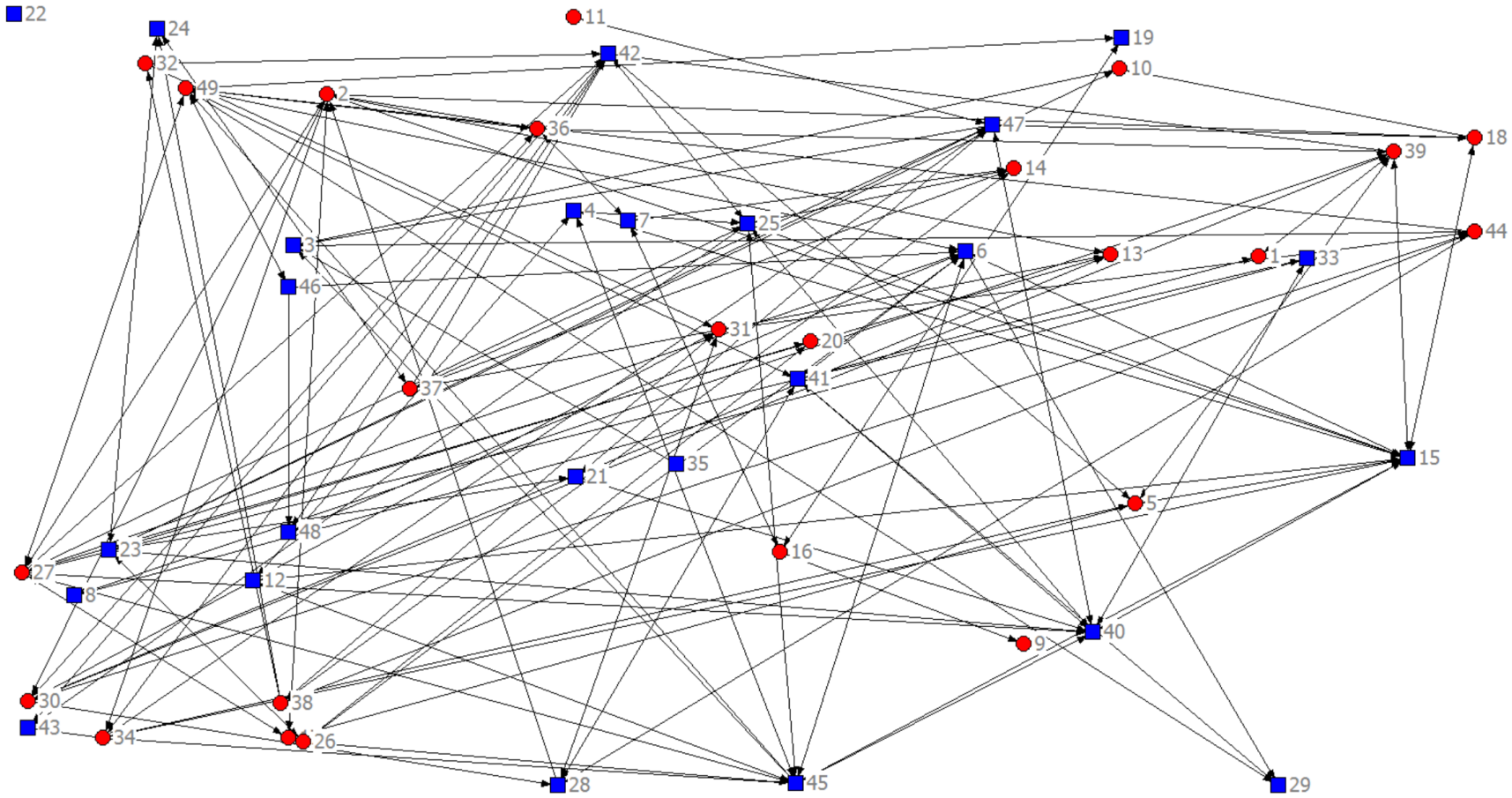
Example: Shortest Path for Messaging

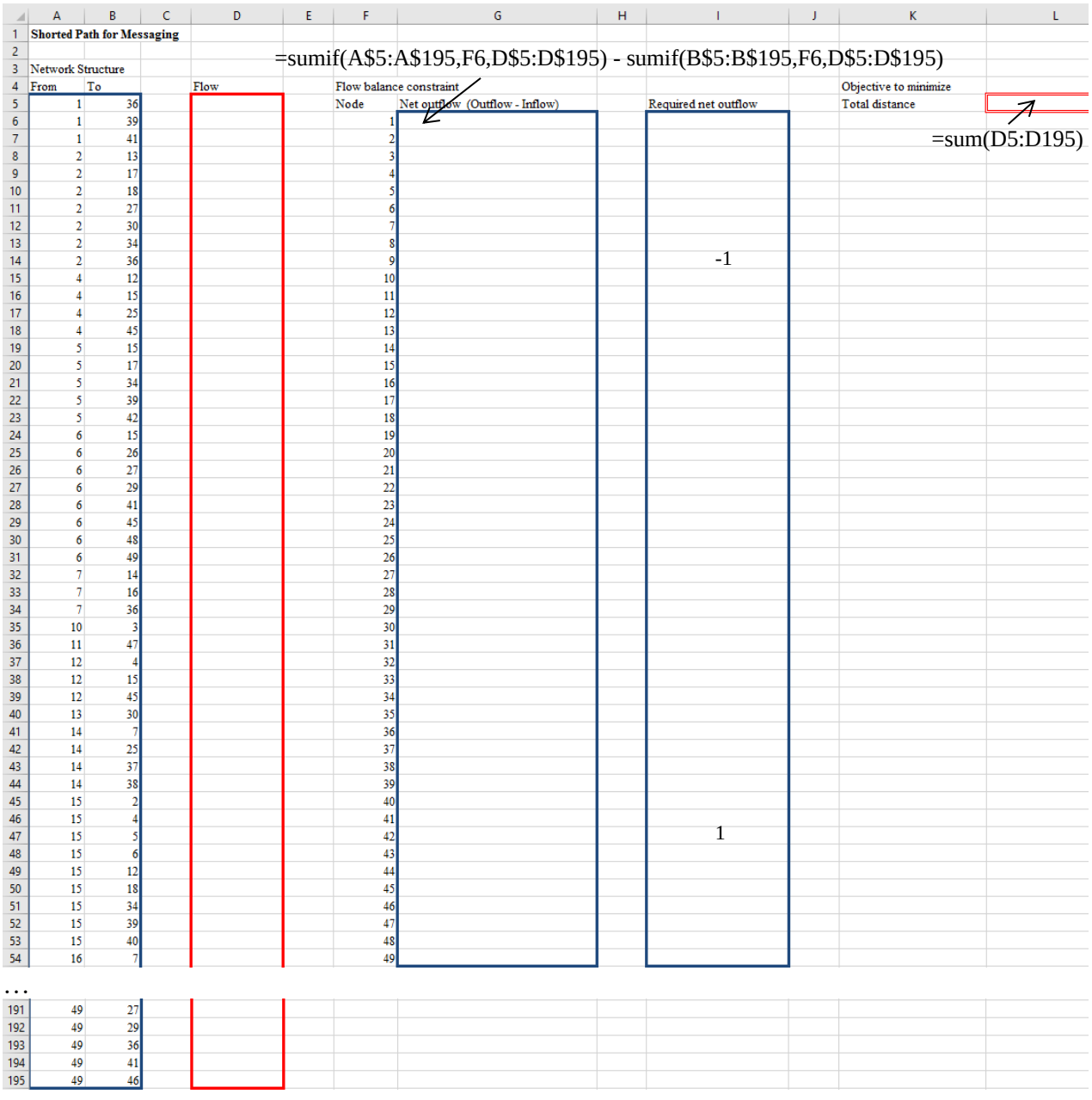
The mobile social network among students in MGT 40750 is provided in the following diagram, where ● represents Female and ■ represents Male.

Question: Find the shortest path from Node 42 to Node 9 through this mobile social network.



Shortest Path for Messaging

Set up the Shorted Path for Messaging model in Excel: **(Start = 42 End = 9)**



	A	B	C	D	E	F	G	H	I	J	K	L
1	**Shorted Path for Messaging**											
2												
3	Network Structure											
4	From	To		Flow		Flow balance constraint					Objective to minimize	
5	1	36				Node	Net outflow (Outflow - Inflow)		Required net outflow		Total distance	
6	1	39				1						
7	1	41				2						
8	2	13				3						
9	2	17				4						
10	2	18				5						
11	2	27				6						
12	2	30				7						
13	2	34				8						
14	2	36				9			-1			
15	4	12				10						
16	4	15				11						
17	4	25				12						
18	4	45				13						
19	5	15				14						
20	5	17				15						
21	5	34				16						
22	5	39				17						
23	5	42				18						
24	6	15				19						
25	6	26				20						
26	6	27				21						
27	6	29				22						
28	6	41				23						
29	6	45				24						
30	6	48				25						
31	6	49				26						
32	7	14				27						
33	7	16				28						
34	7	36				29						
35	10	3				30						
36	11	47				31						
37	12	4				32						
38	12	15				33						
39	12	45				34						
40	13	30				35						
41	14	7				36						
42	14	25				37						
43	14	37				38						
44	14	38				39						
45	15	2				40						
46	15	4				41						
47	15	5				42			1			
48	15	6				43						
49	15	12				44						
50	15	18				45						
51	15	34				46						
52	15	39				47						
53	15	40				48						
54	16	7				49						

=sumif(A$5:A$195,F6,D$5:D$195) - sumif(B$5:B$195,F6,D$5:D$195)

=sum(D5:D195)

...

191	49	27	
192	49	29	
193	49	36	
194	49	41	
195	49	46	

Specify Solver:

Set Objective: L5
To: ○ Max X Min ○ Value of: _____
By Changing Variable Cells: D5:D195
Subject to the Constraints:

G5:G54 = I6:I54
D5:D195 = Integer

X Make Unconstrained Variables Non-Negative
Select a Solving Method: Simplex LP

Solver Results:

7 → 16
14 → 7
16 → 9
25 → 14
42 → 25

Thus, the shortest path is 42 → 25 → 14 → 7 → 16 → 9.

The optimal total distance = 5.