No	Subject_	School/College		10.2
	lege Tel. No.			
51. No.	Date	Title	Page No.	Teocher Sign / Remarks
1	3]11]23	Rythan program on Kaggle	(NEMUT NS
2	10/11/23	Practice program		10
3	17/11/23	Prog. for Tic-Tac-Toe game	No pro-	
4	24/11/23	Parog. for puzzle game	delle d	1 1000
5	8 12/23	8 puzzle prog. using iterative		0
K		despuis search		X.
6	136	& puzzle prog. Ax		Seul
7		8 puzzle pog BFS	7	
9	22/12/23			
	29/12/23	KB using propositional logic		/
10	19/01/23	program to count focto CNF		
12	19/01/23	- prog . For forward chaining		1
10	[4] [4]	pag . Tot followick starting		Ju'.
		A STATE OF THE STA	me,	

	Date
QI	Write a program for Tic-Jac- 100 game!
	import gardom
	tie=[1,2,8,4,5,6,7,8,9]
	def point Board (this) has been a storm () XXX
	print (Hic Co]+(1'+ticCi]+(1'+tic(2))
	mid (" 14) + 10+ 10+ 10+ 10
So 00 1	point (tic[3]+11+tic[4]+11+tic[5])
+	sound ("
	period (tic (6)+11+tic (7)+11+tic(8))
	since who are interest (1) (0)
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	def iswerier (ticy 1908)
	of tic [o] == Hic [i] and tic [i] =tic[e] or
20at 2	fic[2]=ztic[4] ad tic[4]=tic[6]
	Stephen Tours of the Control of the Control
	else if tic [poro] = tic [pos=3] and tic [pos-3]== rett Touce tic [pos-6]
	else if tic[pos //3+1]=tic[pos 3+2] and tic[pos 3+2] ==6c[pos
i retur	The present art wild still the second strain
	rebu True
	netar false de applate user (Hic):
	pu = int (input (" Entra numbro or the board"))
	while ((num not intic):
	Due = int Cuput (" Ele a med or the board
	tic (num-1) == 'a'
	del update - ca p(+ic):
	for i in tic: of i! = 'x' ad i! = 'o':
	4(1)=(x, 1-1)= (x)

	rage
	tic [i-1] = i
	tic [i-1] = 1
	anather treps
	algorithm: 183 1 A 2 10 4 5 10 - 51
	1 make a board and initialize the value
	1 Make a winner function check for the
	armene possibilities
	input.
	(i) Maximize 10 action:
	(i) Maximize computer wins (ii) Maximize user weins
	(A)
	o [sure [] si has [] short of a position.
ज्ञाहि - क	as the cur lee a 3 combination
(3-66	(vi) put main function
Maligal Inc.	pid the board
25	ad or and
A	ad shift byw he use fra puts.
	2110
	This year.
1	Salar - day
VV	
	18 Duran har and Satateo
	AND DESCRIPTION AND ALLEGE

[1, 2, 3, 4	4, 5, 6, 7	, 8, 9]	computer's	turn :		Your turn		
		+	+			enter a nu	mber on the	e board :5
1	2	3	0	2	3	 0	 X	
	 	 +	+	I 			^	
 4 	 5 	 6 	 X 	 5 	 6 	 x 	 0 	
 7	 8 		 7 	 x 	 9 	+ 7 	 X 	 9 1
computer's	turn :	+	Your turn enter a num		e board :3	computer's	turn :	+
1	 2 		+	 2	- 	 0 	 X 	 0
 4	 5		+	 5	 6	x 	 0 	 6
 7	х	+ 9	 + 7	 X	 + 9	x 	 x 	9
t Your turn			 +	 	 	Your turn enter a nu		e board :9
enter a nur	mber on the	board :1	computer's	turn :	+	+	 I	-
 0	2		 0	 X	 0	0 	X 	0 1
 	 	 + 	ļ 	' 		 X	 0 	
4	5	6 	X +	5 	6 +	; I	' I	
7	X		 7	 X	 9	X +	X 	0 +
 		i i	 +	 		winner is	0	

	Page
8	frogram to Solve me 8-puzzee using BFS.
	Contract speak - when a shape tributed
[[(,100	from collections import deque in double redd queme.
	dy find- blank (board, more to find zero (brank)
	for Ei in range (3):
	for j in range (3):
1 3000	14 - Demonstration of board City == 0;
	January relative jy
1.317.	witay (second, show) gard je
	1 to to accorde
[[] Jarbal]	def generate mores (board): feether to generate
	moses = []
	blank your, blank-col - find-blank (board)
	possible_moves = [
	(1,0) (-1,0) (0,1) (0,+1)
	I was marked they they
(Perit 1" Spece to ready of good."
	of for dr, de in possible - moves:
Physical Property	new now, new-col = black-row+dr, black-col
	medition if of= new row (3 and of= new-col/3:
	new _board = [row [:] for row in board]
	new-board [black_row] [black_col],
	pour = = supprisent new board (new row] (new-col) = new board
ruje - b-	[new row] [new board (blat row) (blat -co
	moves append (new-board)
(" " =	west with moves.
	e IV to all the second and a second con-
G	dy solve-pupple (indial-state, goal-state):
	visited (= set () State of their paths
	queue = deque ([(int id - stack, ()))]
	(*

	while queue!
	that quate path = question
	visited add (tupe (map (tupe, current-state)
	Outros (
I para -	if current state = = goal_state 1
	orotin patu
	A some statement of the same
	possible moves = gurate moves (avount - Hest
	for move in possible - moves
	if tuple (map (tuple, move)) not in visio
	queux appened ((more, pate + (nou
	F7 = Aleigni
	(b) and state of Nous) and had
	J = ASSIGNA - PARTIES
	def punit steps (solution -poth):
	if solution-path:
	penil (" Steps to reach the goal!")
	for step in solution pate ?
ر فاعسان مل	1
	January has a conforman in step:
	200 10 1: [and] = Decor as point ("]", end = "")
11.1	a hard [was deard brase outgo val in rose:
esel-Outre =	: o == 0 = val == 0
	or sold broad ain [10 mm] [wer win] puit ("", and?"
	(banch was) Duggo & soulse:
	. som poit (val, end z')
	(12 21/2 - 2007 shorte printer (4 2) 102 - 20002) July
Garller v	pra (======
1(()	queue = despert selected - secret
	prid (" No solustran")
	(" sounds)

initial = [
181 18 (1, 2,3], [2,0,5], [4,7,2]] 15 11
[a] [(, e, s), [a, o, s), [c, 7, 2]
1 81 1 3 goal = [1581 571 5-] - 1 27
goal = [[0,1,27,[3,4,5],[4,7,8]]
print isteps (solution pate)
1 11111 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1818/19 18 1923 7 8 11/25 5 4,5,6,78
1 (1 7 8) -
12 2 3 1 15 1 1 2 8 18 14 19 19
1 SP & D will de using a double
18 1 3 6 7 8 8 1 queue de les resing a double
Tools and the second
D find the blankspace dure (0) using function
for i in rage 31
for , interes
j board (E)[]7==0:
14 17 d lette) em21sh-phalasa en110, 5,111, 4,4
(3) Now generale moves using fuclish is nove
fre blankspale in all possible ways 14 =-
(i) first check if new position is in
board found (3×3)
(i) if it is in bound generate the more
èc move bak space with adjacent till
and board for path.
use 66s now use visted list
every time generate a copy and check
with goal state.
Wy

The second of th
1112131, 12131 1213
111415
1 617 1871 7 = 300 61 7 16
161718
[2]3] [2]3[5]
12101
11415 1141
1617181 1617181 1617181
The County County (to add a content) and in a last
2 3 5 2 5
market a like by 1 1 2 1 1 3 4 1 113 14
1617181 16 7181 617181
D) and the black span dure (0) us on truction
11/2/51 11/2/51
1 3 4 3 4 3 4
1617181 1617181 1617181
1 2 - En 0
11121 1 11 121 1 112
1200 31 -123/24/154 soom 130/4/108/201 (13/4/5)
1617 18 per blossopped in acceptable and 1617 18
6 - Kist cook ut new pontal time
17 /2 /2 /
1/2
How some product on 11 for (11)
the burney to what I park if the of the
outing of second but
When how were while the
Listen Him gangrate a capy and check

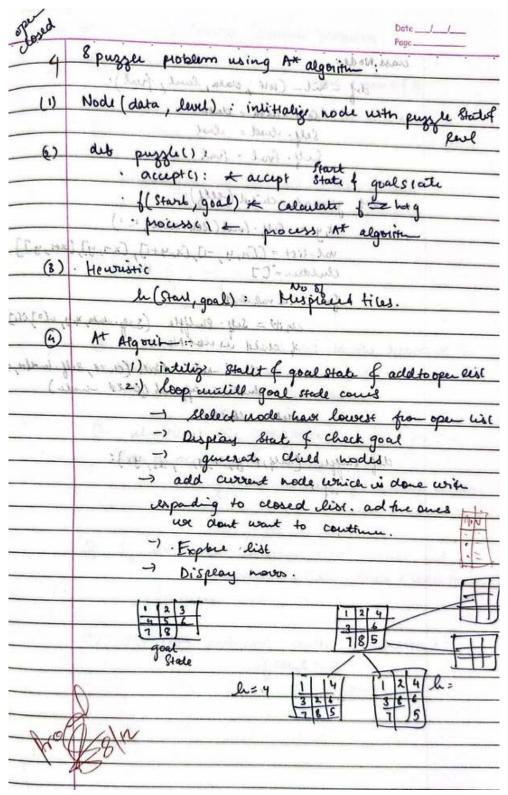
```
main.py
                   d=[]
                   if b not in [0,1,2]:
                  d.append('u')
if b not in [6,7,8]:
    d.append('d')
if b not in [0,3,6]:
    d.append('1')
if b not in [2,5,8]:
    d.append('r')
→ ,² ☆ ,¾
1 | 2 | 3
4 | 5 | 6
0 | 7 | 8
1 | 2 | 3
0 | 5 | 6
4 | 7 | 8
1 | 2 | 3
4 | 5 | 6
7 | 0 | 8
0 | 2 | 3
1 | 5 | 6
4 | 7 | 8
1 | 2 | 3
5 | 0 | 6
4 | 7 | 8
1 | 2 | 3
4 | 0 | 6
7 | 5 | 8
1 | 2 | 3
4 | 5 | 6
   | 8 | 0
Success
 ...Program finished with exit code 0
Press ENTER to exit console.
```

8 puzzle iterative deepening search:-Code:-

	hab-5 Page—
8/12/2	day id dis (puzzla, goal, got-oraves).
3	
111	8 puzzle froblem ousing therates deepening board
(4)	Node (data, level): initialize mode with puzzle state
(þ)	- output () & Start & goal State
Japan Louis	-> des () (mode, goal, depre) + ferfor des
(3)	dy des (mode, goal, depm)
-61	If (current-state == goal):
-	retion folidion
150	Meta-works
62	1 (post) breeze listoned you
== 0 0	generate dield node, recursively call
	1) bessel D = terit increase level
	of a marin (a), 231 police
(4)	dy 105 (Start, goal)
	Start With depth : 0
, (3,0	
Fo.5	Trepeat wirtill goal is found:
	- gufon Dis with current depth
- ((4	7 9 Sola found = exit
	uncremed depth.
(5)	- Jural puzzll instance
1	call ios (start, goal)
1-4/1	W starting trap below the transfer
1.44	(Summer) high
17/	(Asy " May " Find

-	dy id-dis (puzzle, goal, get-moves):
	dy id-ds (puzzli, god)
tayes	11 ace (south appear
	if depth == 01
	nettern
2012 0	if route [-1] == goal;
	gelien grante
	for move in get moves (route [-1]):
	I was not in start!
1.63	if next - route:
4-013	if next - route:
	(work chop womental next noute ?
	for oligh in identicals count ();
	Noute = dfs (Cpuzzle), depth)
	if route:
	vieta vioute
_	dy possible - moves (state): Output:-
5.3	Succession And = () Succession
250	of a met in (1), 2), ports.
	if 6 not in [6,7,8] [[1,2,3,0,4,6,7,5,8],
	a. append (' a') [1,2,3,4,0,6,7,5,8],
	" 6 wat in [0,3,6]! [1,23 4 5 (.7.0.8),
	kan named = [7] [1,2,3,4,5,6,7,7,0]
ر والا	The state of the s
	pos noves (genrate (state, i, b))
-	The President of the Pr
	initial = (1,2,3,0,4,6,7,5,3)
	goal = [1,2,3,4,5,6,7,8,0]
	route = id - dfs (milial , goal , possible wases)
	. If route:
	print (" Success") print (" Patri: " patri)
	prid ("Patri: " pata)
	put (" Jarled to find Solution").

```
d.append('1')
if b not in [2, 5, 8]:
    d.append('r')
 30
            pos_moves = []
             for i in d:
                 pos_moves.append(generate(state, i, b))
            return pos_moves
      def generate(state, m, b):
    temp = state.copy()
            temp[b + 3], temp[b] = temp[b], temp[b + 3]
if m == 'u':
                  temp[b - 3], temp[b] = temp[b], temp[b - 3]
               f m == 'l':
  temp[b - 1], temp[b] = temp[b], temp[b - 1]
f m == 'r':
  temp[b + 1], temp[b] = temp[b], temp[b + 1]
             if m ==
             if m ==
            return temp
      initial = [1, 2, 3, 0, 4, 6, 7, 5, 8]
goal = [1, 2, 3, 4, 5, 6, 7, 8, 0]
      route = id_dfs(initial, goal, possible_moves)
      if route:
            print("Success!! It is possible to solve 8 Puzzle problem")
print("Path:", route)
input
Success!! It is possible to solve 8 Puzzle problem
Path: [[1, 2, 3, 0, 4, 6, 7, 5, 8], [1, 2, 3, 4, 0, 6, 7, 5, 8], [1, 2, 3, 4, 5, 6, 7, 0, 8], [1, 2, 3, 4, 5, 6, 7, 8, 0]]
..Program finished with exit code 0 ress ENTER to exit console.
```



	crass Node:
	ala ta , cool , out
مهد الاصل	att data = dasa
Seas "	Self elwel = clul
	Suy. Aval = Aval
ik	SUNTY STATE OF THE
	del acuents -chief
	ky = fill find (ser. in)
	val-list = ((), y, -1], (x, y+1), (x-1, y), (x+1, y
	val-list = ((31, y, -1], (x, y+1), (x-1, y), (x4, y) children = C]
	last the val test on har?
	on ib = Self. Sulffle (Self. data, x, y, ilo]
	is could is not Name?
110	chied - rade - Node (chied, Self but
ه موسد دی	duld - node - Mode (chies, self lux
ه موسد در	child-rode - Mode (child, Self lust children append (child mode)
open u	children append (child mode)
open u	children append (child mode)
و معرف	child-rode - Mode (child self lust children approd (child mode) rete shildren der children def shiffe (eng, x1, y, , y2, y2):
موس د	dif suffer (ley, pry, x1, y, , y2, y2):
موس د	dif suffer (ley, pry, x1, y, , y2, y2):
موس د	child-rode - Mode (child self lux children append (child mode) rete shildren def suffer (levy, pry, x, y, , y, y, y, y):
موس د	children approd (child mode) rete shildren def shifter (levy, pry, x1, y, , y2, y2):
موس د	children approd (child mode) white shildren approd (child mode) def shifter (leff, pry, x1, y, , y2, y2):
موس د	children approd (child mode) white shildren approd (child mode) def shifter (leff, pry, x1, y, , y2, y2):
موس د	children approd (child mode) white shildren approd (child mode) def shifter (leff, pry, x1, y, , y2, y2):
موس د	children approd (child mode) white shildren approd (child mode) def shifter (leff, pry, x1, y, , y2, y2):
موس د	def sugge (luy, puy, xr, y, y, y, y):
موس د	dif chique (cuy, pur, xr, y, inz, yz):

```
main.py
              print("Enter the goal state matrix \n")
              goal = self.accept()
              start = Node(start,0,0)
              start.fval = self.f(start,goal)
              """ Put the start node in the open list"""
 2 $ 3
Enter the start state matrix
1 2 3
4 5 6
7 8
Enter the goal state matrix
1 2 3
4 5 6
7 8 _
1 2 3
4 5 6
 7 8
1 2 3
4 5 6
 _ 8
1 2 3
4 5 6
78_
...Program finished with exit code 0
```

Press ENTER to exit console.

	Vacuum Cleanear Problem.
5	- Spariting:
/	V. COUNTED TO
	1 Actions → Eitner in room A or B
	(2) Actions -> more L, move R, Suck (de
	· NA LANDA
Comp	Successo function is performed.
,8,	after the action is performed
	o g to p former.
-	result ((s) a) way ") sing
	Presult (45's a head ") stimes State actional year
-	- 2-camp = 1 m
	3 after first with the in the arm it :
	The state of the s
_	whither city clean of mot il clean it may
	to next (distinguish Kinglin).
	(2) after first in the room its is whither aids clean or not if clean is more to next (diritionmore function).
	3 il runs the goal state function atta even
	3 il runs the goal state function atta even
f.~.	3 il rans the goal state function after every
f.~	3 il rans the goal state function after every
	3 il rans the goal state function after every if room A == clean ff room B == clean print (a cleaning complete
in from	3 il rans the goal state function after every if room A == clean ff room B == clean print (a cleaning complete
	3 il rans the goal state function after every
·([,	3 il rans the goal state function after every Step on action " Troom A == clean ff room B == clea fruit (" clean g complete 9 if not clean it dans suck function and
	3 il rans the goal state function after every if room A == clean ff room B == clea print (" clean g complete G if not clean it divis suck function and returns clean then moves to
(I:	3 il rans the goal state function after every Step on action " Troom A == clean for room B == clea print (" clean g complete (9) if not clean it said suck function and returns clean on the moves to
··/···	3 il rand the goal state function after every if room A == clean ff room B == clea print (" clean g complete G if not clean it divis suck function and returns clean then moves to
	3 il rans the goal state function after every If room A == clean ff room B == clea fruit (" clean g complete 9 if not clean it divis suth function and returns clean then moves to the next path cost counter. (each step 1)
(<u>[</u> .	3 il rans the goal state function after every Step on action if room A == clean ff room B == clea print (a cleaning complete 9 if not clean it said suck function and returns cleaning their movers to the next counter. (each step 1) if count == 2
([:	3 il rans the goal state function after every Step on action if room A == clean ff room B == clea print (a cleaning complete 9 if not clean it said suck function and returns cleaning their movers to the next counter. (each step 1) if count == 2

	code:-
	The same same same
	(2 deline of the second of the
	100000
e Luin	ment / ment / fu
	class Vaccum Cleaner:
Mashri	class vacción contente (self) intente de charce (['A', 1
- Cara	lug location = viandom chaice (['A', '
	print (" Morring left,") leads I
	pount (" Moving left)")
-	self · location = (A)
	The same of the sa
	print (4 Mooning right")
pi Zhi	14 Margue a gright
Avietra	most for sparte (arrested) out
	Coult self - Escation = 9
	of and suck (say, From him in 6
و بعروب	the met and man from the
	Will a series in the company of the company
	· point (f" Sucking dirt in Koon 2 500m
	· point (f" Sucking dirt in Koon 2 500m
دع دلارس	print (f" Sucking dirt mikom 2 room
دع دلارس	print (f" Sucking dirt MEKOON 2 room
دع دلارس	print (f" Sucking dirt mikom 2 room
ss dean	dy simulate_cleaning ():
ss dean	dy simulate _ cleaning (): y a course : Yacroin Channell !
ss dean	dy simulate _ cleaning (): y a cours = Vaccour Change() 'A': random · Chaice ([i Clean', 'duity'])
22 chesse " 24 pp	dy simulate cleaning (): "A': vandom Choice (["clean", 'duity'] "B': vandom Choice (["clean", 'duity']
22 chesse " 24 pp	print (f" Sucking dirt mekom [500m] dy simulate _ cleaning (): wa come = Vaccoun Cleaning () 'A': vrandom · Choice ([Clean', 'duity'] 'B': vrandom · Choice ([Clean', 'duity'] 18': vrandom · Choice ([Clean', 'duity']
22 chesse " 24 pp	dy simulate _ cleaning (): Leaning (): Lea
22 chesse " 24 pp	print (f" Sucking dirt mekom 1 500m Aretion of clear? dy simulate _ cleaning (): wa come = Vaccoun Cleaning () "A': vrandom · Choice (["clean", 'dvily"], "B': vrandom · Choice (["clean", 'dvily
22 chesse " 24 pp	print (f" Sucking dirt mekosm 2000m) dy simulate _ cleaning (): vacuum = Vacuum Cleaning () 'A': random · Choice (["cleaning dirty] 'B': random · Choice (["cleaning dirty] 'B': random · Choice (["cleaning dirty] print ("intial State!") print ("intial State!")
22 chesse " 24 pp	print (f" Sucking dirt mekom 1 500m Aretion of clear? dy simulate _ cleaning (): wa come = Vaccoun Cleaning () "A': vrandom · Choice (["clean", 'dvily"], "B': vrandom · Choice (["clean", 'dvily

- T	Page
-	if sooms ['A'] == "clean" and score ['B'] == "clean",
-	praid ("Both rooms are clean, No cleaning
	tule's it is needed)
1	- ulse dominated product
	puil (4 chilis 1
	arount - room + va cum: location
	cleaned - ream : Vacuum Control
	cleaned - room : Vacuum suck (current - 900m
	Vacanus cleaned is the proper
	if cleaned -room == ! clean!:
	rooms (when from) = 'clear
	2.7
	if wout - room == (A'
	vaccum · mary - right ()
	current-400n = 181
-	ulse:
	Vacoum morer left ()
	current roon = (A)
-	
	penit (" In Cleaning completed .")
	puit (Final State ")
	puit (f" Room A: { rooms('A']}")
	penil (f " Room 8: (. rooms ["8']")
	(
	Simulaty_cleaning ()
	output:
	Enter indial elocation of vacuum cleaner (A18): A
	Enter State for Room A (clean (durly): divity
	Ender State for Room B (clear / durly): dirly
	Indial State:
	Vacuum Cerany is in Room A
	Room A: dirty
	Room B: Clirty

	Stacking the creaty process
د (رفوسا) د	Sucking dirt in Room A
ا دادمسر المعطوط)	
C.Karaca.	mound in Rooms
-7:	a historial to
1	we clear of complete to make - transles
/	man Jorde Stale of a more - barress
(moor town)	Vacuum cleaned is in Room B
	: Room A: Cleans
1	Room & a clean bound
14,036	
*:	if nort - secons = (4)
	Valent moon miles
	181 = -901-4-38500
	يدفاره :
	Vicessian. masses left w
	it i many therefore
	puit (" villaing completed . ")
	poit (Final State ")
-	price (for Room A : { necons(1.0.1) }")
	(. E. B.) I wood (. 8. 3.) F
	Eveniate change)
	· · · · · · · · · · · · · · · · · · ·
	Gertgent:

Output:-

...Program finished with exit code 0

Press ENTER to exit console.

```
main.py
              nonlocal cost
              if goal_state[room] == 1:
                  print(f"Cleaning Room {room}...")
                  goal state[room] = 0
                  cost += 1 # Cost for cleaning
                  print(f"Room {room} has been cleaned. Current cost: {cost}")
                  print(f"Room {room} is already clean.")
          rooms = ['A', 'B', 'C', 'D']
          current_index = rooms.index(location_input)
         # Clean all rooms starting from the initial location
          for i in range(current_index, len(rooms)):
              clean room(rooms[i])
          for i in range(0, current_index):
              clean room(rooms[i])
                                                                                      input
Enter Initial Location of Vacuum (A/B/C/D): B
Enter status of each room (1 - dirty, 0 - clean):
Status of Room A: 1
Status of Room B: 0
Status of Room C: 1
Status of Room D: 1
Initial Location Condition: {'A': 1, 'B': 0, 'C': 1, 'D': 1}
Room B is already clean.
Cleaning Room C...
Room C has been cleaned. Current cost: 1
Cleaning Room D...
Room D has been cleaned. Current cost: 2
Cleaning Room A...
Room A has been cleaned. Current cost: 3
Final State of Rooms: {'A': 0, 'B': 0, 'C': 0, 'D': 0}
Performance Measurement (Total Cost): 7
```

Knowledge-based entailment:-Code:-

	in / / P-1 11 2000 1
9	Entailment fall P of Foge
16	month:
	Challed applying the
	Inputs:
	Knowledge base (set of logical rules)
18	and base (set of dogical se and
	July Galtmerd
	- (1) 1+10
	Creat :-
	Preps :- , was spilment make
	1))
	1) Negote the grave,
((Console)	religheren Office in the state of the state
(morning)	134 The negotion.
	1.) Negote the query: Obtain the negociai.
	2.) Combine with knowledge base.
	The state of the same
	3.) Check Sates frabely: to check if the negation with kb
	1 ada 1 . A y . I . Lang - M
	to check of the negation with ks
	res satisfing tresules
	(mening 190) at high preside . What work
	4.) Dutermine Contailment
2 pried	4.) Determine entailment
100	of conjunction is not satisfiable > True
N	if conjunction is satisfiable -> the.
	1 8 3
	- Margania Cara Cara Cara Cara Cara Cara Cara Ca
/	212 /4 A 1 2 4 1 No 1 12 1
7.7.7697	milly (15 4) charge ! I was a sudaplicated !
	1: 200
	and the second of the second of the second
	

	code:
	From sympy import symbols
	1 of cas att kurt
	P = symbols ('P')
	1 = signor
	Note that the second se
	V = Symbols ('('))
	provedge base = And (implies (1) 1)
	r = symbols ('(') peraverage base = And (implies e(p, ar), implies (ar, r) Not (r))
	relan knowledge base.
	def query - estails (knowledgebase, query)
	at a salustiality (And (knowledgebase,
	entaulmist = saluspialor (And (knowledgebase,
_	rete not entailmed sold sold of
	reti_ was to will the same of
	in- name_ = "
.185	Kb = create tenowledge base ()
	quing systems ('P')
	resultiff = query- entails (Kb, query)
-	print (" knowledge Base ", Kb)
met!	prid (" query , muy)
اد.	pril (" Dary entails bouredge base", resul
	N. h. 1:
	- su fuse
	Knowledgebase: ar & (Frequer (all 01= 15)
	Knowledgebase: ~ or & (inpluis (P, W) of (Inplusting)
	Query entails knowledgebase, False.
-	

```
main.py
          entailment = satisfiable(And(knowledge base, Not(query)))
          # If there is no satisfying assignment, then the query is entailed
          return not entailment
  25 if __name__ == "__main__":
26 # Create the knowledge base
          kb = create_knowledge_base()
          query = symbols('p')
          result = query_entails(kb, query)
          print("Knowledge Base:", kb)
          print("Query:", query)
          print("Query entails Knowledge Base:", result)
v 📝 🌣 😘
Knowledge Base: ~r & (Implies(p, q)) & (Implies(q, r))
Query: p
Query entails Knowledge Base: False
...Program finished with exit code 0
Press ENTER to exit console.
```

Knowledge-based resolution Code:-

- 4	Para de la constante de la con	
_	Knowledge based viesolution:	0/1/2
	S.S. Le. J. Larriet No.	
	Inputs:-	
	proceedings base (set of clauses in proposition	onal
	Knowledge base (set of clauses in proposition logic)	
	Steps:	
15	THE COURSE HAND SHOW	
	1) Frilialize vesolvent:	
	2) Repeat until no new revolvents can be que	indid
	39 2.1 pairwis selection	
util) r	gainvis selection (clause A, clause B)	
atopa)	Sandy Sand Bear	
(الناصم	3) Resolving clause.	
	shindred) agast makes	
_	BVA	
	- CVA - PRIO	
	-BVA PV-QVR	
	CV719 TQVR	
	-AV-BVD	8
	TA - Lond 1424	
	Joseph Street Street	
6	Megate the query of add it to the to	
Lin	Repeated resolve the partie of claused in	the
Astuse	knowledge last untill a contradiction	oud or
	No men queles are possible.	
	Mourial	
	del	
	Misself Land Land Land March Land	
	Maria Andrea Maria and Andrea Andrea	
	1 0 _ 2 m V 3 g J - 20 - 1	

he - little	1
dy nigate - libral (tiles as) sif libral [o] == 'n': lettial [1:]	
significant Los	_
Gratics State	
else: crety 'n' + televal	
and the second of the second o	
(5 mg o)	
dy resolve (L1, C2): set (C1) Sut(
gusolve-clause = set (C1) Sut ((2)
for Illeral in City	
Bollond (lederal) in	2:
if negati-lebral (Ideral) in	4/10
(8 seems) Resource Clark There	Gen
gesdy clause Tens	nor (reg
الأدوارث واعيس .	(Jul
greter laple (resolved-	clause
Land Broken Kally Karoli and	_
dy resolution (knowledge base):	
dig resolution (knowledge base):	
AVSI	
new clauses = Set C)	
	() =#.
for i, c, in turnerale (kb)	
new Court - South	10.11
hero clause = resolu	101
if le (view classe)=	01
da da	11
hew-Chure add (numb
if not new-clause	_
kreak	_
Kapulada II I	_
Knowledge bas - new - claure	
betwo prowledge base	
at the	_
) = none = = 4	

+	kb = {('p', 'a'), ('~p', 'v'), ('~q',
	result = resolute (Kb)
	ut (" original kb", 146)
	put (" Predudkio", remet)
4	Sealition of a country of the seal of the
	Janitoshi san i mast p) mast (a
-	All astrono II
	bles if them I is a veriable
	s-not in Louise 1 most to
	Line Statement Fam.
-	10 15 alle of huma a is a resigher
	the state of the second on the
	The state of the s
	Section ((teres))
-	TALL MANAGEMENT OF THE STATE OF
	Superior of franciscon (sound) of produces
	107
-	Megali ninasana il degeneral di
-	12 June 19 in grander of the

Output:-

	de de
8	Unification
	Eg knows (John, x) Knows (John, Jane)
	Eg knows (John, x) mous (John, Jane)
	(d) of x / Jame }
	Step 1: If term 1 or term 2 ils avasticible as
	a) term 1 of term 2 are identical
	& settern NIL
	L V
	b.) Else if team 1 is a variable
	if term 1 occurs in term 2
	Ocetum FAIL
	() celle if term 2 is a variable
	if term 2 oceurs in term
	vietum FAIL
	ulse 1 have an all
	d.) else rolling Fall
	d.) else relien FAIL
	that though - I do
	Step 2: if predicate (term) of predicate (terms
	Step3: number of degeneral of
	relieur FAIL
	Stepy: set (sub st) to NIL
	Steps: For 1=1 do the time
	elem 1
	a) call ensity (it terms, if te-2)
	put results visto s
	S = FAIL
	Set PAIL.

Stept	b: c) w S fril	
	The second second	
	a.) Apply s to the værnande & both 1, g	L,
	6.) SUBST . APPEND (S, SUBST)	-
	Trans I Lovens to V	
Step.	6: Relin SUBST	
	O pudicate sa	
	The state of the s	
	& No Z arque	
	3 The some	
0	Triplant Cont.	Jane
1	tum puties	ulset
1,011:	Shows abeliette also appleding to	
imp	port see	-
do	1000	
	of get Initial Predicale (expression):	-
	echew expression speil ("(")[0]	
de	of exconstand (chan).	
	Declarer chan · Bupper() ad Jun(den) == 1	
de	of exopeace Attributes (esup, old, new):	
	attributes = getAltribules (exp)	
All Control	for index, val in enumerate (allributes).	
	190 1-9 vym val = old:	
	(a 1/2) 300 The aller Buty (index J=new	-
	prediede = get Initial predicab (osp)	_
(- Althory	Ocelver producate + " ("+ ")" . join (ettribute)+	")"
	def apply (oxp ; Substitutions).	
	for Substituted in Substitutions:	
	new, ald = Sulartitulian	
	exp = replace Attributes (exp, old, new)	
	elettenelxp.	al.
	def getfvistPart (expression):	
	predicate = gottrilial Bredicale (asyumian)	
	attributes = getAttribute (expression)	
	return new Expression.	
		11 9/

	0.02)
	defunfy (corp1, corp2)
13. 11 pt	
	Netton
	if its constant (exp1):
	retur ((esipe, wipi)]
الدائم القنصد	
Humber	of check Occurs (drps, esip2):
Solver:	return Fall
Just -	attribute count & = len (get Attributes (exp.))
وسلا الاستعادد	albribile Count 2 = elen (getAttibutes (exp2))
	of allribut (Count 1 = attribute cout 2:
	vieture talse.
	head = get fivestpart (expl)
	head 2 = get tirest Part (pop2)
	witial Substitution = unify (heads, heads)
	if not initial Substitution:
	. deelter False.
	(90) Deelen intial Sulstitulion
. 40	(of interpretable in supervised failed
**	tail 1 = getReman Aud (cexp1)
	tail 2 = get Remais Part (exp2)
	and the state of the The The state of the st
" Carolin	into al Substitution : extend (our any Substitution)
	outer mide al Sulbhi tution.
	icini minimi de mandre de la companya de la company
	Marie and a survey
1 Carr	the property of the second of
	And weekless
	the get problem (experiend):
(presidente a gotinimal Predict Carpen.
	ateritales = getheritatelessenial

```
exp1 = "knows(X)"
exp2 = "knows(Richard)"
substitutions = unify(exp1, exp2)
print("Substitutions:")
print(substitutions)

Substitutions:
[('X', 'Richard')]
```

```
[7] exp1 = "knows(A,x)"
    exp2 = "knows(y,mother(y))"
    substitutions = unify(exp1, exp2)
    print("Substitutions:")
    print(substitutions)

Substitutions:
[('A', 'y'), ('mother(y)', 'x')]
```

to CN	FOI To CALE COUNTY Date
POCK A OR	FOL to CNF coursing Page
-9	Stepi) count a list of SKOLEH. CONSTANTS
	Step2 Find \$3 -> ture solds
-	of the albribules are Lower case, suplace the
	cloith a sholem constant.
	remove and spen
	remove used skolem constant or function from
	- 11.1 E PARS
	if the allribuly are bothe lown case and
	appearable suplece the appearance albeitutes we
	a Skolon function.
_	Dean land his high the
	Step3: suplace with '-'
	bransform - as Q = (P = Q) 1 (D => P)
	() () () () () () () () () ()
	Stopy: replace => with (-)
4.0.14	
- 19	Staps: Apply de morgan e Law
	ruplace ~ C
	: as ~ Pf ~P ib (1 was present)
	ruplan ~[
	as ~P/~ o if (f was great)
	supeail ~ wir ""
	COMP PROPERTY
	for health as the comment of the comment
	+ 11 King (x) A lyrudy (x) -> Evil (x)
1),	K = (0) ^ Sheedy (R) => Evil (R)
	~ [King (e) A grundy (e)] V Eile (e)
	(Kingle) Inguing (a)
10	~ (K] (x) V ~ (eneedy (p)) V Ei
tro	(a) (b) (aprecon (b))
L. Wiles	20theter 100 miles of the March Co
- charle	- No. female (LEV 2).

	Page of the course of the cour
	del notAtminutes (Steway):
	expr:
	matches - re fridall (wife, string)
	return (m for m in Str (matches) up m. isappear)
mark o	dy god Poudicales (Rhang).
	expn = '[a-2~]+(A-Za-z]+'
	ocether one fondall (cuseps, string)
Ann Laux	des Dre Morga (Sentence):
	string = ". join (list (sentence) · copy ())
	Stung = Stung repeace (""")
(14)	frag = '[' in string
	strig = strig replace ('~[', ''')
	for predicate in get predicate (Alig):
	By - ship repeace (prediced, +1- [prick
	S = list (stig)
	for i, ciù emmerate (stig):
(t	engage 1) & if E= Ui:
	8 [i] = 'f'
· (Just	a 1200) Le vely C+= 141:
	" " shee & Ci) = i phogen.
	Stage ". jour (s)
	Sty : Ha . replace 1 "~~" ")
(d	1 1 Stig 147 1 withen to
(4	Soil or (a) mayor or (a) and
ا شاير (م)	dy skolemización (sentence):
	SKOLEM_CONSTANTS = [f'four (c) } forc in rage
۵)) ۷ لتنا	(ord ('A'), ord ('z')
(4)	Statement = ". jain (less (sentures) - copy 4)
	materis = re. findale (1'[+ 7]. , status)
	for matches in rematour [::-1]

	for predicate inget predicates (Hote)
	attributes - get Attribute (predvall)
Herry 1943	(altributes) :18 lows (1)
	Stalement: Staleand replace (matchle),
	Skolen contacts : pop(a)
	else:
	al = [a for a in alleibute if a island]
	all = [a for a in albubils if not a retorna
	Co7
	Julian Stational
	1 M January Diagnosia, of Ca
	while '-' in statumed:
its control in	Gratement Andex ('ny)
	Statement - lest (statement)
	Statement [i] = , Stalent [iti] , Stalend(iti]="7
7	Statut [i+2], (N)
	Halement = (' jain (statement)
	Statement : statement repease ('N[+', '[~+')
	eaps - ((~(E)+)))
	for Sin Stability
	Car = (n)
	for S in Statements:
	Stalend - Stalend . replace (5 ptages
	rete Statuil.
	was the constitution

```
print(Skolemization(fol_to_cnf("animal(y)<=>loves(x,y)")))
print(Skolemization(fol_to_cnf("∀x[∀y[animal(y)=>loves(x,y)]]=>[∃z[loves(z,x)]]")))
print(fol_to_cnf("[american(x)&weapon(y)&sells(x,y,z)&hostile(z)]=>criminal(x)"))

[~animal(y)|loves(x,y)]&[~loves(x,y)|animal(y)]
[animal(G(x))&~loves(x,G(x))]|[loves(F(x),x)]
[~american(x)|~weapon(y)|~sells(x,y,z)|~hostile(z)]|criminal(x)
```

10/1/20	Page
	Forward chaining
	Comment There was the second
	1) Input the knowledge lease and the query
1,1	2.) for c in KB:
160000	i == query octam True
	Julia n
Crati	Split live and this part
DAGU.	if the wike:
	add sums to KB
	exclusion False
	3.) To viernous variables
	if intourin ()
	occepeace the variable with constants
	Every de la Carte Carte Carte Carte
- Torib	Example: 1 - 2012 . ~ [5] transton
	KB 100 Total January
	King (2) & greedy (c) = evil (2)
Carrelly !	lag (John)
	grudy (John)
	K-g (Richard)
	0
	Query
Sept. 275	age . Similar light with
	- July - 130 Pg
	The state of the s

	Code:
	Code:
141	of in post die (v) 10 march of i proceeding
_	def is variable (x):
_	and is the state of the state o
_	salum len(x)==1 ad x islamen () ad x. is app
_	Class J. September J. Wall
_	of get Attributes (Phy):
_	esper: ')([^)] +1)'
_	metches - re-tickall (expr. etmg)
44	Delum matches.
_	LI VIA POLL (LCD)
	def get predicates (stuy).
	Expr = ((a-z~)+) \([^9[]+1],
	orelan re findall (exper. strig)
	Test testille (expr. strig)
	cluss Fact:
	def - init - (sey - expression)
Anna	self expression - expression.
Jac.	self. parais: parais
à	Self · result - any (sey · getcontacts(1)
7	Jan
	duf split Expression (self, cexpression):
	predicate = get predicates (expression)(0)
	params = gt Atributs (apression (0))
	(4 0 (()') . salit ('')
	gelwan (pedicate, pare s)
	Company to the second of the s
	11 Coella:
de la	getweet ley result.
	Jest Green D
	des get Constrains (eng):
MA.	Holy Calou is in vovalle (c) west con
4	con self paris]

	ay get variable (self):	
	occluse (v if is variable (v) alse None	for vii
	sey parus]	
Jaka 21. 3	(1) 15409113736 (b. 6) 15-16 X 2415 (b. 74111430)	
	Class Inplications (Buy expression)	8
	self. lepression = expression	
	(=)	14.7
	self lhs = fact (1) god un	(o) specil
	sey she = fact (26.7)	
	def evaluate (self. facts):	De la
	(part 1993) Coolistants = { Zalana	
	new les-67	-
	for fact in facts it is seen	-
	for val in left. Its if val - predicate = fa	., .,,,
-	17 tal-predicate- ju	ate (val. anti
Loa	waster has pro = sent to the	arially
	34.4 34	0)
	L class 18: Next is marged tiles Into	
fe Y	dy init - (suy):	
J rach	self facts set U	
(33)	Rey implications = 80+ ()	
	Confrag Marting James 200	
	def tell (self-c)	
	(Noil) Dring:	
	Sell-implications.a	dd (Teplicaling
	13.1/26 - 3/12	
	for i in seef in perc	ale 1
AAL CLE		sey factor)

Date
def growing (sey . 6): facts - set ([f. repression for in sey facts]
facts - see
(f. repression for s
del deselar (2001)
paried (" and
def despeay (self): period (" All facts")
The Carlon on
for in in enumerale (set (16. coping) for in self. facts print (ful fix 13 [53])
print (ful six ? six?
146 = 14B()
Fb - tell ("King (x) & and
the - tall ("King (x) of greedy (x) =) evil (n))
66 lell (greedy (tol))
· Mb- tell ("Kij (Richard))
to gery ('evil (x)')
tony (Eve (2))
Output:
Georgie (vil (x):
evil (John)
24 1 24
A it
Conf

Output:-

```
kb_ = KB()
kb_.tell('king(x)&greedy(x)=>evil(x)')
kb_.tell('king(John)')
kb_.tell('greedy(John)')
kb_.tell('king(Richard)')
kb_.query('evil(x)')

Querying evil(x):
    1. evil(John)
```