Islington College

MA4001NI
Logic and Problem Solving
Group Coursework
(50% Weighted)

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We extend our thanks to the math department for giving us the chance to finish this assignment. Our academic career has been greatly improved by your support.
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1. Problem 1 Solution

When a taxing body, typically the government, puts a financial responsibility on its citizens or residents, it is referred to as taxation. Since ancient times, paying taxes to governments or officials has been a fundamental aspect of civilization.

The word "taxation" refers to all kinds of compulsory charges, including capital gains, income, and estate taxes. While taxes can be either verbs or nouns, they are typically described as acts, and the money that is collected as a result is known as "taxes." (Janssen, 1999)

Income:
Their overall earnings, including their salary and wages, investment returns, pension payouts, and other receipts, are referred to as their income. For businesses, income consists of the money they make from selling goods and services as well as any interest or dividends they get from their business-related cash accounts and reserves. It acts as the primary source when calculating taxes. (Janssen, 1999)

Tax deduction:
A deduction from taxes is an arrangement that lowers taxable income. One deduction at a set amount is known as a standard deduction. Higher-income taxpayers who frequently have large deductible expenses (Jr, 1937)

Income Tax Bracket:
The range of incomes taxed at specific rates—which usually vary based on filing status—is known as a tax bracket. Rates increase in line with income under a progressive individual or corporate income tax system. The federal corporation income tax structure is flat, but there are seven federal individual income tax bands. (Jr, 1937)

Tax Slab:

This is a representation of each income tax bracket's width. It is the range of earnings that each bracket covers. Each tax slab in this chart is worth 250,000 Indian rupees.

Tax Rate:

The percentage that an organization or person must pay in taxes on their income is known as their tax rate. When an individual's or company's taxable income rises, so does the tax rate that is charged. Higher income people pay more in taxes under a progressive system. (Janssen, 1999)

Tax Amount:

Based on the taxable income and tax rate, this is the actual tax amount. It is calculated if the yearly taxable income is less than or equal to the tax slab. The tax rate is multiplied by Yearly taxable income (tax rate multiplied by tax slab)

Taxable Income Left:

This is what's remaining after the total revenue is subtracted by the tax amount. in the event that (yearly taxable income less the tax slab, 0, yearly taxable income less the tax slab). It displays the remaining income for each tax bracket.

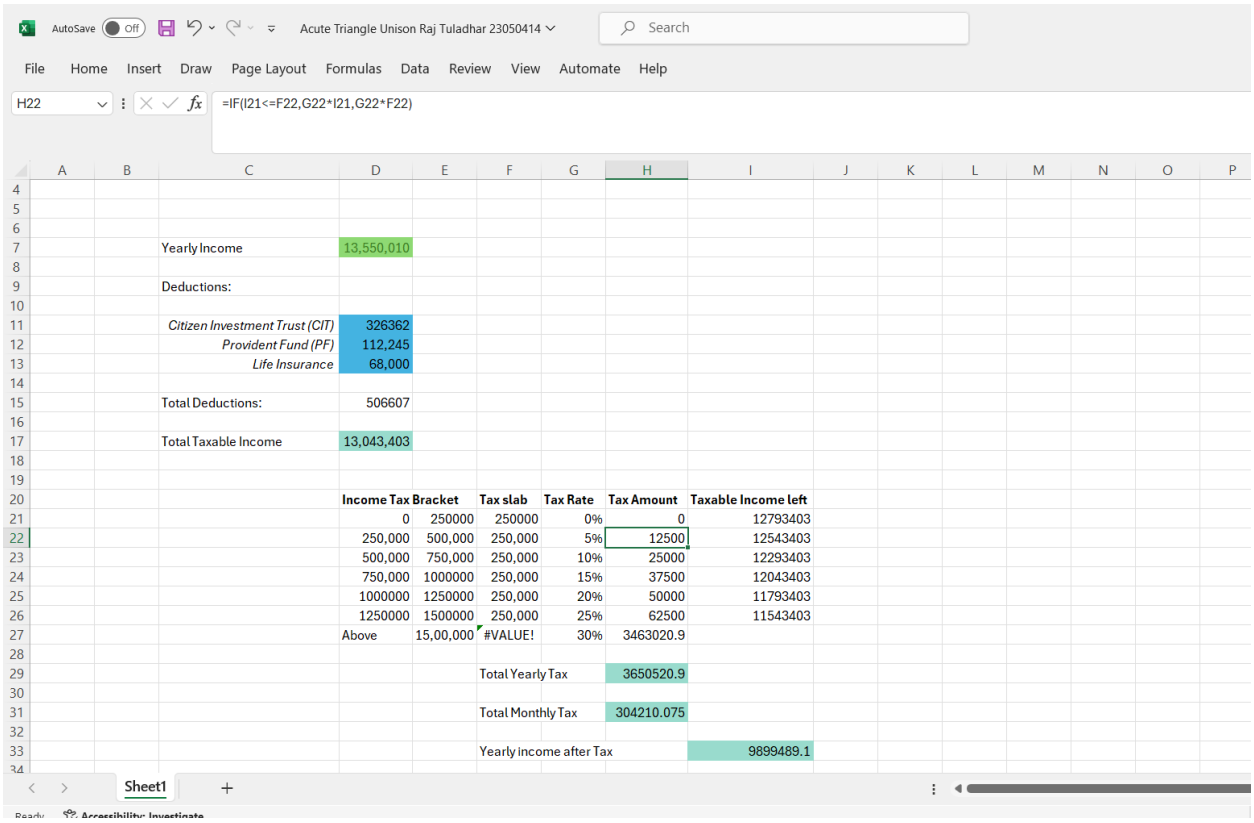
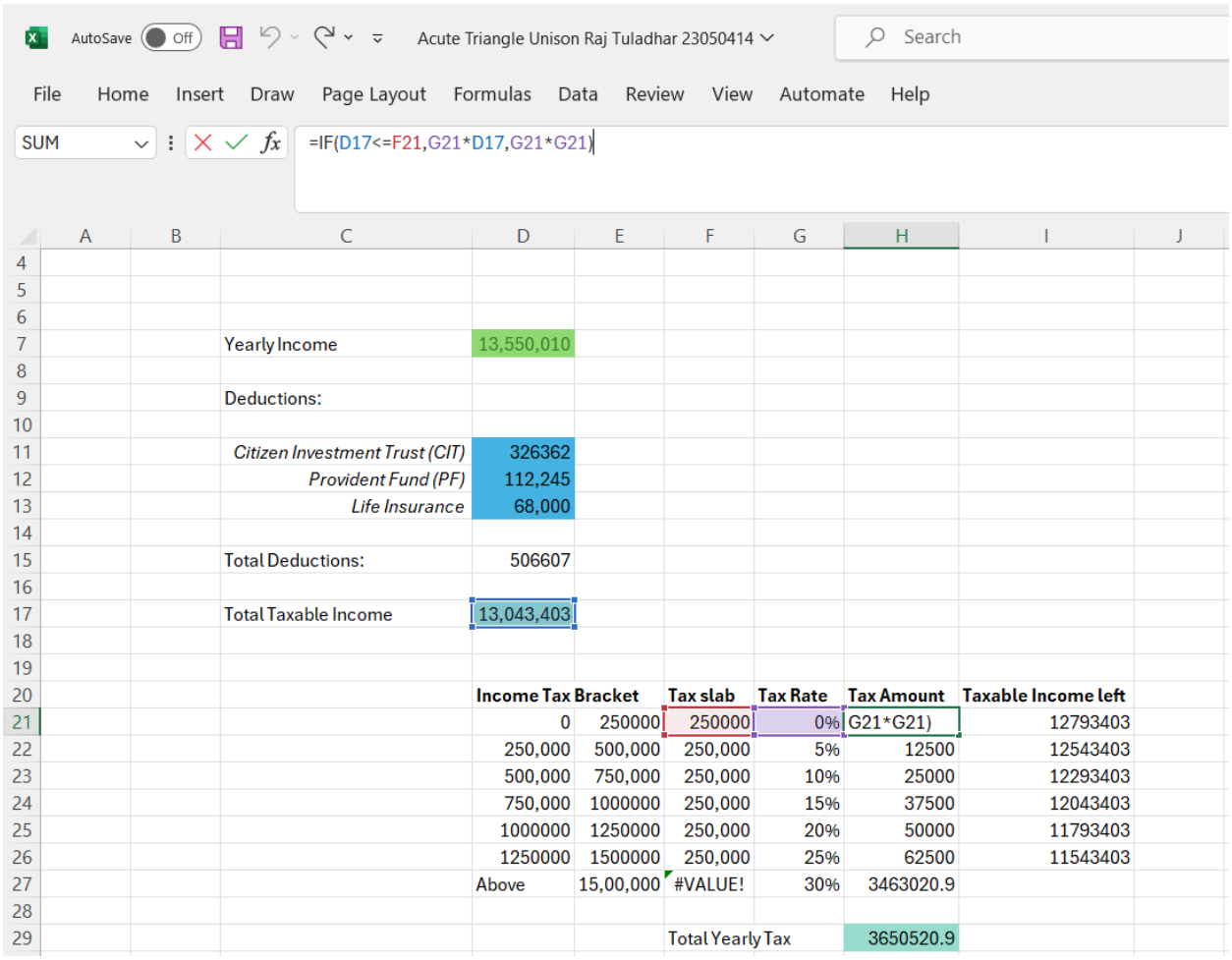


Figure 1 Screen shots for tax Template.



4									
5									
6									
7			Yearly Income	13,550,010					
8									
9			Deductions:						
10									
11			*Citizen Investment Trust (CIT)*	326362					
12			*Provident Fund (PF)*	112,245					
13			*Life Insurance*	68,000					
14									
15			Total Deductions:	506607					
16									
17			Total Taxable Income	13,043,403					
18									
19									
20				**Income Tax Bracket**		**Tax slab**	**Tax Rate**	**Tax Amount**	**Taxable Income left**
21				0	250000	250000	0%	G21*G21)	12793403
22				250,000	500,000	250,000	5%	12500	12543403
23				500,000	750,000	250,000	10%	25000	12293403
24				750,000	1000000	250,000	15%	37500	12043403
25				1000000	1250000	250,000	20%	50000	11793403
26				1250000	1500000	250,000	25%	62500	11543403
27				Above	15,00,000	#VALUE!	30%	3463020.9	
28									
29						Total Yearly Tax		3650520.9	

Figure 2 Screen shots for Formula of Taxable amount 1

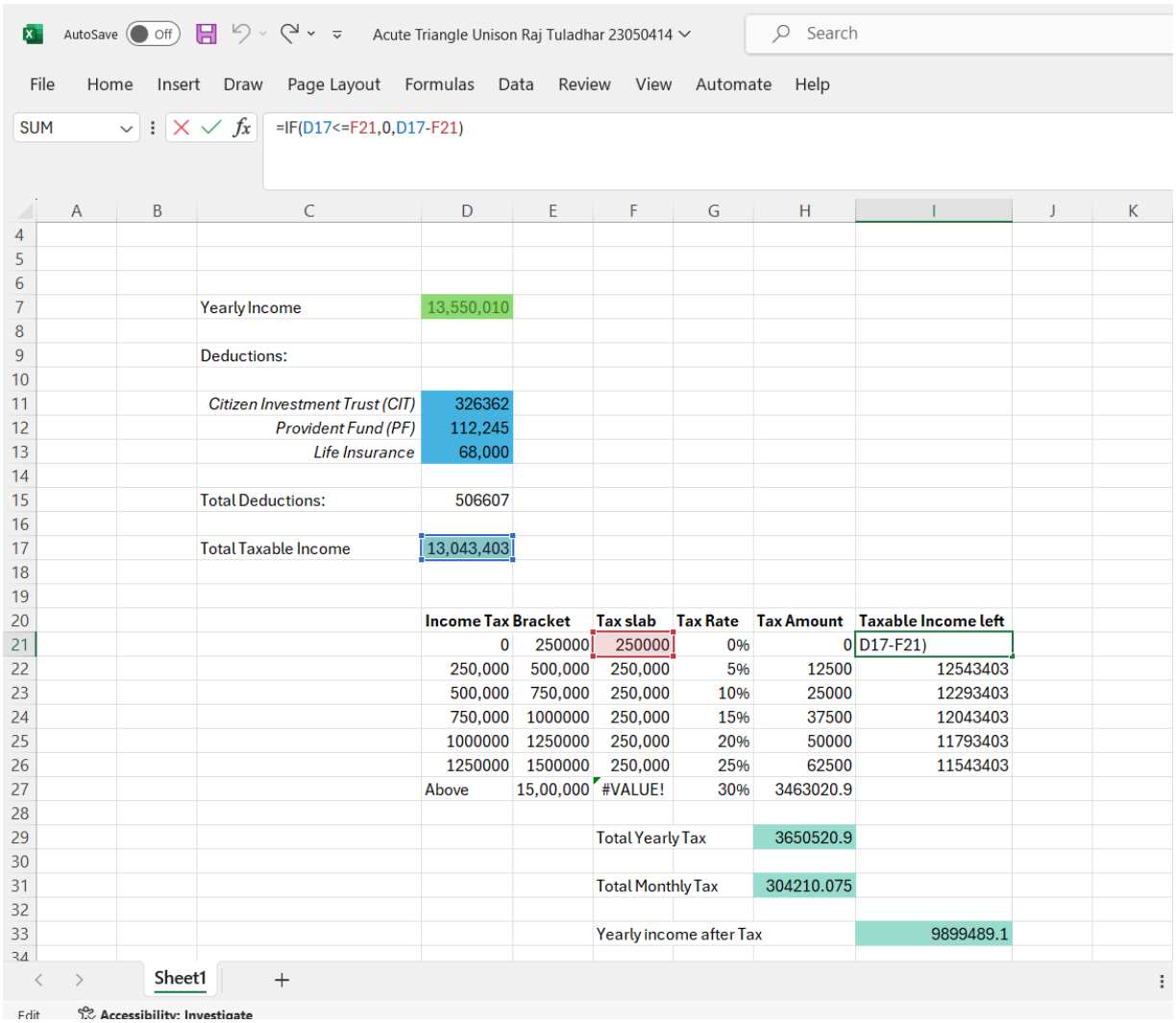


Figure 3 Screen shots for Formula of Taxable amount left 1.

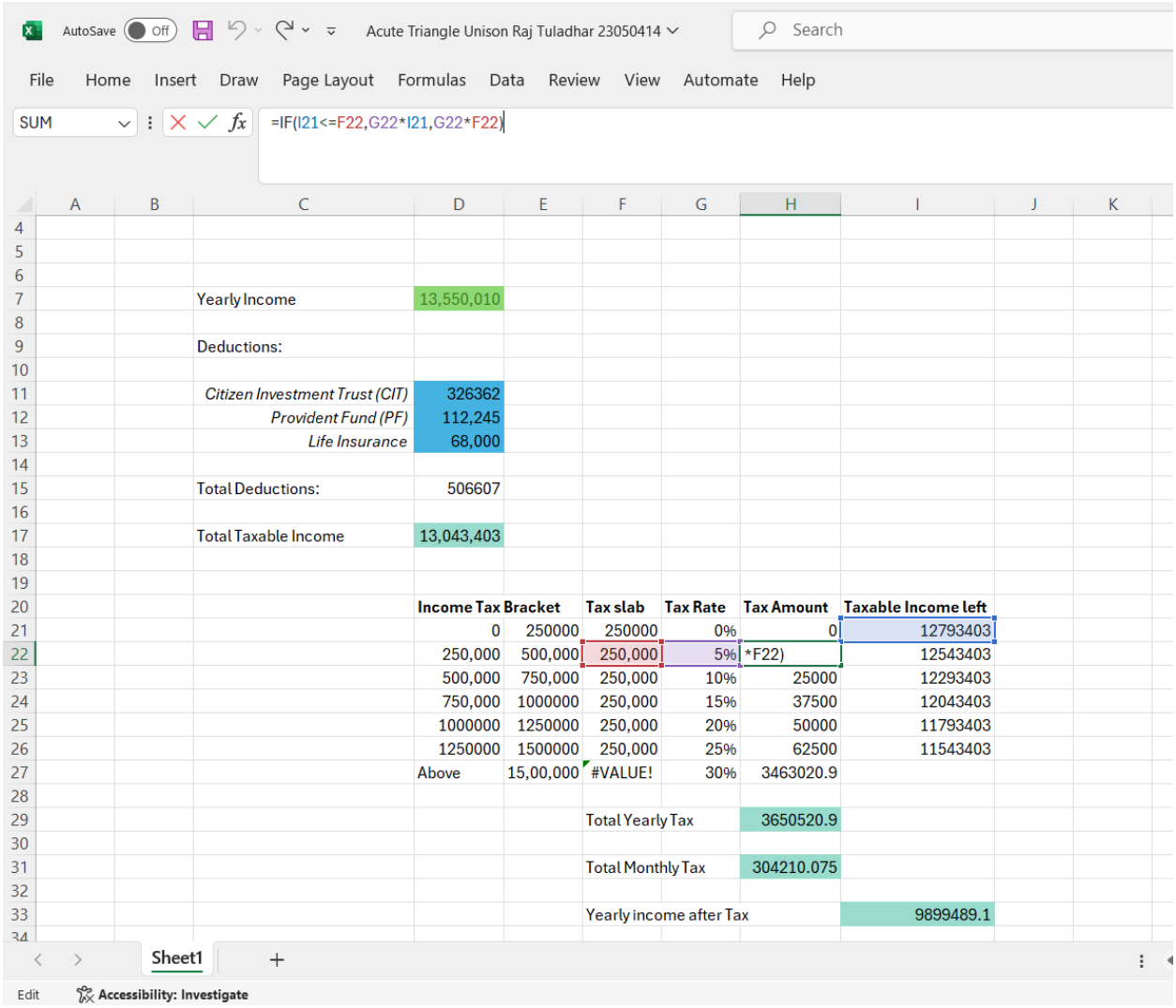


Figure 4 Screen shots for Formula of Tax amount 2.

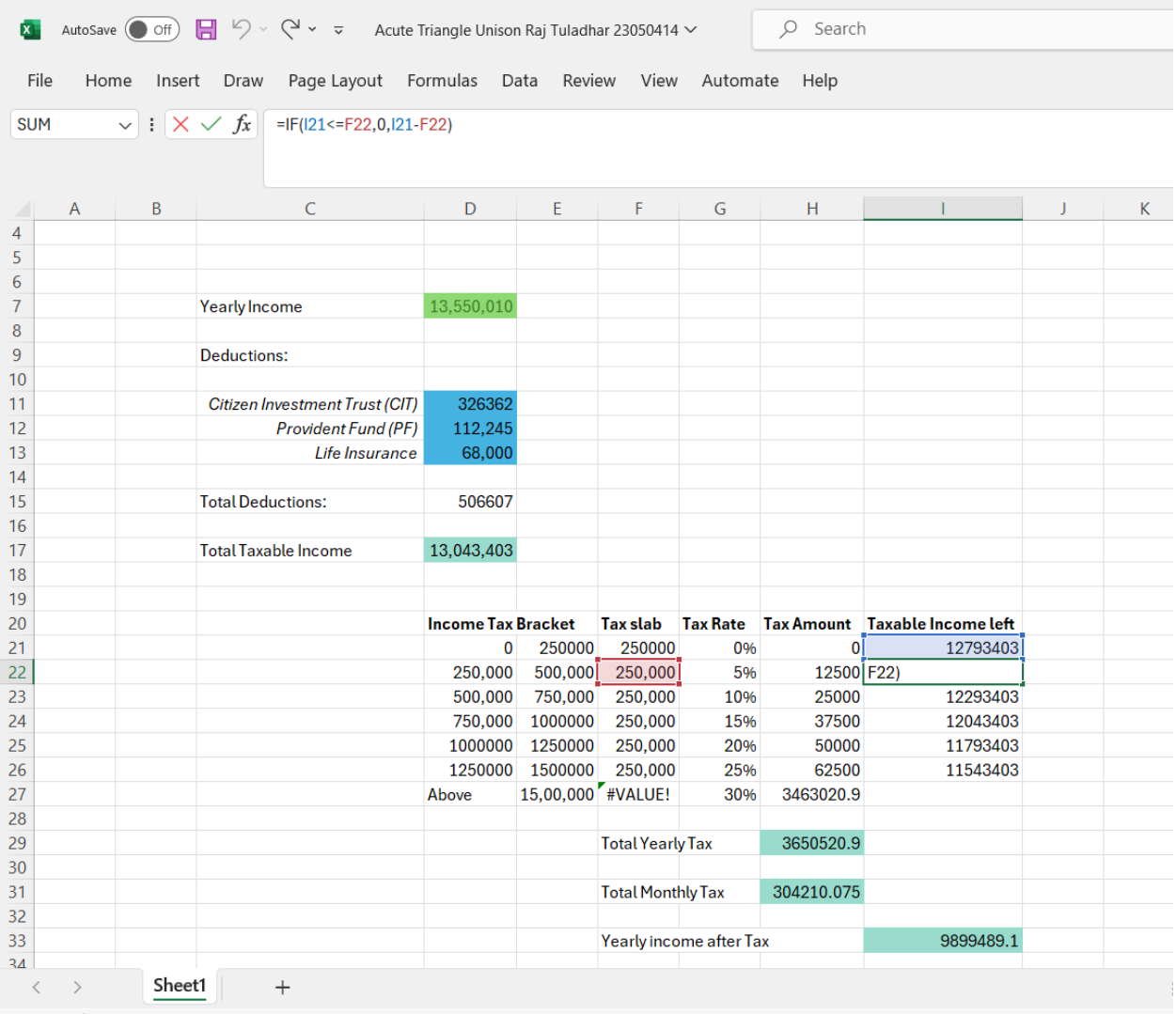


Figure 5 Screen shots for Formula of Taxable amount left 2.

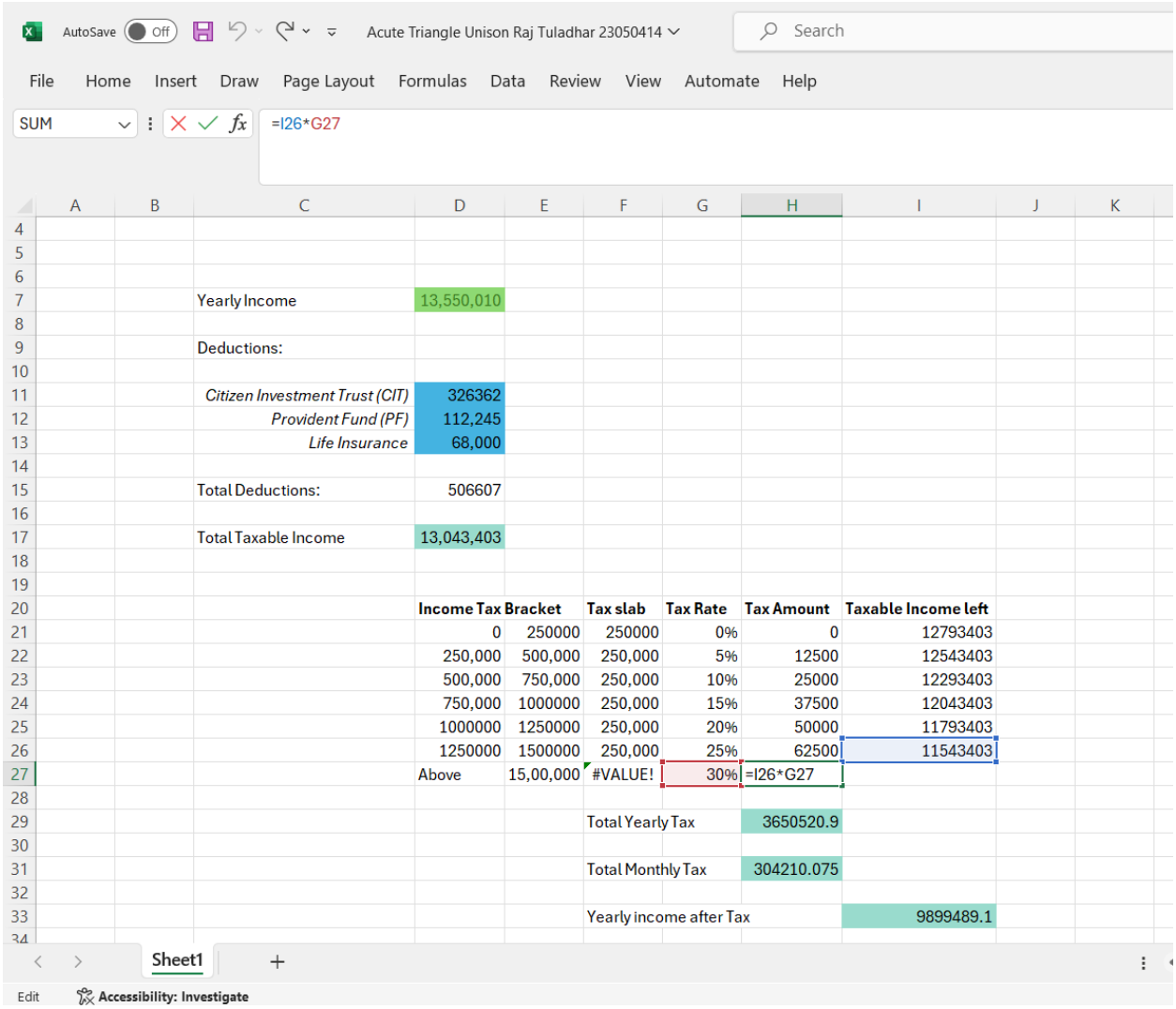


Figure 6 Screen shots for Formula of for last income tax bracket.

Write a procedure, tax, to calculate (in Indian rupees, Rs.) the tax a person owes, depending on his/her income. Calculate the tax using this table:

Taxable income	Income tax rates (in Percent)
0 to 250000	0%
250,000 to 500,000	5%
500,000 to 750000	10%
750,000 to 10,00,000	15%
10,00,000 to 12,50,000	20%
12,50,000 to 15,00,000	25%
15,00,000 and above	30%

The procedure should show.

i) The salary,

ii) The tax rate,

iii) The amount of tax

iv) The amount left after tax and

v) Be able to deal with any input, valid or not.

Your tests of procedure should include the following values, which should be included in your final presentation.

a) tax (Rs. 4,005,000)

Deductions:

- Employees provident fund organization: (Rs. 415,330)

b) tax (Rs. 13,550,010)

Deductions:

- Employees provident fund organization: (Rs. 112,245)
- Life Insurance premium: (Rs. 68,000)

c) tax (Rs. 620,000)

Deductions:

- Employees provident fund organization: (Rs. 17,007)
- Life Insurance premium: (Rs. 32,000)

d) tax (Rs. 9,19,887)

Deductions:

Employees provident fund organization: (Rs. 92,224)

e) tax (Rs. 18,009,000)

Deductions:

Employees provident fund organization: (114,221)

f) tax (Rs. - 7,050,000)

Deductions:

Employees provident fund organization: (Rs. 88,526)

Sol^{n}:

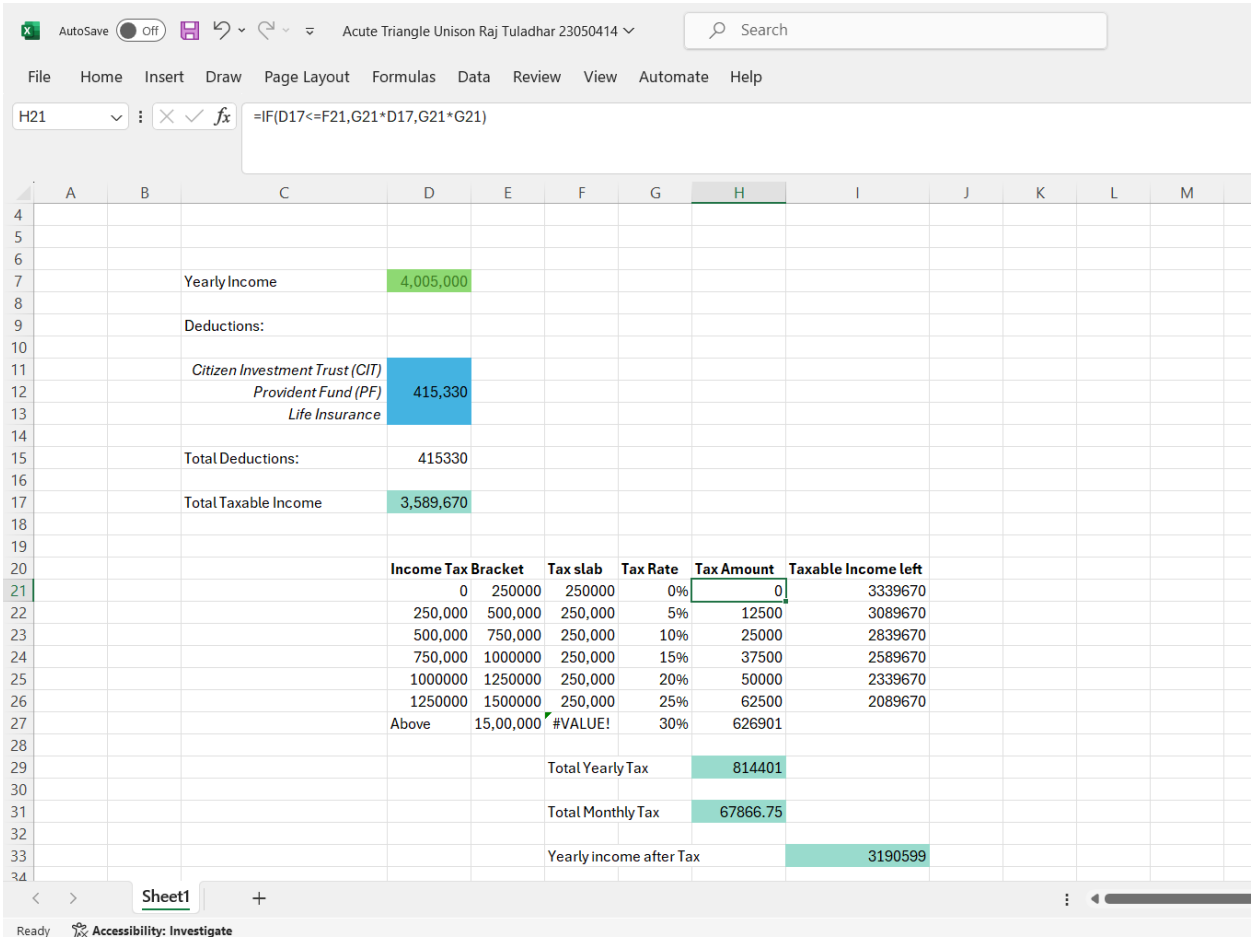


Figure 7: Screenshot for Test 1

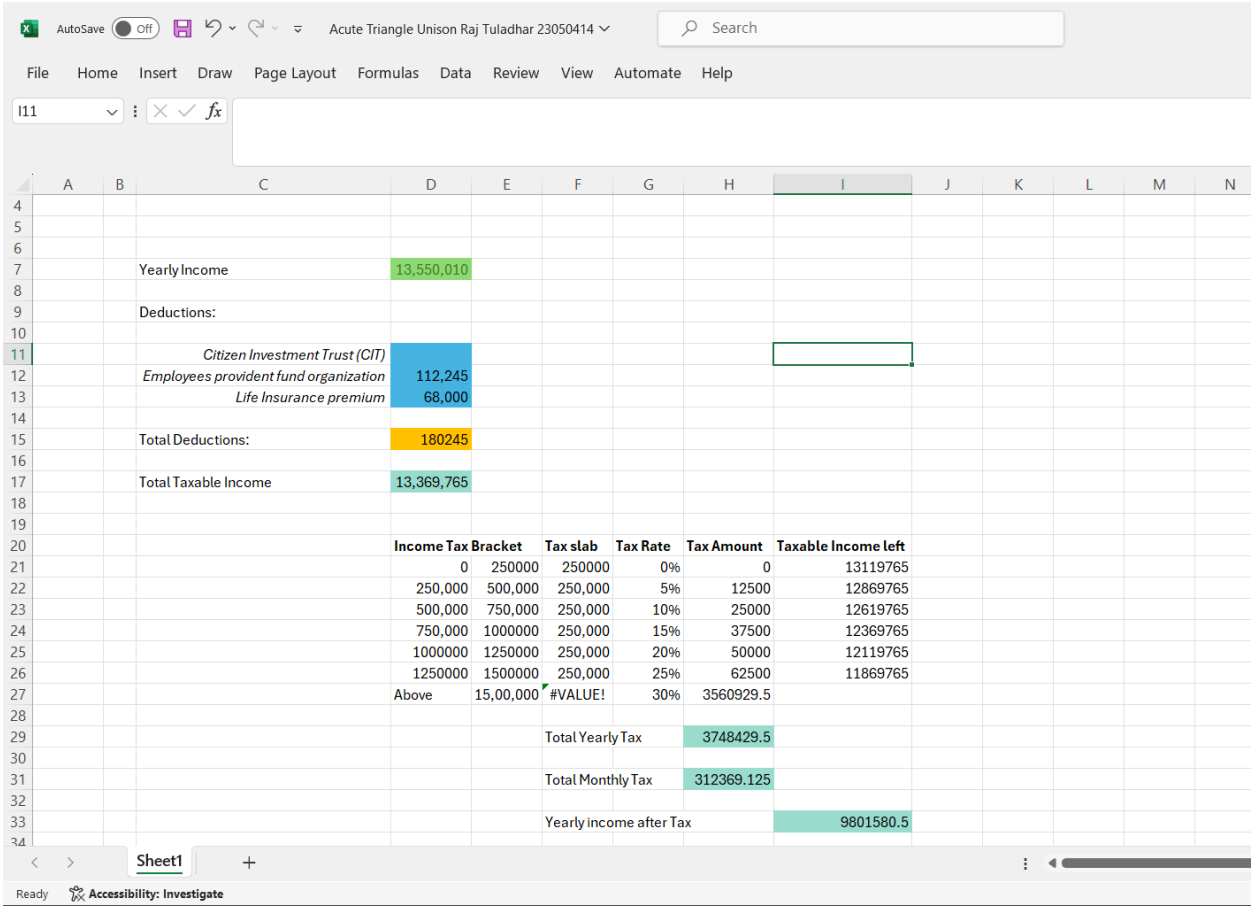


Figure 8 Screenshot for Test 2

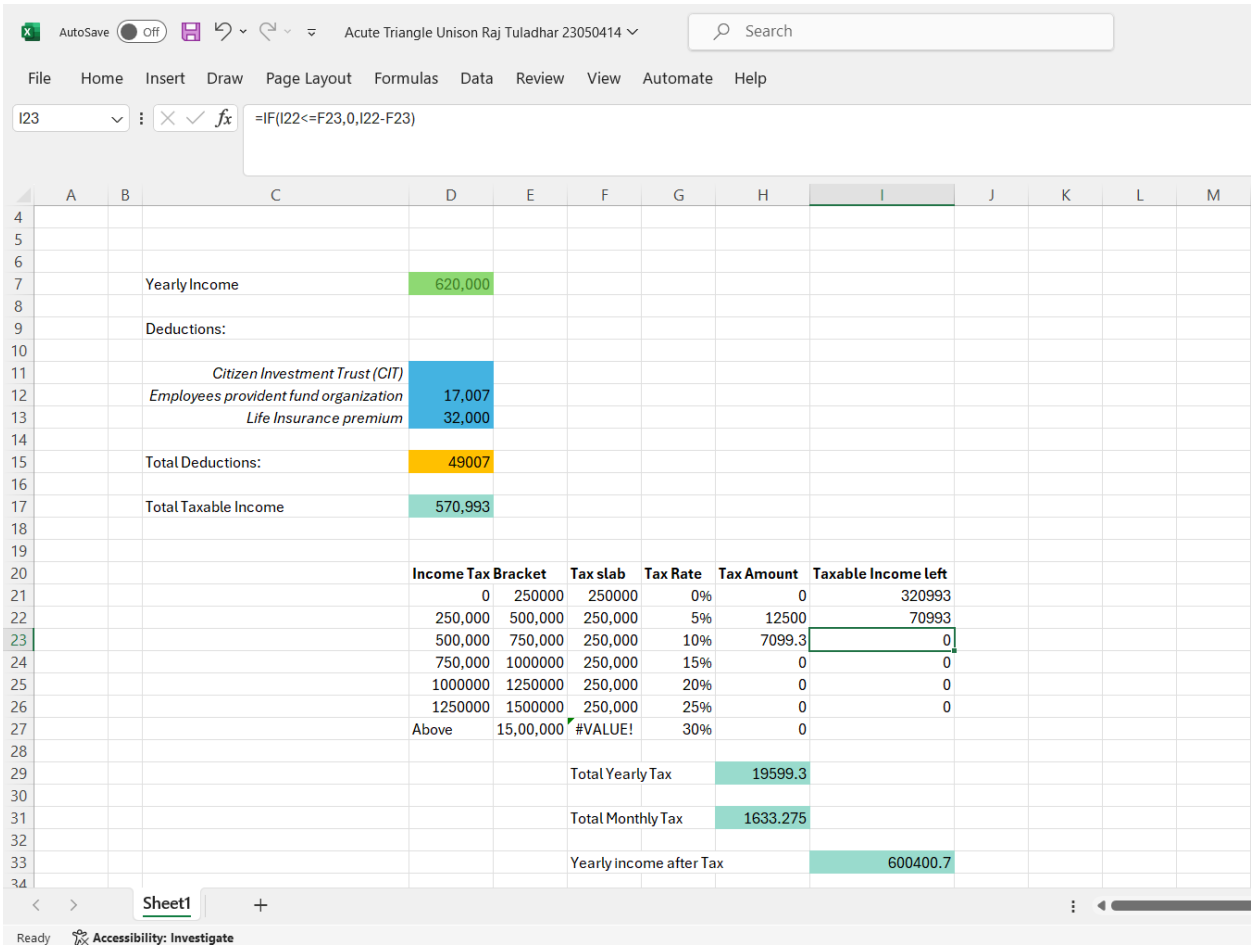
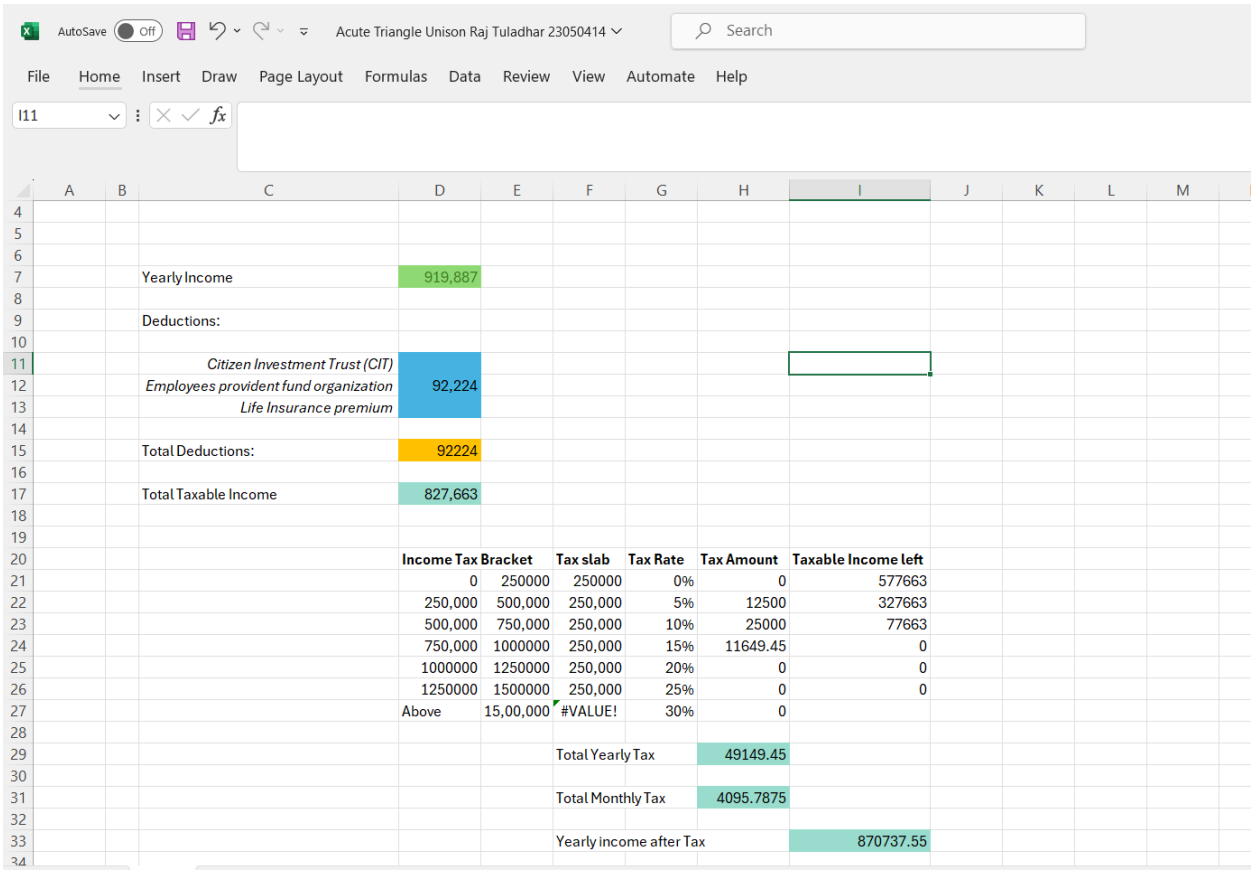


Figure 9 Screenshot for Test 3



Yearly Income	919,887	
Deductions:		
Citizen Investment Trust (CIT)		
Employees provident fund organization	92,224	
Life Insurance premium		
Total Deductions:	92224	
Total Taxable Income	827,663	

Income Tax Bracket		Tax slab	Tax Rate	Tax Amount	Taxable Income left
0	250000	250000	0%	0	577663
250,000	500,000	250,000	5%	12500	327663
500,000	750,000	250,000	10%	25000	77663
750,000	1000000	250,000	15%	11649.45	0
1000000	1250000	250,000	20%	0	0
1250000	1500000	250,000	25%	0	0
Above	15,00,000	#VALUE!	30%	0	

Total Yearly Tax	49149.45
Total Monthly Tax	4095.7875
Yearly income after Tax	870737.55

Figure 10 Screenshot for Test 4

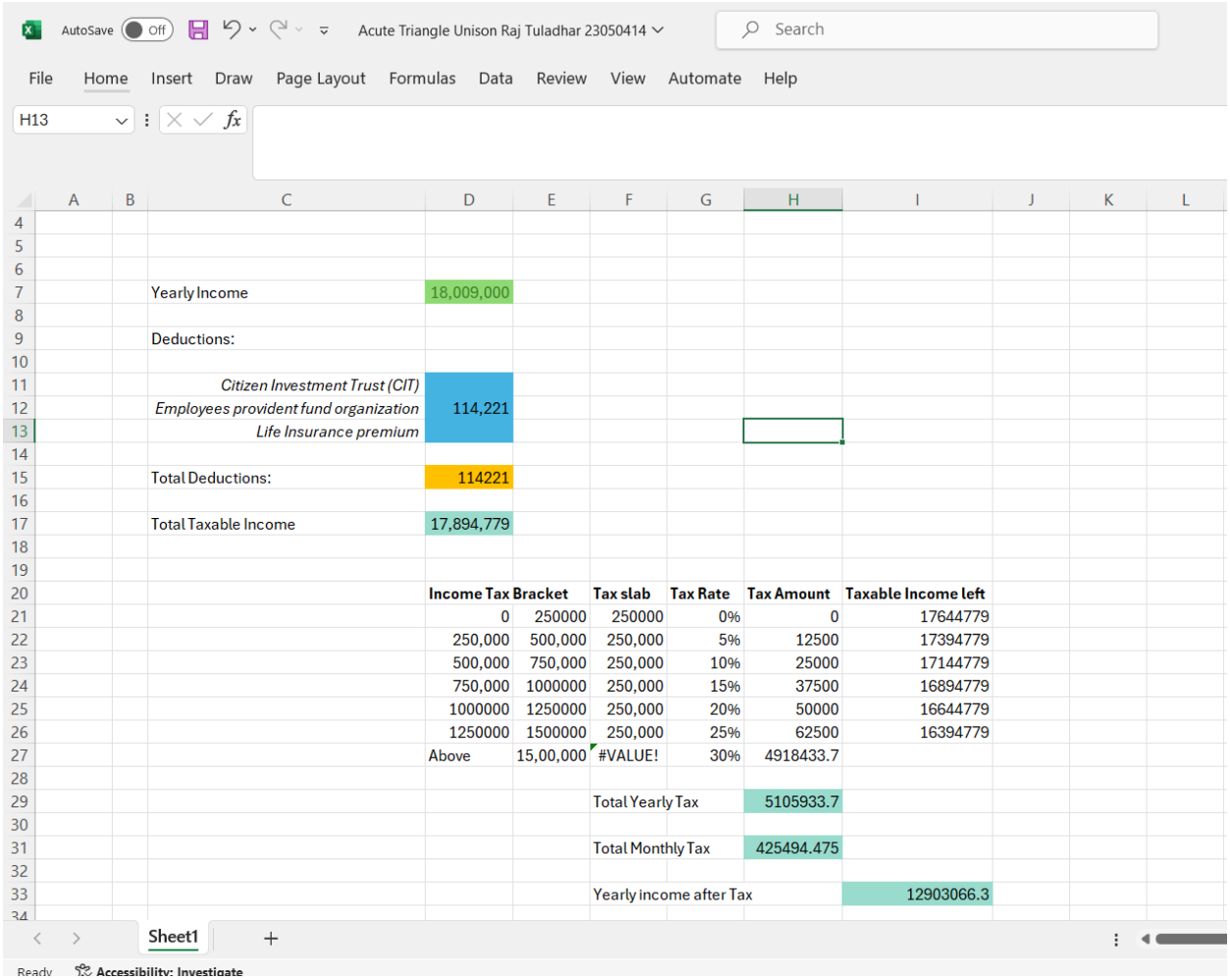


Figure 11 Screenshot for Test 5

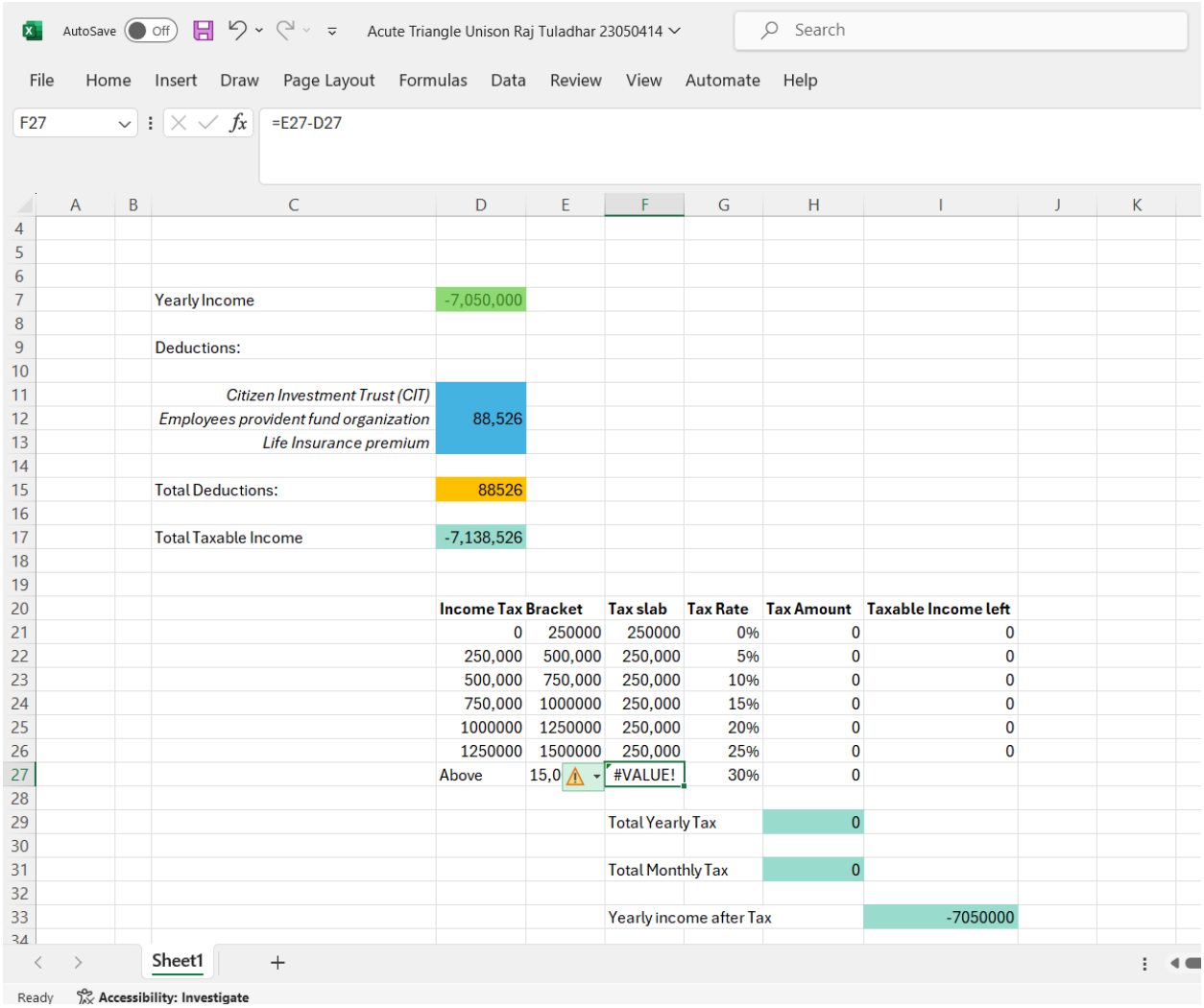


Figure 12 Screenshot for Test 6

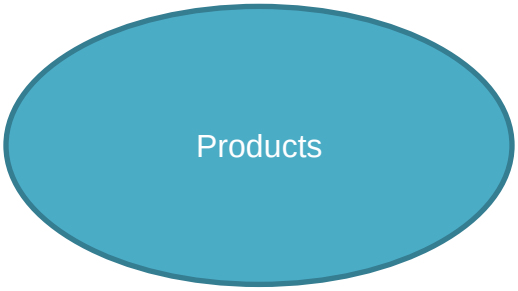
2. Problem 2 Solution

A) The Newcastle company manufactures three products: A, B and C. Their contribution to profit is $3, $5 and $2 per unit respectively. The sales department currently has firm orders for 150 units of A and 100 units of C for the week which must be fulfilled. All three products must go through a bottleneck machine, which has only 80 hours of processing time available each week. The time requirements are 10,10 and 5 minutes per unit for products A, B and C respectively.

Questions
You should answer the following questions and incorporate your answers into a word-processed report to form part of your final pdf. The sections of your report should correspond to the individual questions following.

a) Formulate the problem as a linear programming model, clearly defining the variables, the objective function, and the constraints.
b) Solve the problem using Simplex method.
c) Solve the problem using the Excel Solver and interpret the results.
d) For the final part of your report, in your capacity as an Adviser, you should present a memorandum to the Newcastle Company. Describe your main conclusions in simple, non-technical English, i.e., do not use technical terms like variable, objective function, or dual price. Don’t worry about repeating some or all the points that you have already made in answer to earlier questions. The aim is to communicate your conclusions clearly to someone who is knowledgeable about the combination of contents used in the production, but who knows nothing. about the subject of linear programming. You may use tables and charts. if you wish.

A)



	A	B	C
Products	$3	$5	$2
Time	10	10	5
Oder in unit	150	-	100

Let X, Y, Z be the number of unit of A B and C respectively.

The maximum value of the function is(R) = 3x+ 5y+ 2z

We have 80 hours of processing time which is converted into minutes.

$10x + 10y + 5z \leq 4800$

Other constraints are,

X = 150
Y = 100

Hence the final equations are
Maximize(Z) = 3x + 5y + 2z.

b) Soln

To maximize R = 3 x + 5 y + 2z

Constraints,

x = 150

z = 100

$10x + 10y + 5z \leq 4800$

y ≥ 0

Let A_1, A_2 be the artificial variables & S_1 be the slack variable.

$x + A_1 = 150$

$Z + A_2 = 100$

$10x + 10y + 5 + S_1 = 4800$

x, y , z, A_1, A_2, $S_1 \geq 0$

Standard equation for the simplex table,

$1.C - 3.x - 5.y - 2{:}z + 10A_1 + 10A_2 + 0.S_1 = 0$

$0.C + 1.x + 0.y + 0.z + 1.A_1 + 0.A_2 + 0.S_1 = 150$

$0.C + 0.x + 0.y + 1.z + 0.A_1 + 1.A_1 + 0.S_1 = 100$

$0.C + 10x + 10.y + 5.z + 0.A_1 + 0.A_2 + 1.S_1 = 4800$

Simplex Table 1:

	R	x	y	z	A_1	A_2	S_1	Constant
R_0	1	−3	−5	−2	10	10	0	0
R_1	0	1	0	0	1	0	0	150
R_2	0	0	0	1	0	1	0	100
R_3	0	10	10	5	0	0	1	4800

∴ Since the artificial values are not zero So, we cannot convert it into zero

So,

New R_0 = old $R_0 - 10x$ ($R_1 + R_2 + R_3$)

Old R_0	$-10x$ ($R_1 + R_2 + R_3$)	New R_0
1	0	1
-3	-30	-33
-5	-20	-25
-2	-20	-22
10	-10	0
10	-10	0
0	-10	-10
0	-12100	-12100

Now,

Simple Table 2,

	R	x	y	z	A_1	A_2	S_1	Constant	Ratio
R_0	1	-33	-25	-22	0	0	-10	-12100	
R_1	0	1	0	0	1	0	0	150	$R_1 = 150$
R_2	0	0	0	1	0	1	0	100	$R_2 = \infty$
R_3	0	10	10	5	0	0	1	4800	$R_3 = 480$

Key column is x.

Key row Is R_1

Key element = 1

Here,

R_1 is the key row & x is the key column.

New $R_1 = \frac{Old\ R_1}{Key\ element}$

$\therefore$ New $R_1 = \frac{Old\ R_1}{1}$

Updating R_1 R_2 & R_3 using formula

For R_0

Old R_0	$-33 \times$ New R_1	New R_0
1	0	1
-33	33	0
-25	0	-25
-22	0	-22
0	33	33
0	0	0
-10	0	-10
-12100	4950	-7150

$\therefore$ Since the value of R_2 is subtracted by 0, So New R_2 = Old R_2

For R_3

Old R3	$-2 \times$ New R_2	New R_3
0	0	0
10	-2	0
10	0	2
5	0	1
0	-2	-2
0	0	0
1	0	1
4800	-300	660

Simplex Table 3:

	R	x	y	z	A_1	A_2	S_1	Constant	Ratio
R_0	1	0	-25	-22	33	0	-10	-7150	
R_1	0	1	0	0	1	0	0	150	∞
R_2	0	0	0	1	0	1	0	100	∞
R_3	0	0	2	1	-2	0	1	660	330

Key column = y
Key row = R_3
Key element = 2

Here,

R_3 is the key row so it must be updated first,

$R_3 = \frac{Old\ R_2}{2}$

New R_3 = 0, 0, 1, $^1/_2$, $-1, 0, ^1/_2$, 330

Now,

For R_0, R_1, R_2

New R_0 = Old $R_0 - (-25) \times New\ R_3$
New R_1 = Old $R_1 - 0 \times New\ R_3$
New R_1 = Old $R_2 - 0 \times New\ R_3$

For R_0

Old R_0	$-33 \times$ New R_1	New R_0
1	0	1
0	0	0
-25	25	0
-22	$^{25}/_2$	$-^{19}/_2$
33	-25	8
0	0	0
-10	$^{25}/_2$	$\mathbf{^5/_2}$
-7150	8250	1100

Simplex Table 4

	R	x	y	z	A_1	A_2	S_1	Constant	Ratio
R_0	1	0	0	$-^{19}/_2$	8	0	$^5/_2$	1100	
R_1	0	1	0	0	1	0	0	150	∞
R_2	0	0	0	1	0	1	0	100	100
R_3	0	0	1	1	-1	0	$^1/_2$	330	660

Key column = z

Key row = R_3

Key element = 1

Here,

R_2 is the key row so it must be updated.

First,

New $R_2 = \frac{Old\ R_2}{1}$

Similarly, For R_0 ,R_1 ,R_3

New R_0 = Old $R_0 - \left(-{}^{19}/_{2}\right) \times New\ R_2$

New R_1 = Old $R_1 - 0 \times New\ R_2$

New R_3 = Old $R_3 - \frac{1}{2} \times New\ R_2$

For R_0

Old R_0	$\pm {}^{19}/_{2}$ × New R_2	New R_0
1	0	1
0	0	0
0	0	0
$-{}^{19}/_{2}$	${}^{19}/_{2}$	8
8	0	${}^{19}/_{2}$
${}^{5}/_{2}$	${}^{19}/_{2}$	${}^{5}/_{2}$
1100	950	2050

For R_2

Old R_3	$-\frac{1}{2}$ × New R_2	New R_3
0	0	0
0	0	0
1	$-\frac{1}{2}$	1
$\frac{1}{2}$	0	0
-1	0	-1
0	$-\frac{1}{2}$	$\frac{-1}{2}$
$\frac{1}{2}$	0	$\frac{1}{2}$
330	-50	280

Simplex Table 5

	R	x	y	z	A_1	A_2	S_1	Constant
R_0	1	0	0	0	8	$\frac{19}{2}$	$\frac{5}{2}$	2050
R_1	0	1	0	0	1	0	0	150
R_2	0	0	0	1	0	1	0	100
R_3	0	0	1	0	-1	$-\frac{1}{2}$	$\frac{1}{2}$	330

Here all the constants of variables in R_0 is positive So this is the optimal condition. X = 150, Y = 280, Z = 100 $\therefore R = 2050$

B) Maximize and Minimize

z = $4x + 7y$

Subjected to the constraints

$2x + 3y \leq 60$

$x + y \geq 12$

$x \leq y$

$x \geq 0, y \geq 0$

Sol^n

Changing $\leq, \geq, into =$

$2x + 3y = 60 \ldots\ldots\ldots\ldots\ldots\ldots (i)$

$x + y = 12 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (ii)$

$x - y = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (iii)$

From eq^n (i) $2x + 3y \leq 60$

x	0	15	-30
y	20	10	40

From eq^n (ii) $x + y = 12$

x	6	-6	-30
y	6	18	42

From eq^n (iii) $x - y = 0$

x	0	15	15
y	0	10	15

Take (0,0) as a testing point,

$2x + 3y = 60$

$2 \times 0 + 3 \times 0 \leq 60$

$0 \leq 60\ [True]$

$\therefore It\ contains\ origin.$

$x + y \geq 12$

$0 + 0 \geq 12$

$0 \geq 12\ [False]$

$\therefore It\ doesn't\ contains\ origin.$

$x - y \leq 0$

$0 - 0 \leq 0$

$0 \leq 0\ [True]$

$\therefore It\ does\ contains\ origin.$

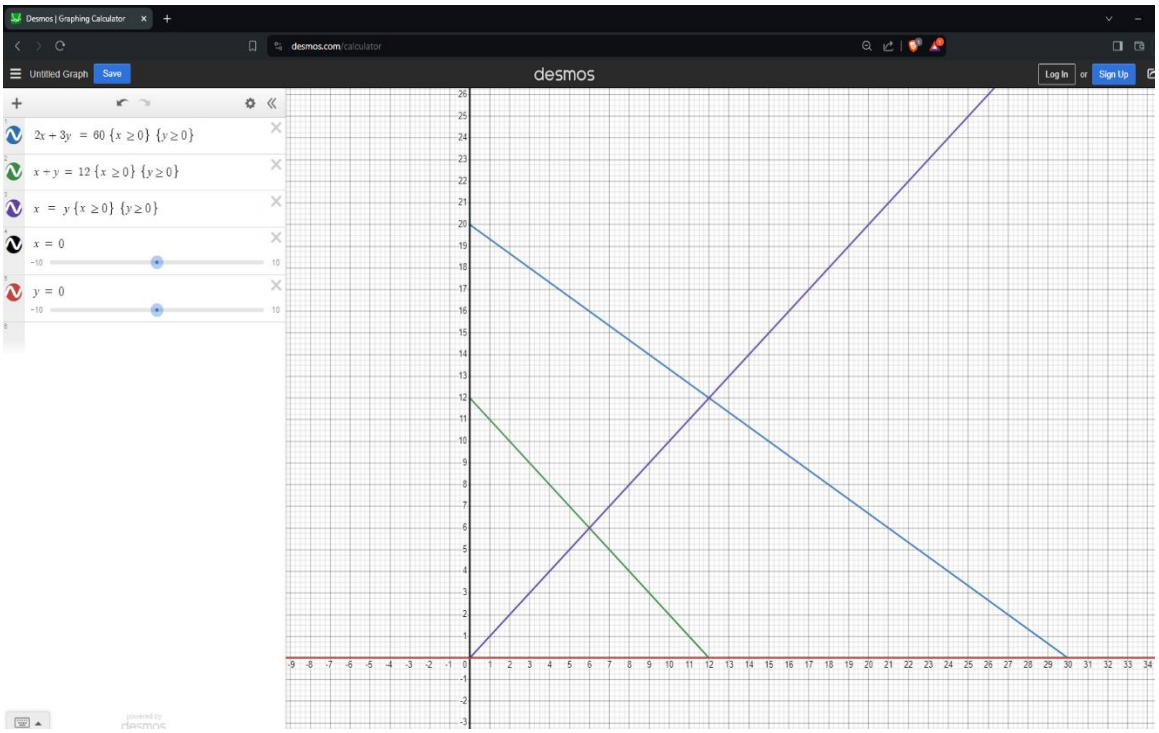


Figure 13: Screen shot for graph of question no 2.

The Feasible region is shaded and can be labelled as (0,20), (0,12), (6,6), (12,12).

Now,

Points	x	y	$Z = 4x + 7y$
(0,20)	0	20	140
(0,12)	0	12	84
(6,6)	6	6	66
(12,12)	12	12	132

Therefore, the maximum value is 140 when $x = 0$ and $y = 20$.

Therefore, the minimum value is 66 when $x = 6$ and $y = 6$.

c) Excel solver and the interpret results

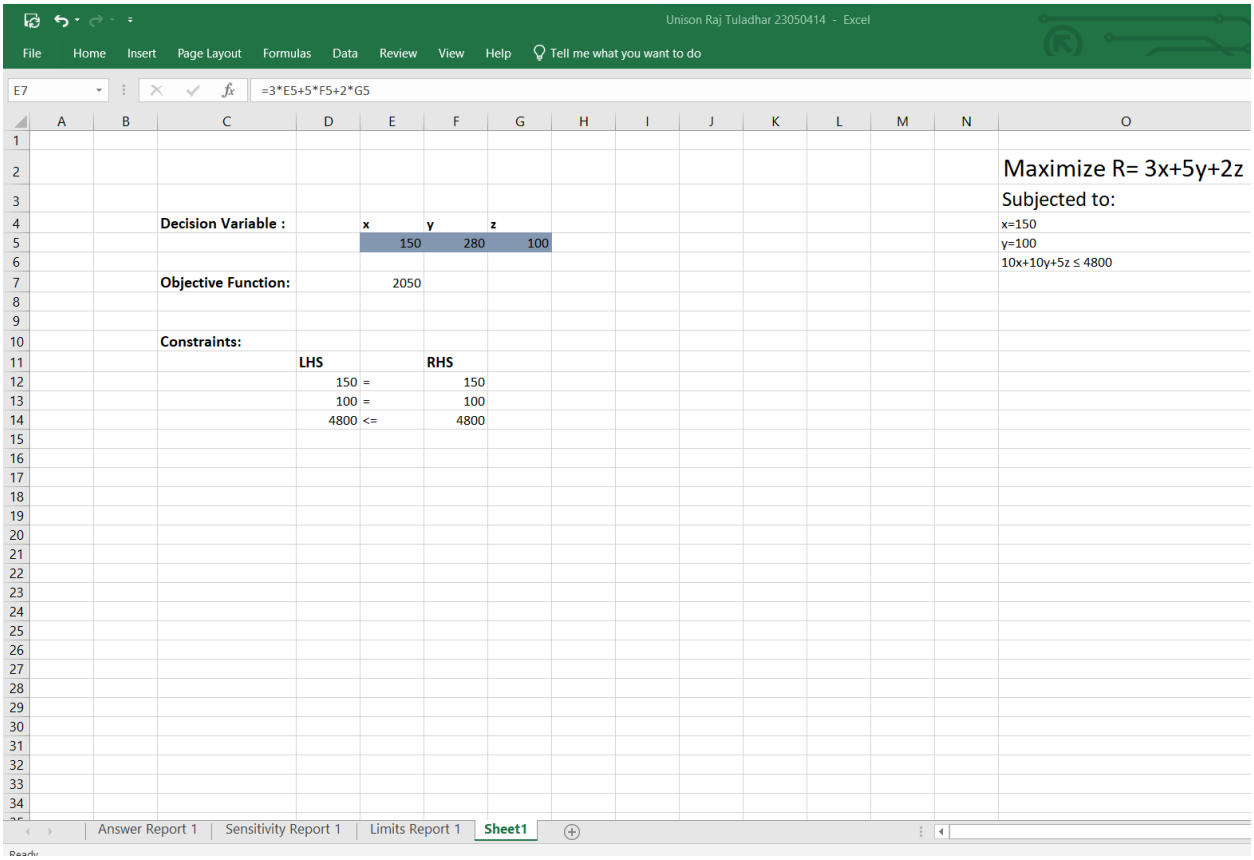
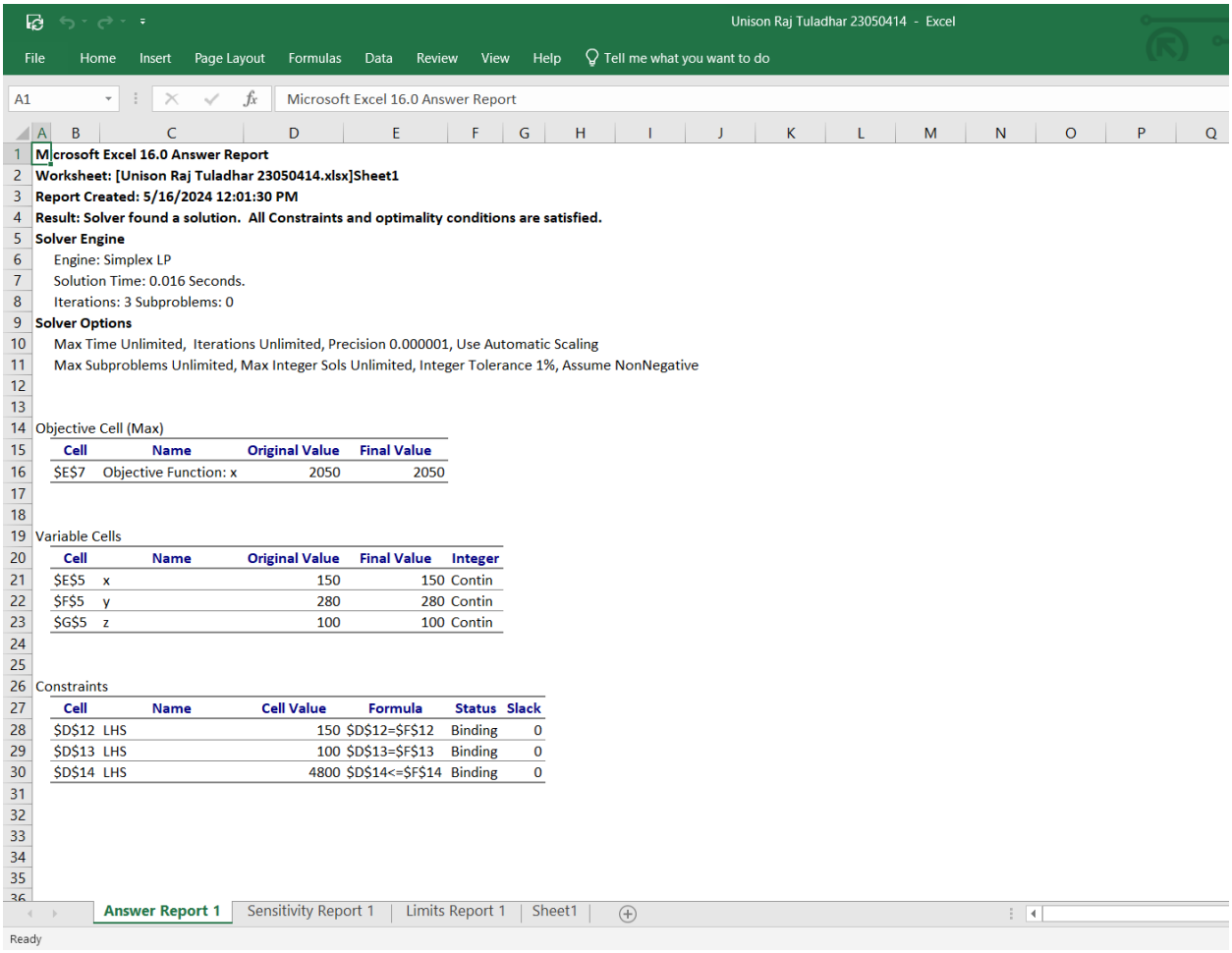


Figure 14: Solution of 2c using excel solver.



Unison Raj Tuladhar 23050414 - Excel

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

A1 Microsoft Excel 16.0 Answer Report

Microsoft Excel 16.0 Answer Report
Worksheet: [Unison Raj Tuladhar 23050414.xlsx]Sheet1
Report Created: 5/16/2024 12:01:30 PM
Result: Solver found a solution. All Constraints and optimality conditions are satisfied.
Solver Engine
Engine: Simplex LP
Solution Time: 0.016 Seconds.
Iterations: 3 Subproblems: 0
Solver Options
Max Time Unlimited, Iterations Unlimited, Precision 0.000001, Use Automatic Scaling
Max Subproblems Unlimited, Max Integer Sols Unlimited, Integer Tolerance 1%, Assume NonNegative

Objective Cell (Max)

Cell	Name	Original Value	Final Value
$E$7	Objective Function: x	2050	2050

Variable Cells

Cell	Name	Original Value	Final Value	Integer
$E$5	x	150	150	Contin
$F$5	y	280	280	Contin
$G$5	z	100	100	Contin

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
$D$12	LHS	150	$D$12=$F$12	Binding	0
$D$13	LHS	100	$D$13=$F$13	Binding	0
$D$14	LHS	4800	$D$14<=$F$14	Binding	0

Answer Report 1 | Sensitivity Report 1 | Limits Report 1 | Sheet1

Ready

Figure 15: Solution of 2c using excel solver.

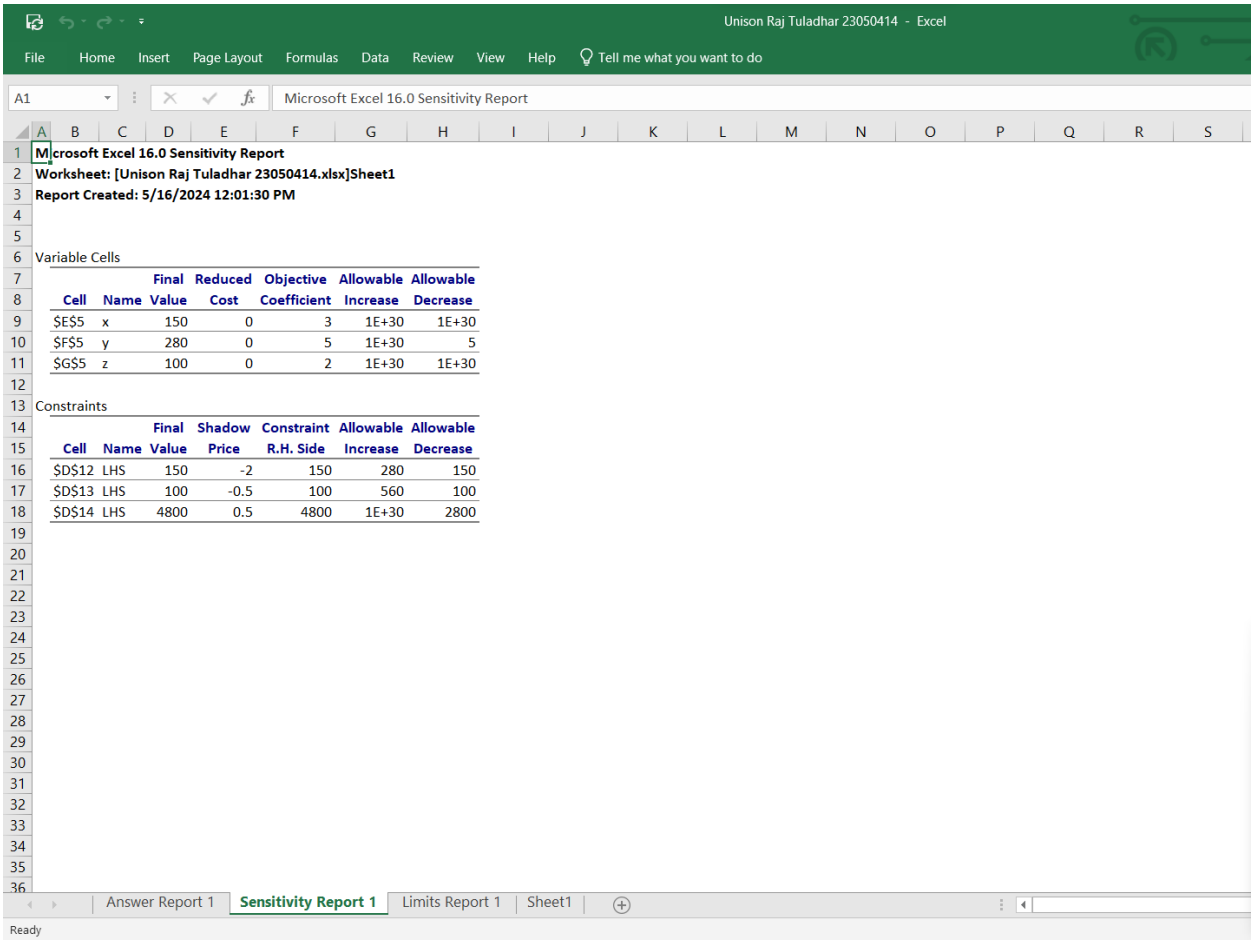


Figure 16: Solution of 2c using excel solver.

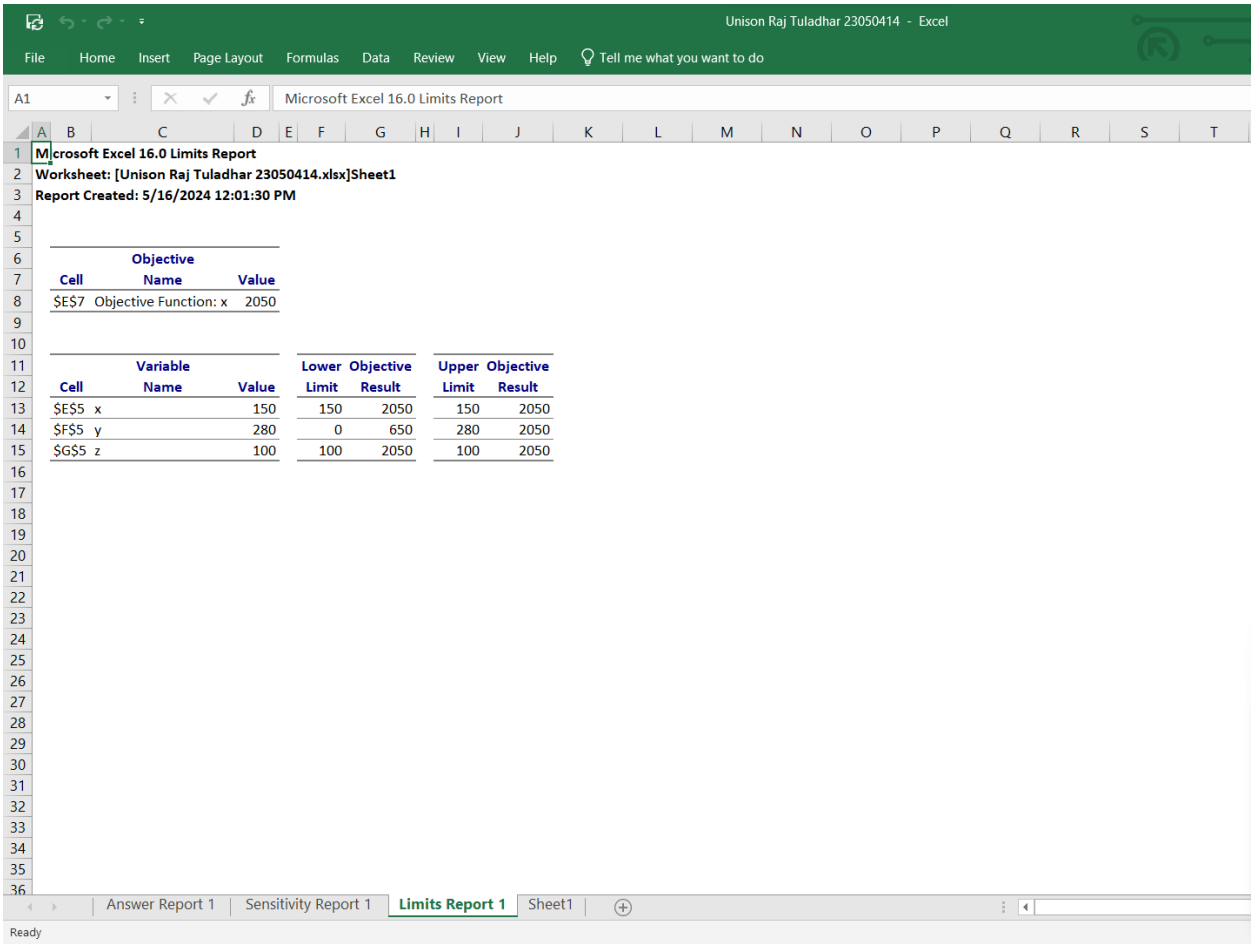


Figure 17: Solution of 2c using excel solver.

d) Memorandum

To: Newcastle Business

From: Math’s Group,

Date: 15th May, 2024

Subject: Inferences and Suggestions

To Whom It May Concern,

After carefully examining everything, I discovered the following:

Streamline Operations: We can modify our resource allocation to ensure that we're getting the most out of what we have. This implies that we can produce more goods without increasing our costs.

Save Money: There are ways to reduce expenses without losing out on quality. By using more tactics, we can reduce costs without losing our income.

Stay Ahead of the Curve: It's critical to manufacture goods that consumers genuinely desire to purchase. We can prevent resource waste by keeping an eye on what is and is not selling.

Make Plans for the Future: We must plan ahead and consider what will make us successful in the long run. This could entail taking risks or getting ready for market shifts.

Product	Unit to profit	Time	Profit per unit	Total Profit
X	150	1500	3	450
Y	280	2800	5	1400
Z	100	500	2	200
				Total profit =2050

All things considered, we can strengthen and increase the success of the Newcastle Company by implementing some adjustments based on these concepts.

Let's talk more about how to put these concepts into practice.

Regards, Math’s Group

3. Problem 3 Solution

In a survey of a research department, a company that produces certain type of spare parts has the price-demand function found to be () = 3000 − 55, where () is the price per spare part in dollars at which number of spare parts can be sold. The company's fixed cost is $3000, and the production cost per spare part is $400.
You should answer the following questions and incorporate your answers into a word-processed report. The sections of your report should correspond to the individual questions below.
(a) Find the cost function and the revenue function.
(b) Find the break-even point.
(c) Plot the break-even points in graph paper. Label the points accurately.
(d) Find the output level that maximizes the profit and find the maximum profit.
Round the answers in the nearest integer values.

Sol^{n}

p(x) = price per spare part

x = number of spare parts can be sold

Price demand function p (x) = 3000 – 55 x

Fixed Cost = $3000

Production per spare part = $400

Now,

a) Cost function c (x) = 3000 + 400 x

Revenue function = p (x)* x

= 3000 – 55 x^2

b) Breakeven Point,

Revenue = Cost

3000x – 55 x^2 = 3000 + 400 x

3000x – 55 x^2 – 3000 – 400 x = 0

55 x^2 – 2600 x + 3000 = 0 ……..... (i)

Now,

Comparing eq^{n} (i) with the formula a x^2 – b x + c = 0

Where,

a = 55, b = – 2600, c = 3000

Putting value of a, b, c in the formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-2600) \pm \sqrt{(-2600)^2 - 4 \times 55 \times 3000}}{2 \times 55}$$

$$= \frac{2600 \pm \sqrt{6100000}}{110}$$

Taking +,

= 2600 + 6100000

= 46.08

Taking –,

= 2600 – 1610000

= 1.18

Again,

For the corresponding valves,

Y_1 = 3000 + (400 × 46.08)

= 21432

&

Y_2 = 3000 + (400 × 1.18)

= 3472

c) Graph

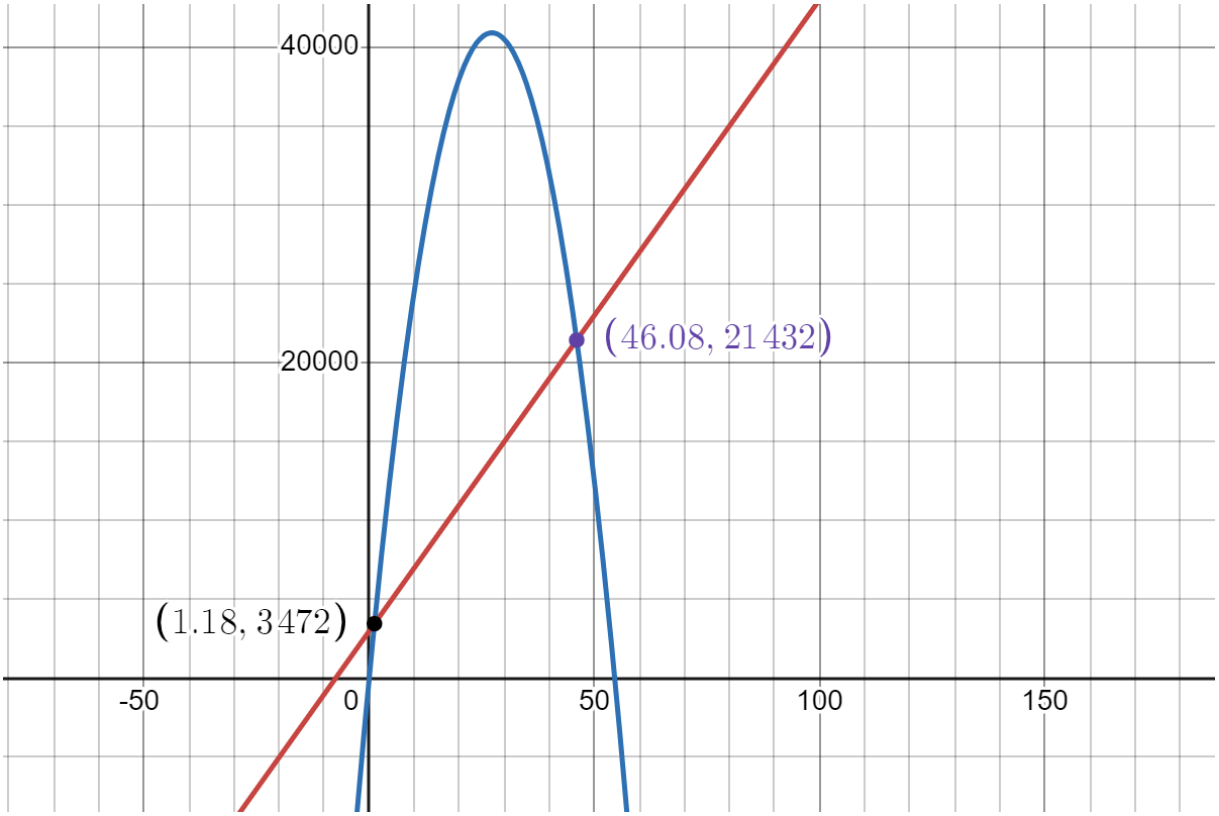


Figure 18: Screenshot for the graph of question 3.

d) Profit = R(x) + C(x)

= 3000 x – 55 x^2 + 3000 + 400 x

= – 55 x^2 + 2600 x – 3000

Level of production $(x) = \frac{-b}{2a}$

$= \frac{-2600}{2 \times -55}$

$= 23.63 \approx 24$

Maximum profit (y) = $c.\frac{b^2}{4a}$

$= -3000 \frac{(2600)^2}{4 \times -55}$

$= 27727$

4. Conclusion

To sum out, this project provides an in-depth study of important mathematical ideas, strategies for solving problems, and real-world applications. We have explored topics including demand analysis, linear programming, and tax computation by working through three different problem sets. Our studies have improved our mathematical abilities while also explaining real-world situations, such as taxation plans, production efficiency, and market structure.

Our coursework has given us invaluable abilities for our future academic and professional activities, and we are appreciative of the chance to put our knowledge to use in real-world situations. It was also difficult to understand data, conduct equations correctly, and have technical software tool skill. We overcame these challenges by working together, being constant, and being open, and as a result, we were able to solve problems more effectively and learn mathematical ideas on deeper levels.

5. References

References

Janssen, C. W. a. C., 1999. *Investopedia.* [Online]
Available at: https://www.investopedia.com/terms/t/taxrate.asp
[Accessed 14 may 2024].
Jr, A. P. S., 1937. *Tax Foundation.* [Online]
Available at: https://taxfoundation.org/taxedu/glossary/tax-brackets/#:~:text=A%20tax%20bracket%20is%20the,rates%20rise%20as%20income%20increases.
[Accessed 14 may 2024].

6. Appendix: Logbook Entry Sheet

6.1 Entry sheet 1.

Table 1: Entry sheet 1

Logbook Entry Sheet

Meeting No: 1 **Date: 6th May 2024**

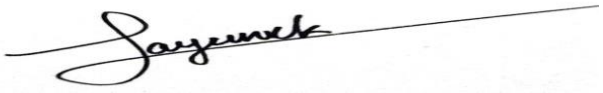
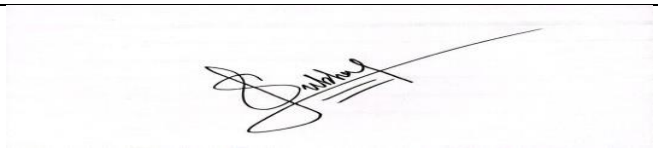
Start Time: 11:00 pm Finish Time: 12:00 pm

Items Discussed: Questions divided into sections for each group member.

Achievements: Questions is discussed and learnt new things.

Problems (if any): N/A

Tasks for Next Meeting: Show the task's progress.

Student's Name	Student's Signature
Unison Raj Tuladhar	
Sayun Rajkarnikar	
Subham Khoju Shrestha	

6.2 Entry sheet 2.

Table 2 : Entry sheet 2

Logbook Entry Sheet

Meeting No: 2 **Date: 9th May 2024**

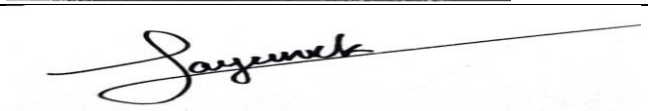
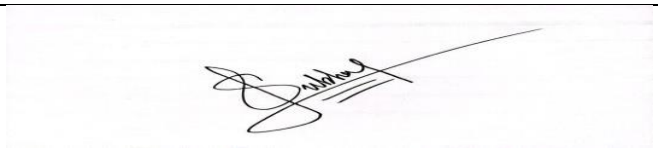
Start Time: 1:00 pm Finish Time: 2:00 pm

Items Discussed: The amount of progress was shown and some problems regarding the question were discussed.

Achievements: Found the problem's basic reasoning and logic for the issue.

Problems (if any): N/A

Tasks for Next Meeting: check for further any problems

Student's Name	Student's Signature
Unison Raj Tuladhar	
Sayun Rajkarnikar	
Subham Khoju Shrestha	

6.3 Entry sheet 3.

Table 3: Entry sheet 3

Logbook Entry Sheet

Meeting No: 3 **Date: 12th May 2024**

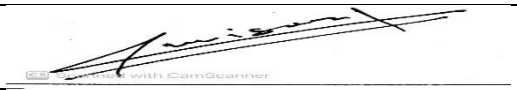
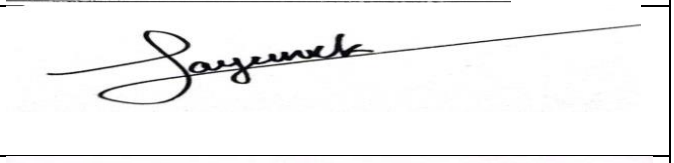
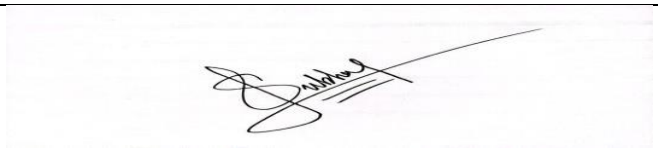
Start Time: 2:00 pm Finish Time: 4:00 pm

Items Discussed: With the teacher's assistance, every issue was resolved, and now it was time to write the report.

Achievements: The issue was resolved, and report work was given out.

Problems (if any): N/A

Tasks for Next Meeting: Present the finished report and request feedback.

Student's Name	Student's Signature
Unison Raj Tuladhar	
Sayun Rajkarnikar	
Subham Khoju Shrestha	

6.4Entry sheet 4.

Table 4: Entry sheet 4

Logbook Entry Sheet

Meeting No: 4 **Date: 14th May 2024**

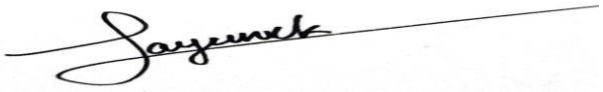
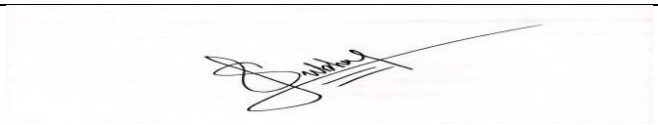
Start Time: 12:00 pm Finish Time: 2:00 pm

Items Discussed: All the things were discussed with the group members and now time for submission.

Achievements: All the work was done and ready to submit.

Problems (if any): N/A

Tasks for Next Meeting: The final report was submitted by the group leader.

Student's Name	Student's Signature
Unison Raj Tuladhar	
Sayun Rajkarnikar	
Subham Khoju Shrestha	

7. Photo and Evidences

7.1 Photo of question number 2 a.

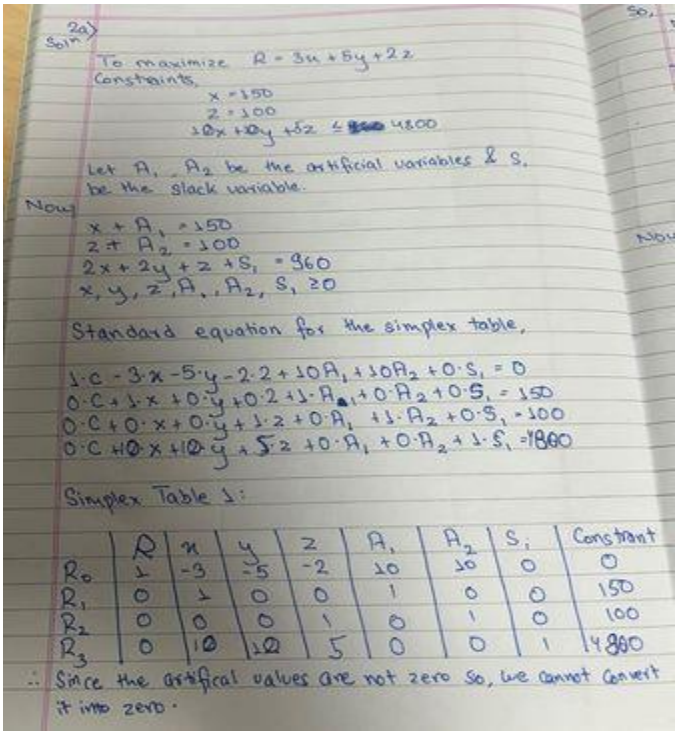


Figure 19: Solution of 2a part 1

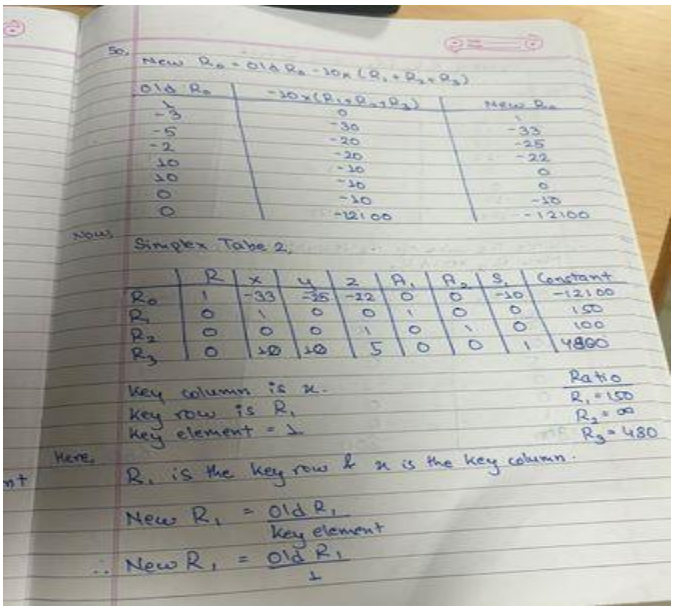


Figure 20: Solution of 2a part 2

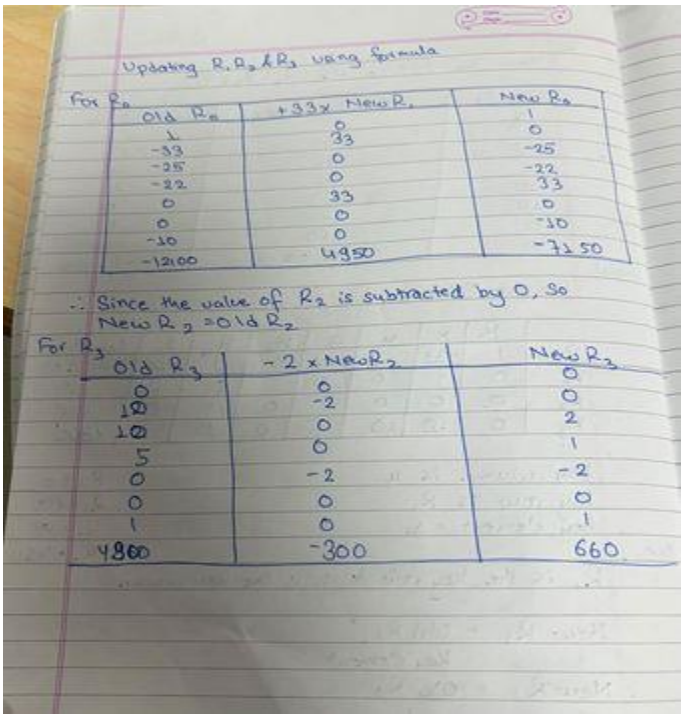


Figure 21: Solution of 2a part 3

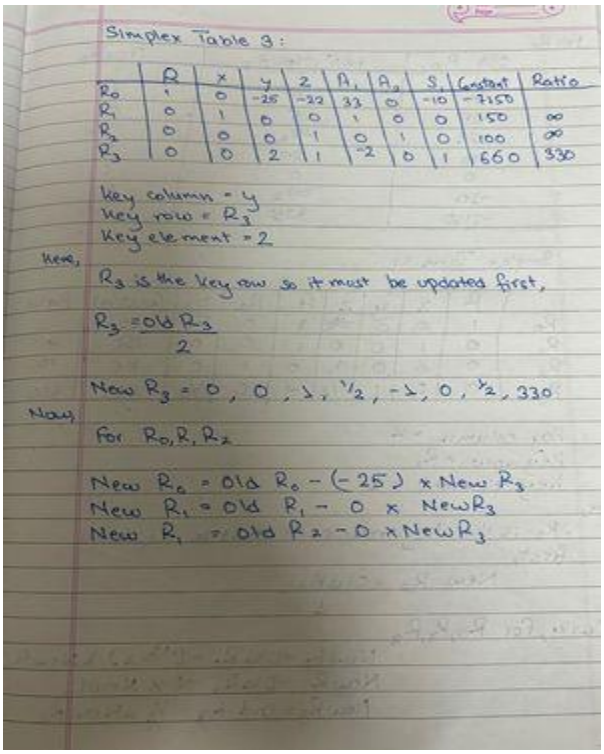
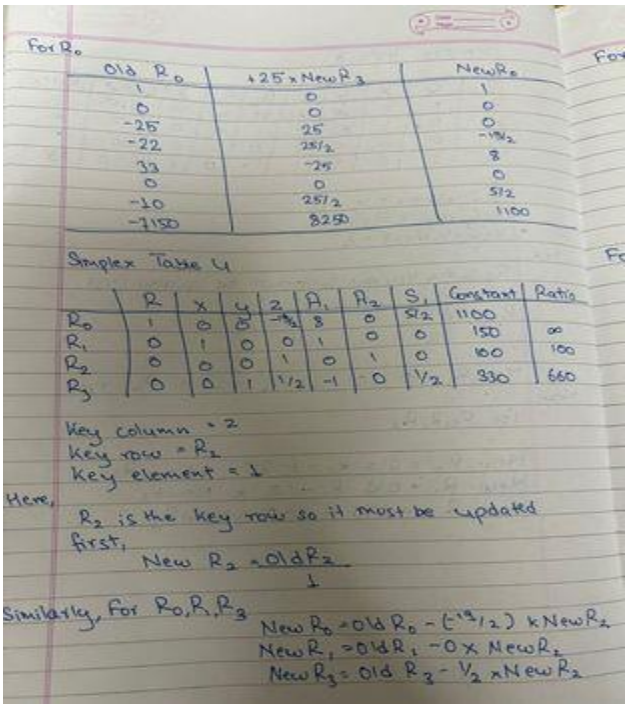


Figure 22: Solution of 2a part 4


For R_0

Old R_0	$+25 \times$ New R_2	New R_0
1	0	1
0	0	0
-25	25	0
-22	25/2	-19/2
33	-25	8
0	0	0
-10	25/2	5/2
-7150	8250	1100

Simplex Table 4

	R	x	y	z	A_1	A_2	S_1	Constant	Ratio
R_0	1	0	0	-19/2	8	0	5/2	1100	
R_1	0	1	0	0	1	0	0	150	∞
R_2	0	0	0	1	0	1	0	100	100
R_3	0	0	1	1/2	-1	0	1/2	330	660

Key column = z
Key row = R_2
Key element = 1

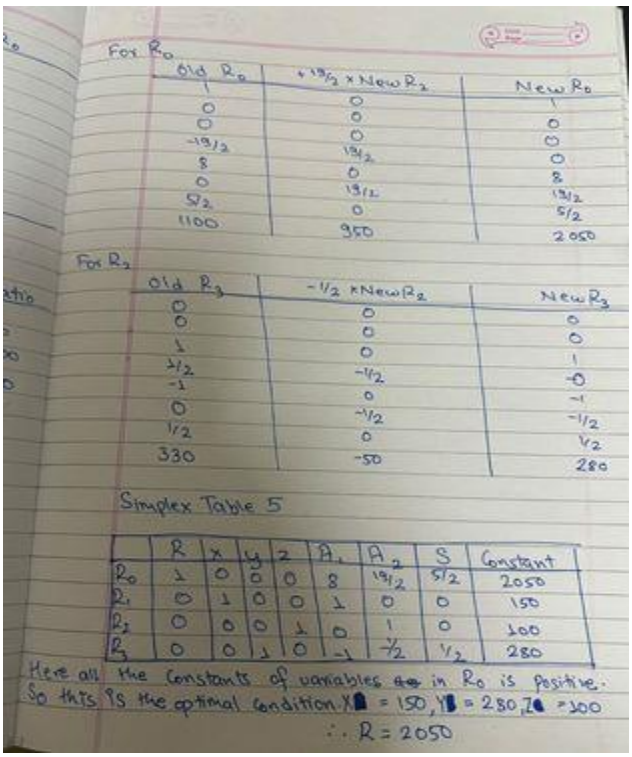
Here,
R_2 is the key row so it must be updated first,

$$\text{New } R_2 = \frac{\text{Old } R_2}{1}$$

Similarly, for R_0, R_1, R_3

New R_0 = Old R_0 - (-19/2) × New R_2
New R_1 = Old R_1 - 0 × New R_2
New R_3 = Old R_3 - 1/2 × New R_2

Figure 23: Solution of 2a part 5


For R_0

Old R_0	$+19/2 \times$ New R_2	New R_0
1	0	1
0	0	0
0	0	0
-19/2	19/2	0
8	0	0
0	19/2	8
5/2	0	19/2
1100	950	5/2
		2050

For R_2

Old R_3	$-1/2 \times$ New R_2	New R_3
0	0	0
0	0	0
1	0	1
1/2	-1/2	-0
-1	0	-1
0	-1/2	-1/2
1/2	0	1/2
330	-50	280

Simplex Table 5

	R	x	y	z	A_1	A_2	S	Constant
R_0	1	0	0	0	8	19/2	5/2	2050
R_1	0	1	0	0	1	0	0	150
R_2	0	0	0	1	0	1	0	100
R_3	0	0	1	0	-1	-1/2	1/2	280

Here all the constants of variables ~~are~~ in R_0 is positive.
So this is the optimal condition. X = 150, Y = 280, Z = 100
∴ R = 2050

Figure 24: Solution of 2a part 6

7.2 Photo of question number 2 b.

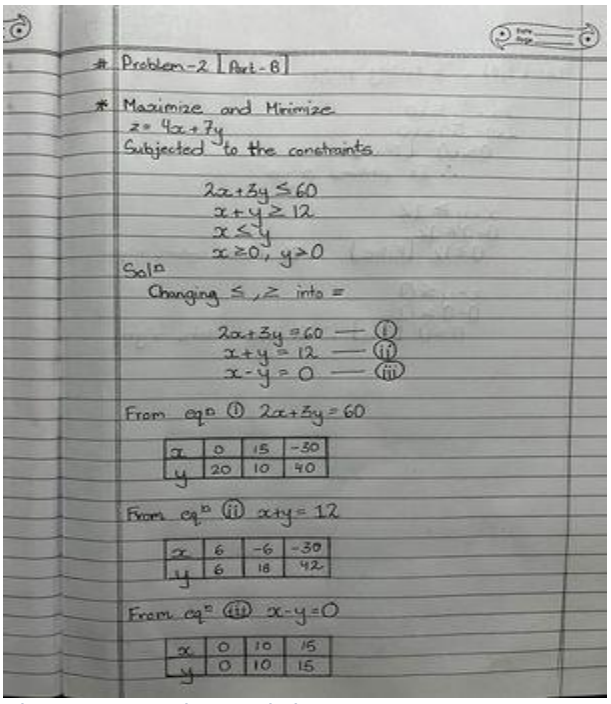


Figure 25: Question 2 solution1

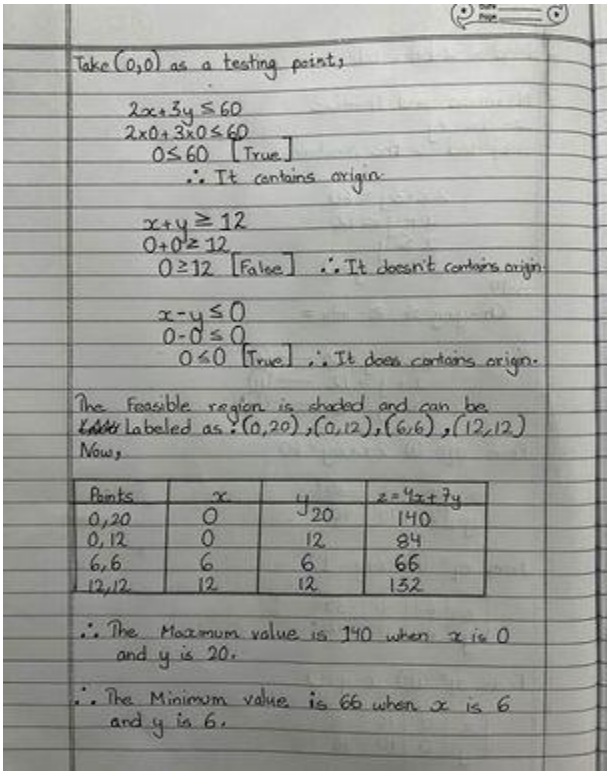


Figure 26: Question 2 solution2

7.2 Photo of question number 3.

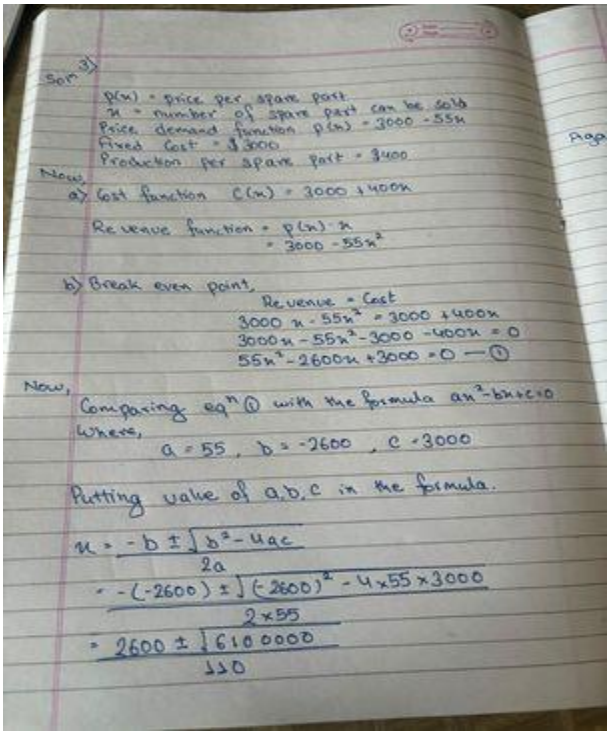


Figure 27: Question 3 solution1

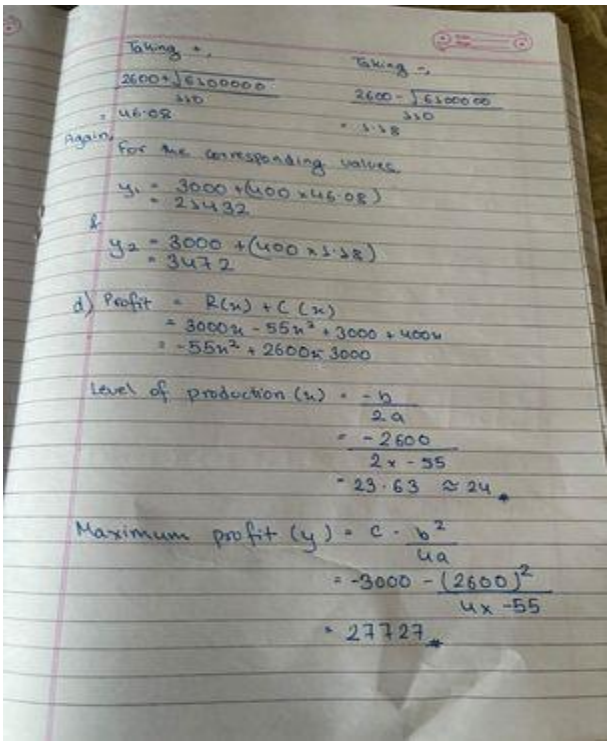


Figure 28: Question 3 solution2