4	7	7	7	7	7	7	

6

Good Luck

Q2) Construct a truth table for the compound propositions $\neg(P \wedge (P \rightarrow \neg q))$. Then show is it a contradiction, why?

(5 marks)

P	q	~q	P → ~q	(P∧(P→~q))	~(P∧(P→~q))
T	T	F	F	F	T
T	F	T	T	T	F
F	T	F	T	F	T
F	F	T	T	F	T

5

From the above table we have ~(P∧(P→~q)) is not contradiction because the value is not false

Q3) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology using logical laws? **(4 marks)**

~~~(P∨q) → ~(P∧q)~~

P∧q → P∧q

~P∨q → ~P∨q

~(P∧q) ∨ (P∨q)

~~~P∨~q ∨ P∨q~~

1

Q4) Let the universal set U={1,2,3,4,5,6,7,8,9,10}, represent the bit strings for the two sets where elements of the first set are **square of each element in U** that > 16 and <70 and elements of the second set are the **cube root of each element >0 and** Use bit strings to find the **union** and **intersection** of the complement of these two sets? **(6 mark**

A = {5, 6, 7, 8} bit string 0000111100

B = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} 1111111111

$\overline{A \cup B}$ = {1, 2, 3, 4, 9, 10} 1111000011

$\overline{A \cap B}$ {Ø}

$\overline{A}$ = {1, 2, 3, 4, 9, 10} 1111000011

$\overline{B}$ = {Ø}

5

Q5) Use an indirect contraposition to proof that if m and n are integers and mn is even, then m is even or n is even.? (5 marks)

~q → ~p

1) m is odd or n is odd → mn odd

m = 2k+1 or n = 2k → 2k(2k+1)

= 4k+2kk = 2k(2k+m) the result is even

False

2) m ≠ 2k n = 2k+1 → 4k+2k = 2k(2k

first contrapositive is False

∴ It is not contrapositive

Good Luck

نماذج الامتحانات النهائية

تجميع :

نور الجفري & فاطمة عاشور

HADHRAMOUT UNIVERSITY
COLLEGE OF COMPUTERS & INFORMATION TECHNOLOGY
FINAL EXAMINATION

Exam Semester: *First*
Level: *First* (عام + موازي)
Department: *Information Technology*
Subject: *Discrete Structures*

Academic year: *2017 – 2018*
Day and Date: *Sunday / 4th February - 2018*
Examiner: *Dr. Saeed Baneamoon + Dr. Ahmed Kourd*
Time allowed: *2 Hours & 30 Minutes*

$\sim q \to \sim p$
$n+1$ odd $\to$ n even
$2k+2 = 2(k+1)$
$2k+2$
$2(k+1)$
$2k$ even

Answer any four of the following questions:

Question (1): (8 + 7 + 10 = 25 marks)

(1) Construct a truth table for the compound proposition $X \to (Y \oplus \neg X)$.

(2) Let $A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$. Find the meet and join of **A** and **B**?

(3) Let S={(-1,2), (4,5), (0,0), (6,-5), (5,1),(3,4)}, Find the following:
(a) the elements of the set **A** where **A**={a+b > 3}. (6,-5) (0,0)
(b) Relation **R** = {(a, b) | a + b ≤ 3 }

Question (2): (9 + 8 + 8 = 25 marks)

$\sim q \to \sim p$ $\quad 2(n+1)$

(1) Give an indirect proof of "if n is an odd integer, then $n+1$ is an even". even odd

(2) Let X = {a, b, c, d} and Y = {1, 2, 3}. Let $f: X \to Y$ be a function defined as $f(a) = 2$, $f(b) = 1$, $f(c) = 3$, $f(d) = 2$, Is f a bijection function? Why?

(3) Show that the statement $(p \wedge q) \to (p \vee q)$ is a **tautology** by using:
(a) Truth table $\quad \sim(p \wedge q) \vee p \vee q$
(b) Logic laws $\quad \sim p \vee q \vee p \vee q$

Question (3): (12 +8+ 5 = 25 marks)

(1) Use the **bubble** and **insertion sorts** to put **8, 7, 9, 6, 10** into increasing order?

(2) Use mathematical induction to show that if n is a positive integer, then

$$1 + 2 + \cdots + n = \frac{n(n+1)}{2}.$$

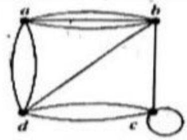
(3) How many permutations of the letters **ABCDEFGH** contain the string ***ABC***? $6! =$

Question 4: (7 + 8 + 10 = **25 marks**)

(1) Give a recursive definition of the sequence $\{a_n\}$, $n = 1, 2, 3, 4, 5$, if: $a_0 = 2$, $a_n = 1 + (-1)^n$?

---

(2) Represent an **adjacency** matrix of the graph shown in **Figure 1**.



$$\begin{array}{c|cccc} & a & b & c & d \\ \hline a & 0 & 3 & 0 & 2 \\ b & 3 & 0 & 1 & 1 \\ c & 0 & 1 & 1 & 2 \\ d & 2 & 1 & 2 & 0 \end{array}$$

Figure 1

---

bcda

(3) The computer network is shown in **Figure 1.** Use an **preorder** and **postorder** traversal algorithms to find **User 9**? Determine the best traversal algorithm? Why?

user 9,7

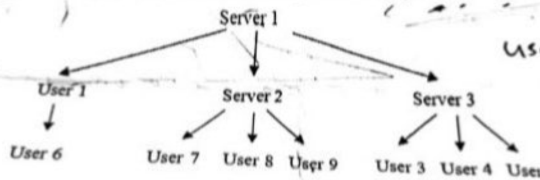


Figure 1

Question 5: (13 + 12 = **25 marks**)

(1) Find all the ordered pairs in the relation $R = \{(a, b) \mid a \text{ divides } b\ (b/a)\}$ on the set $\{1, 2, 3, 4\}$. Then answer the following questions:

(a) What is the matrix representing **R**?

(b) Is R equivalence relation? Why?.

(c) Find R^2 ?.

---

(2) List all the steps used to search for **8** in the sequence **1, 3, 4, 5, 6, 8, 9, 11** using:

(a) a linear search.

(b) a binary search.