Experiment 1

Aim: Charting:Create an XY scatter graph, XY chart with two Y-Axes, add error bars to your plot, create a combination chart

Procedure

steps to draw scatter chart in Excel:

- Select the columns that have the data (excluding column A)
- Click the Insert option
- In the Chart group, click on the Insert Scatter Chart icon
- Click on the ‘Scatter chart’ option in the charts thats show up
- The above steps would insert a scatter plot in the worksheet.

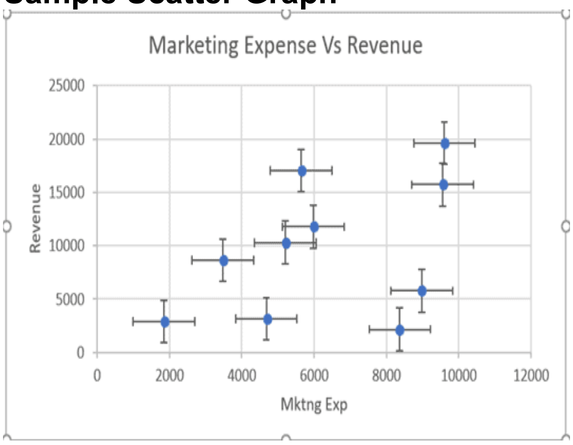
steps to add a trendline and error bar to a scatter chart in Excel:

- Select the Scatter plot (where you want to add the trendline)
- Click the Chart Design tab. This is a contextual tab which only appears when you select the chart
- In the Chart Layouts group, click on the ‘Add Chart Element’ option
- Go to the ‘Trendline’ option and then clickco on ‘Linear’
- To add the error bars, select the chart, click on the plus icon, and then check the Error Bars option.

Sample Data

	A	B	C
1		**Mktng Exp**	**Revenue**
2	Company 1	1849	2911
3	Company 2	2708	5777
4	Company 3	3474	8625
5	Company 4	4681	9171
6	Company 5	5205	10308
7	Company 6	5982	11779
8	Company 7	8371	12138
9	Company 8	8457	17074
10	Company 9	9554	15729
11	Company 10	9604	19610

Sample Scatter Graph



Experiment 2

Aim: Functions: Computing Sum, Average, Count, Max and Min, Computing Weighted Average, Trigonometric Functions, Exponential Functions, Using The CONVERT Function to Convert Units

Procedure

Steps to Add a group of numbers in MS Excel

- Select the cell where you want to display the result.
- Then type **"=" sign** in the highlighted area
- Now type **"SUM"** and then type opening parenthesis **"("**
- Now **select the data cells to add them**
- Hit the **ENTER** button to get the result.

Steps to calculate the average of numbers?

- Select the cell where you want to display the average result
- Now type **"=" sign** in the cell and type **"average"** then type **opening parenthesis "("** in the cell.
- Now **select the data,**
- Next hit the ENTER button.

Similarly to calculate count, max, min, sin, cos, tan, ln, log, e^x of a value can be calculated using following functions.

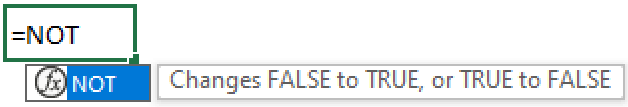
count	=COUNT(…)
Max	=MAX(…)
Min	=MIN(…)
sin	=SIN(….)
tan	=TAN(….)
cos	=COS(….)
ln	=LN(….)
e^x	=EXP(….)
Log	=LOG(…,(BASE))
Convert	=CONVERT(…., from_unit, to_unit)

Experiment 3

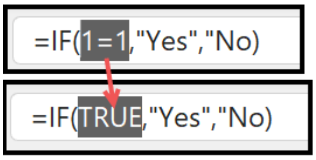
Aim: Conditional Functions: Logical Expressions, Boolean Functions, IF Function, Creating a Quadratic Equation Solver, Table VLOOKUP Function, AND, OR and XOR functions.

Procedure

Application of NOT Boolean Operator



The NOT function reverses the result. Converts **TRUE** into **FALSE** and vice-versa.



Those logical operations are performed when we apply any boolean operation.

LOGICAL OPERATOR	MEANING	EXAMPLE	EXPLANATION
=	**Equal**	**=B4=C4**	**This formula will compare B4 and C4 if both are equal return TRUE otherwise FALSE.**
>	**Greater than**	**=B4>C4**	**If B4 is greater than C4 the return will be TRUE otherwise FALSE.**
<	**Less than**	**=B4<C4**	**If B4 is less than C4 the return will be TRUE otherwise FALSE.**
<>	**Not Equal**	**=B4<>C4**	**This will compare B4 and C4 and if both are not equal the return TRUE, otherwise FALSE.**
>=	**Greater than or equal**	**=B4>=C4**	**If B4 is greater than or equal to C4 return will be TRUE, otherwise FALSE.**
<=	**Less than or equal**	**=B4<=C4**	**If B4 is smaller than or equal to C4 return will be TRUE, otherwise FALSE.**

The following table provides a short summary of what each logical function does to help you choose the right formula for a specific task.

Function	Description	Formula Example	Formula Description
AND	Returns TRUE if all of the arguments evaluate to TRUE.	**=AND(A2>=10, B2<5)**	The formula returns TRUE if a value in cell A2 is greater than or equal to 10, and a value in B2 is less than 5, FALSE otherwise.
OR	Returns TRUE if any argument evaluates to TRUE.	**=OR(A2>=10, B2<5)**	The formula returns TRUE if A2 is greater than or equal to 10 or B2 is less than 5, or both conditions are met. If neither of the conditions it met, the formula returns FALSE.
XOR	Returns a logical Exclusive Or of all arguments.	**=XOR(A2>=10, B2<5)**	The formula returns TRUE if either A2 is greater than or equal to 10 or B2 is less than 5. If neither of the conditions is met or both conditions are met, the formula returns FALSE.
NOT	Returns the reversed logical value of its argument. I.e. If the argument is FALSE, then TRUE is returned and vice versa.	**=NOT(A2>=10)**	The formula returns FALSE if a value in cell A1 is greater than or equal to 10; TRUE otherwise.

Experiment 4

Aim: Regression Analysis: Trendline, Slope and Intercept, Interpolation and Forecast, The LINEST Function, Multilinear Regression, Polynomial Fit Functions, Residuals Plot, Slope and Tangent, Analysis ToolPack.

Procedure

To discover the value of Y from a given value of X

1. Select the table and insert a scatter chart.
2. Right-click on the trendline and then select Format Trendline.
3. Check the boxes beside Display R-squared value on chart and Display Equation on chart.
4. Also, choose the Linear trendline.
5. Once the scatter graph reveals the equation, fit the value of X into it to find the value of Y.
6. The following formula reveals the value of Y.
7. Use =SLOPE(known_y's, known_x's) to find slope and =INTERCEPT(known_y's, known_x's) to find intercept

Determine the value of Y by following these steps:

1. The cell where you want to populate the value for Y should have an equal (=) sign.
2. Now, type Forecast and select FORECAST.LINEAR function from the formula drop-down menu.
3. Click on the X's value and put a comma.
4. Then select the known Ys' value cell range followed by a comma.
5. Select the known Xs' cell range and close the formula with a parenthesis.
6. Press Enter to retrieve the interpolated value of Y.
7. You can keep on changing the value of X within the range of the given table to fetch Y-values.

Analysis ToolPak is available in all versions of Excel 365 to 2003 but is not enabled by default. So, you need to turn it on manually. Here's how:

1. In your Excel, click File > Options.
2. In the Excel Options dialog box, select Add-ins on the left sidebar, make sure Excel Add-ins is selected in the Manage box, and click Go.
3. In the *Add-ins* dialog box, tick off Analysis Toolpak, and click *OK*:
4. This will add the **Data Analysis** tools to the *Data* tab of your Excel ribbon.

With Analysis Toolpak added enabled, carry out these steps to perform regression analysis in Excel:

1. On the *Data* tab, in the *Analysis* group, click the **Data Analysis** button.
2. Select **Regression** and click *OK*.

In the *Regression* dialog box, configure the following settings:

- Select the *Input Y Range*, which is your **dependent variable**. In our case, it's umbrella sales (C1:C25).
- Select the *Input X Range*, i.e. your **independent variable**. In this example, it's the average monthly rainfall (B1:B25).

If you are building a multiple regression model, select two or more adjacent columns with different independent variables.

- Check the **Labels box** if there are headers at the top of your X and Y ranges.
- Choose your preferred **Output option,** a new worksheet in our case.
- Optionally, select the **Residuals** checkbox to get the difference between the predicted and actual values.
- Click *OK* and observe the regression analysis output created by Excel.

Use of LINEST function

Syntax
LINEST(known_y's, [known_x's], [const], [stats])
The LINEST function syntax has the following arguments:
Syntax

- **known_y's** Required. The set of y-values that you already know in the relationship y = mx + b.
  - If the range of ***known_y's*** is in a single column, each column of ***known_x's*** is interpreted as a separate variable.
  - If the range of ***known_y's*** is contained in a single row, each row of ***known_x's*** is interpreted as a separate variable.
- **known_x's** Optional. A set of x-values that you may already know in the relationship y = mx + b.
  - The range of ***known_x's*** can include one or more sets of variables. If only one variable is used, ***known_y's*** and ***known_x's*** can be ranges of any shape, as long as they have equal dimensions. If more than one variable is used, ***known_y's*** must be a vector (that is, a range with a height of one row or a width of one column).
  - If ***known_x's*** is omitted, it is assumed to be the array {1,2,3,...} that is the same size as ***known_y's***.
- **const** Optional. A logical value specifying whether to force the constant b to equal 0.
  - If ***const*** is TRUE or omitted, b is calculated normally.
  - If ***const*** is FALSE, b is set equal to 0 and the m-values are adjusted to fit y = mx.
- **stats** Optional. A logical value specifying whether to return additional regression statistics.
  - If ***stats*** is TRUE, **LINEST** returns the additional regression statistics; as a result, the returned array is **{mn,mn-1,...,m1,b;sen,sen-1,...,se1,seb;r^2,sey;F,df;ssreg,ssresid}**.
  - If ***stats*** is FALSE or omitted, **LINEST** returns only the m-coefficients and the constant b.

Experiment 5

Aim: Iterative Solutions Using Excel: Using Goal Seek in Excel, Using The Solver To Find Roots, Finding Multiple Roots, Optimization Using The Solver, Minimization Analysis, NonLinear Regression Analysis.

Procedure

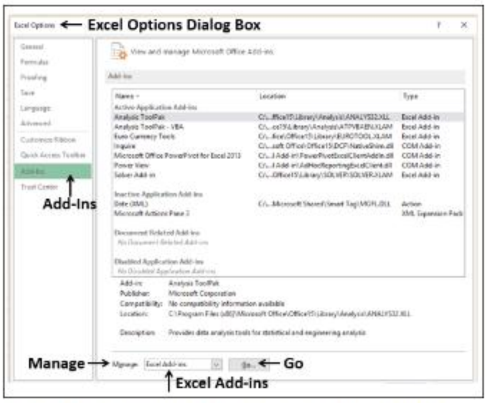
Activating Solver Add-in

Before you proceed with finding solution for a problem with Solver, ensure that the **Solver Add-in** is activated in Excel as follows –

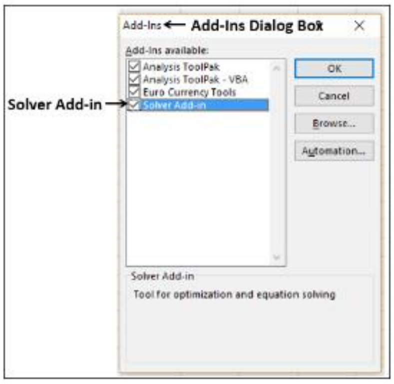
- Click the DATA tab on the Ribbon. The **Solver** command should appear in the Analysis group as shown below.

In case you do not find the Solver command, activate it as follows –

- Click the FILE tab.
- Click Options in the left pane. Excel Options dialog box appears.
- Click Add-Ins in the left pane.
- Select Excel Add-Ins in the Manage box and click Go.



The Add-Ins dialog box appears. Check **Solver Add-in** and click Ok. Now, you should be able to find the Solver command on the Ribbon under the DATA tab.



Finding Roots of Polynomial using Microsoft Excel

Let us go down to earth using numerical example, suppose you want to find the real root of this polynomial cubic equation

$$f(x) = x^3 - 2x^2 + 6x - 3 = 0$$

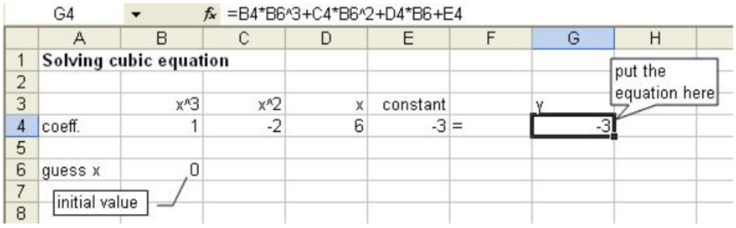
Here is how to do it steps by step:

1. Firstly, input the coefficient of the equations in separate cells (B4:E4).

2. Then, you may guess the value of x with any number as initial value (B6).

3. After that, type the equation of polynomial (G4).

The screen is shown in the figure below

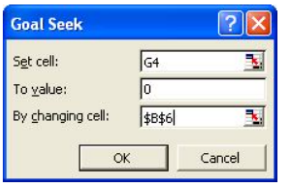


4. � From the menu of MS Excel, click **Tools-Goal Seek** and Goal Seek dialog show up.

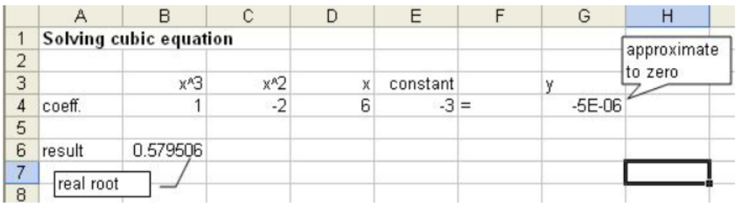
5. Set cell G4 (*the equation*) to value 0 (*target value*) by changing cell B6 (*initial guess of x*) and click OK button.

4. � From the menu of MS Excel, click **Tools-Goal Seek** and Goal Seek dialog show up.

5. Set cell G4 (*the equation*) to value 0 (*target value*) by changing cell B6 (*initial guess of x*) and click OK button.



6. The result is shown in the figure below. The real root is 0.5795 when y is approximately zero (-5E-06 = -0.0000050)



Generalized Reduced Gradient (GRG) Nonlinear

- Initially define the problem and enter the data into excel cells. Example is shown as below

Defining a Problem

Suppose you are analyzing the profits made by a company that manufactures and sells a certain product. You are asked to find the amount that can be spent on advertising in the next two quarters subject to a maximum of 20,000. The level of advertising in each quarter affects the following −

- The number of units sold, indirectly determining the amount of sales revenue.
- The associated expenses, and
- The profit.

You can proceed to define the problem as −

- Find Unit Cost.
- Find the advertising cost per Unit.
- Find Unit Price.

	A	B	C
1			
2		**Unit Cost**	50
3		**Unit Price**	100
4		**Adv. Cost per Unit**	20

Next, set the cells for the required calculations as given below.

	A	B	C	D
1				
2		**Unit Cost**	50	**Total Profit**
3		**Unit Price**	100	=C12+D12
4		**Adv. Cost per Unit**	20	
5				
6			**Quarter1**	**Quarter2**
7		No. of Units Available	400	600
8		Adv. Budget	10000	10000
9		No. of Units Sold	=MIN(C8/C4,C7)	=MIN(D8/C4,D7)
10		Revenue	=C3*C9	=C3*D9
11		Expenses	=C2*C7+C8	=C2*D7+D8
12		Profit	=C10-C11	=D10-D11

As you can observe, the calculations are done for Quarter1 and Quarter2 that are in consideration are −

- No. of units available for sale in Quarter1 is 400 and in Quarter2 is 600 (cells – C7 and D7).
- The initial values for advertising budget are set as 10000 per Quarter (Cells – C8 and D8).
- No. of units sold is dependent on the advertising cost per unit and hence is budget for the quarter / Adv. Cost per unit. Note that we have used the Min function to take care to see that the no. of units sold in <= no. of units available. (Cells – C9 and D9).
- Revenue is calculated as Unit Price * No. of Units sold (Cells – C10 and D10).
- Expenses is calculated as Unit Cost * No. of Units Available + Adv. Cost for that quarter (Cells – C11 and D12).
- Profit is Revenue – Expenses (Cells C12 and D12).
- Total Profit is Profit in Quarter1 + Profit in Quarter2 (Cell – D3).

Next, you can set the parameters for Solver as given below −

	A	B	C	D
1				
2		**Unit Cost**	50	**Total Profit**
3		**Unit Price**	100	=C12+D12
4		**Adv. Cost per Unit**	20	
5				
6			**Quarter1**	**Quarter2**
7		No. of Units Available	400	600
8		Adv. Budget	10000	10000
9		No. of Units Sold	=MIN(C8/C4,C7)	=MIN(D8/C4,D7)
10		Revenue	=C3*C9	=C3*D9
11		Expenses	=C2*C7+C8	=C2*D7+D8
12		Profit	=C10-C11	=D10-D11
13				
14		Total Adv. Budget	=C8+D8	20000
15		No. of Units sold in Quarter1	=C9	=C7
16		No. of Units sold in Quarter2	=D9	=D7

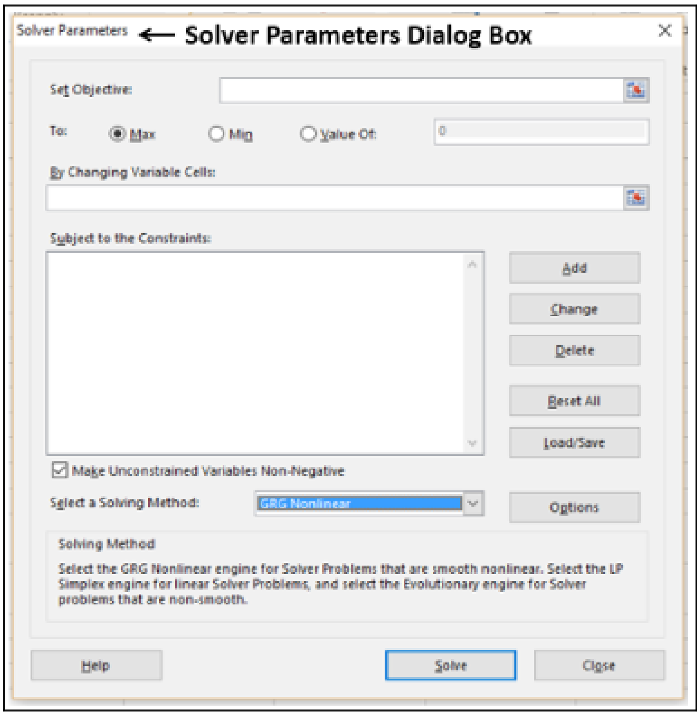
As you can observe, the parameters for Solver are −

- Objective cell is D3 that contains Total Profit, which you want to maximize.
- Decision Variable cells are C8 and D8 that contain the budgets for the two quarters – Quarter1 and Quarter2.
- There are three Constraint cells - C14, C15 and C16.
  - Cell C14 that contains total budget is to set the constraint of 20000 (cell D14).
  - Cell C15 that contains the no. of units sold in Quarter1 is to set the constraint of <= no. of units available in Quarter1 (cell D15).
  - Cell C16 that contains the no. of units sold in Quarter2 is to set the constraint of <= no. of units available in Quarter2 (cell D16).

Solving the Problem

The next step is to use Solver to find the solution as follows –

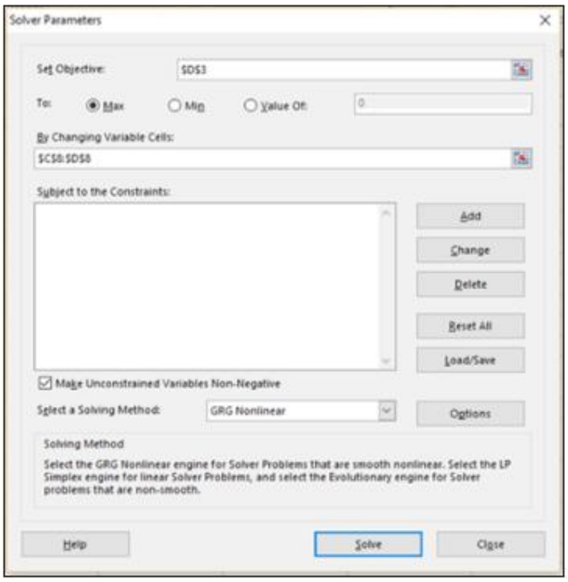
Step 1 – Go to DATA > Analysis > Solver on the Ribbon. The Solver Parameters dialog box appears.



Step 2 – In the Set Objective box, select the cell D3.

Step 3 – Select Max.

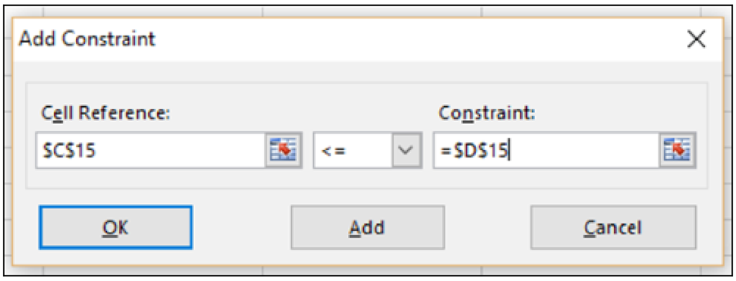
Step 4 – Select range C8:D8 in the **By Changing Variable Cells** box.



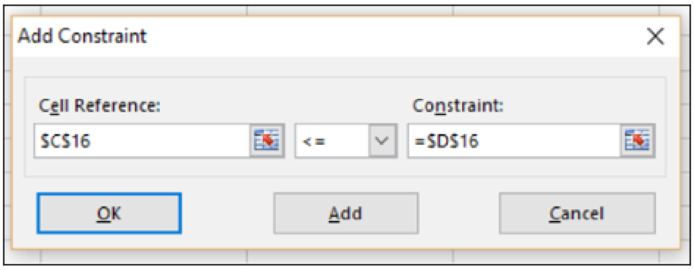
Step 5 – Next, click the Add button to add the three constraints that you have identified.

Step 6 – The Add Constraint dialog box appears. Set the constraint for total budget as given below and click Add.

Step 7 – Set the constraint for total no. of units sold in Quarter1 as given below and click Add.

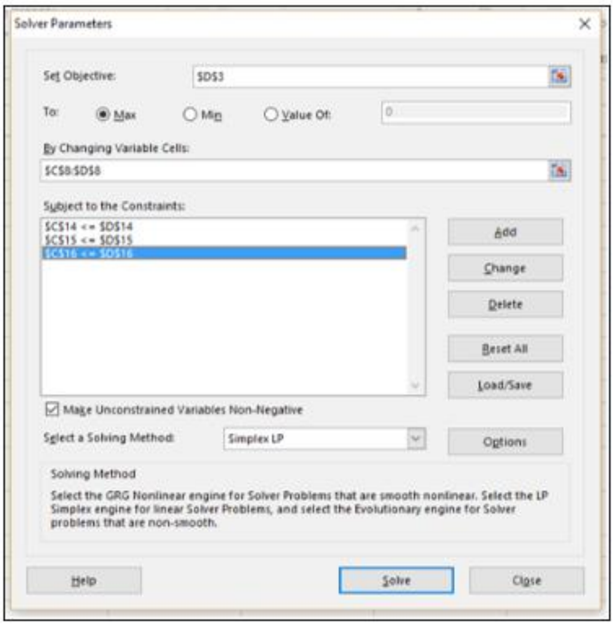


Step 8 – Set the constraint for total no. of units sold in Quarter2 as given below and click OK.

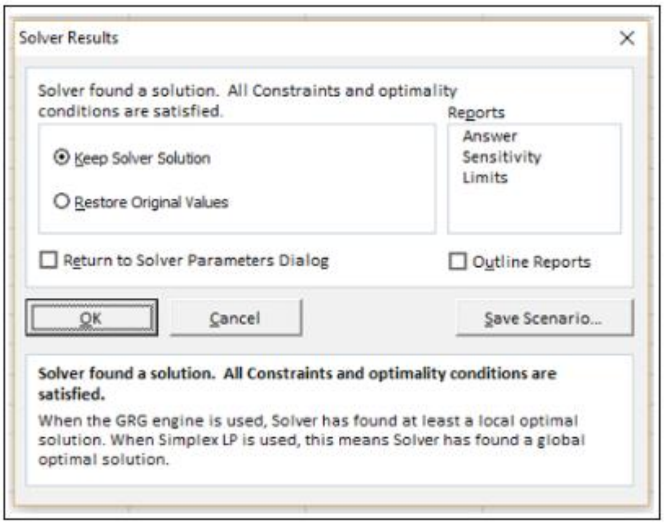


The Solver Parameters dialog box appears with the three constraints added in box –Subject to the Constraints.

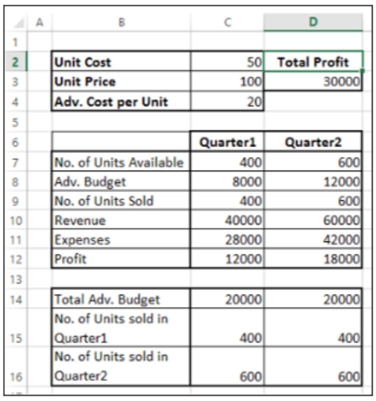
Step 9 – In the **Select a Solving Method** box, select Simplex LP.



Step 10 – Click the Solve button. The Solver Results dialog box appears. Select **Keep Solver Solution** and click OK.



The results will appear in your worksheet.



	A	B	C	D
1				
2		Unit Cost	50	Total Profit
3		Unit Price	100	30000
4		Adv. Cost per Unit	20	
5				
6			Quarter1	Quarter2
7		No. of Units Available	400	600
8		Adv. Budget	8000	12000
9		No. of Units Sold	400	600
10		Revenue	40000	60000
11		Expenses	28000	42000
12		Profit	12000	18000
13				
14		Total Adv. Budget	20000	20000
15		No. of Units sold in Quarter1	400	400
16		No. of Units sold in Quarter2	600	600

As you can observe, the optimal solution that produces maximum total profit, subject to the given constraints, is found to be the following –

- Total Profit – 30000.
- Adv. Budget for Quarter1 – 8000.
- Adv. Budget for Quarter2 – 12000.

Experiment 6

Aim: Matrix Operations Using Excel: Adding Two Matrices, Multiplying a Matrix by a Scalar, Multiplying Two Matrices, Transposing a Matrix, Inverting a Matrix and Solving System of Linear Equations.

Procedure

Addition of a matrices

You can sum up matrices with the same number of elements. The number of rows and columns of the first range should be equal to the number of rows and columns of the second range.

In the first cell of the resulting matrix you need to enter a formula of the next form: = the first element of the first array + the first element of the second: (=A1+E1). Press Enter and stretch the formula to the full range.

Matrices multiplication in Excel

The task is next:

F1 | fx | =A1*E3

	A	B	C	D	E	F
1	30	5	2			360
2	10	25	10			
3	4	9	10	**x**	**12**	
4	1	6	20			
5	-5	10	15			

To multiply a matrix by a number you need to multiply each of its elements by this number. The formula in Excel: =A1*E3 (a reference to a cell with a number must be absolute).

F1 | fx | =A1*E3

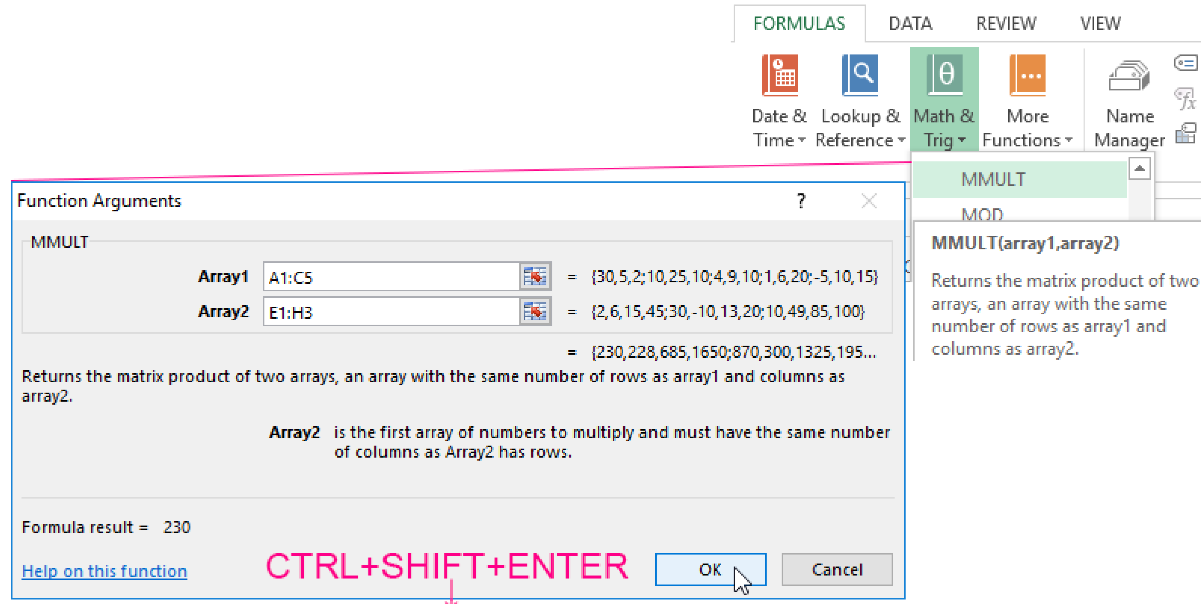
	A	B	C	D	E	F	G	H
1	30	5	2			360	60	24
2	10	25	10			120	300	120
3	4	9	10	**x**	**12**	48	108	120
4	1	6	20			12	72	240
5	-5	10	15			-60	120	180

Let's multiply the matrix with different ranges. It's possible only to find the product of matrices if the number of columns of the first matrix is equal to the number of rows of the second one.

	A	B	C	D	E	F	G	H
1	30	5	2		2	6	15	45
2	10	25	10	x	30	-10	13	20
3	4	9	10		10	49	85	100
4	1	6	20					
5	-5	10	15					

In the resulting matrix, the number of rows is equal to the number of rows of the first array, and the number of columns is equal to the number of columns of the second.

For convenience, we select the range where the multiplication results will be placed. We make the first cell of the resulting field active. Then select: «FORMULAS»-«Math and Trig»-«MMULT» We introduce the formula: = =MMULT(A1:C5,E1:H3). Enter as an array formula (CTRL+SHIFT+Enter).



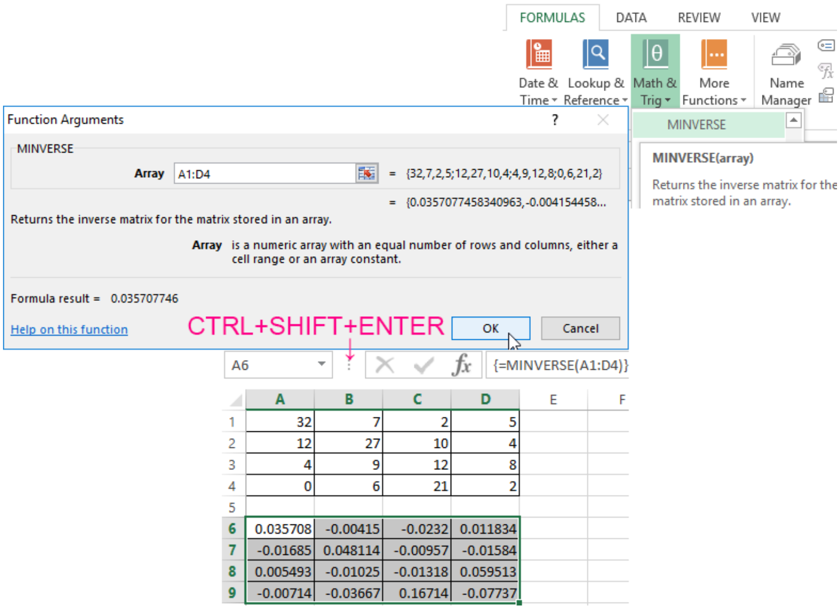
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	30	5	2		2	6	15	45		230	228	685	1650
2	10	25	10	x	30	-10	13	20	=	870	300	1325	1950
3	4	9	10		10	49	85	100		378	424	1027	1360
4	1	6	20							382	926	1793	2165
5	-5	10	15							440	605	1330	1475

The inverse matrices in Excel

It makes sense to find it if we are dealing with a square matrix (the number of rows and columns is the same).

The dimension of the inverse matrix corresponds to the size of the original. We use: «FORMULAS»-«Math and Trig»-«MINVERSE» function in Excel.

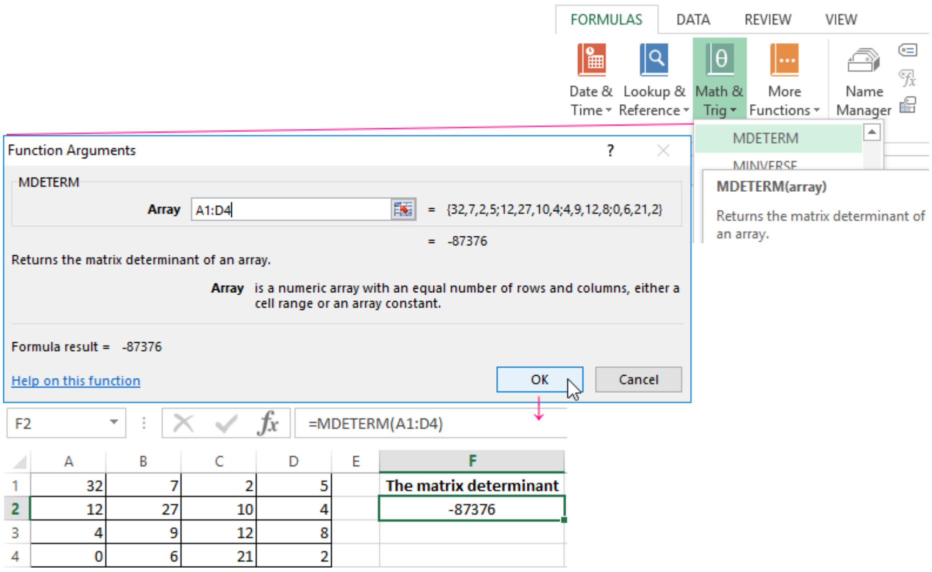
Select the first cell of the empty range for the inverse matrix. We introduce the formula «= MINVERSE(A1:D4)» as a data set function. The only argument is the range with the original. We got the inverse array in Excel:



Finding the matrices determinant

This is one single number that is found for a square matrix. We use: «FORMULAS»-«Math and Trig»-«MDETERM» function.

We put the cursor in any cell of the open sheet. Enter the formula: =MOPRED(A1:D4).



Thus, we performed actions with the matrixes using the built-in Excel features.

Experiment 7

Aim: Numerical Integration Using Excel: The Rectangle Rule, The Trapezoid Rule, The Simpson's Rule, Creating a User-Defined Function Using the Simpson's Rule

Procedure

To start with, let's add some columns for Velocity and Position to our data and also fill in the initial values.
We can assume that the object being accelerated here is starting at rest, so it's velocity and position are "0" at time t=0.

	A	B	C	D
1				
2				
3	Time (s)	Acceleration (in/sec^2)	Velocity (in/s)	Position (in)
4	0	0	0	0
5	0.01	1		
6	0.02	2		
7	0.03	3		
8	0.04	4		
9	0.05	5		
10	0.06	6		
11	0.07	7		
12	0.08	8		

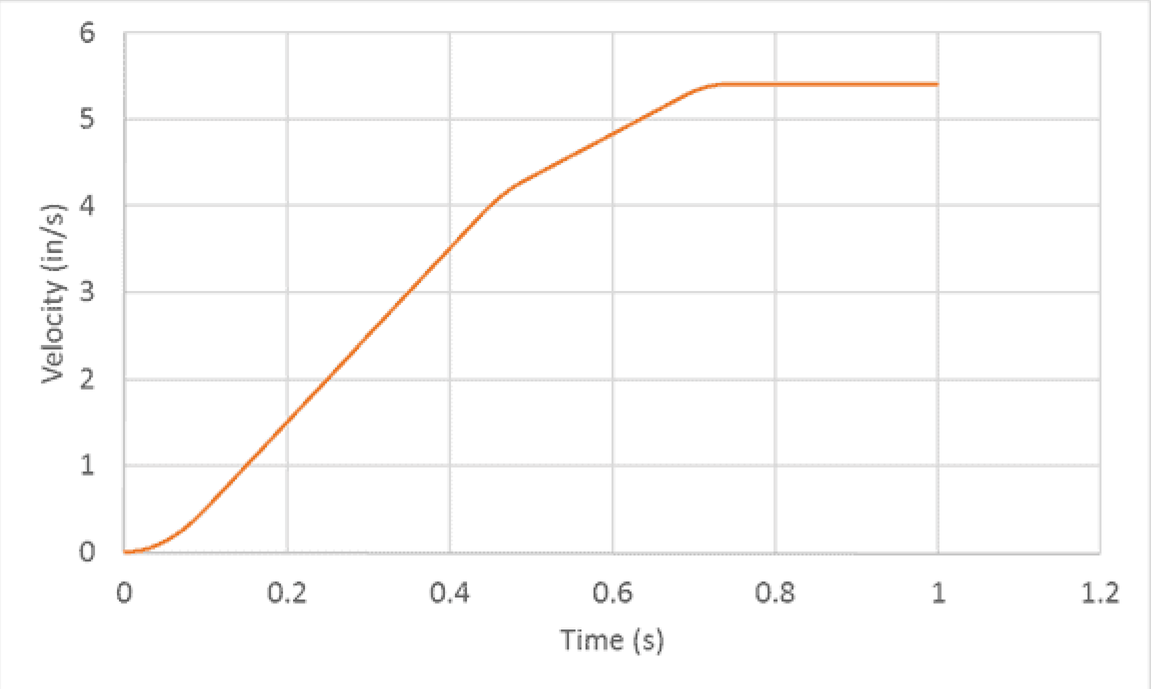
Integrate in Excel to Calculate Velocity from Acceleration Data
Next, we can calculate the velocity. We know that, in general, velocity is related to acceleration by the following equation:

$$v = \int a \, dt$$

So, to calculate the velocity at any given time, we need to calculate the integral of acceleration through time.
Since we have a finite number of data points the trapezoidal method will give us the greatest accuracy, so let's use that.
In cell C5 (the first velocity value after the initial velocity, 0, we entered above), enter the formula to calculate the trapezoidal area under the curve.
=(A5-A4)*((B4+B5)/2)+C4

	A	B	C	D	E
1					
2					
3	Time (s)	Acceleration (in/sec^2)	Velocity (in/s)	Position (in)	
4	0	0	0	0	
5	0.01	1	=(A5-A4)*((B4+B5)/2)+C4		
6	0.02	2			
7	0.03	3			
8	0.04	4			
9	0.05	5			
10	0.06	6			
11	0.07	7			
12	0.08	8			
13	0.09	9			

Filling that formula all the way down gives us the following velocity result:



The velocity result makes sense given the acceleration data. We have a region of progressively increasing velocity from 0-0.1 seconds. Increasing velocity at different rates from 0.1 to ~0.45 seconds and ~0.45 to 0.7 seconds. And constant velocity (zero acceleration) from 0.7 to 1 seconds.

Experiment 8

Aim: Differential Equations: Euler's Method, Modified Euler's Method, The Runge Kutta Method, Solving a Second Order Differential Equation

Procedure

STEP 1: Create Dataset

- First of all, we need to create a dataset to insert the **iteration number** (**n**), **time value** (**t**), **y value**, **y–exact value**, and **delta_t**.
- The **delta_t** is the separation value.
- Also, you can display the equations to find the **t(n+1)** and **y(n+1)** values. We will implement these equations in the following sections.
- We have also added the **time interval** and **initial value** to make the calculation easy.

STEP 2: Apply Formula for Time Values & Y-values

- Secondly, we will apply formulas to calculate the **time values** and **y-values**.
- At the start of the iteration, **n** is **0**, **t** is **0**, and **y** is **5**.
- Now, insert these values in **Cells B5**, **C5**, and **D5** respectively.
- After that, we will insert a formula to calculate the **t-values**.
- To do so, select **Cell C6** and type the formula below:
  - **=C5+G5**
- Press **Enter**.

STEP 3: Fill Columns

- In the third step, we will fill the values of the n, t, and y columns.
- First of all, we will fill the iteration number (n) column.
- To find the number of iterations, we need to divide the time interval by the delta_t value.
- In our case, iteration number (n) = (2/0.1) = 12.
- So, we need to fill the iteration column from 0 to 12.
- After that, select both **Cells C6** & **D6** and drag the Fill Handle down.
- Finally, you will get all the t and y–values.

STEP 4: Plot Data

- At this moment, we need to plot the t and y–values.
- For that purpose, select the range C4:D17.
- After that, go to the Insert tab and click on the Insert Scatter icon. A drop-down menu will appear.
- Select **Scatter with Lines** from there.
- As a result, you will see a chart on the sheet.

- You can change the chart title according to your preferences.

STEP 5: Format Axis

- In step 5, we will format the axis of the graph.
- To do so, double–click on the horizontal axis. It will open the Format Axis options on the right side of the sheet.
- Set the Minimum value to 0 and Maximum value to 1.2 in the Bounds section and press Enter to proceed.
- Similarly, double–click on the vertical axis.
- Then, set the Minimum value to 0.3 and Maximum value to 0.65 in the Bounds section and press Enter to proceed.
- As a result, the graph will be displayed

STEP 6: Find Exact Solution

- Now, we will calculate the exact solution of the differential equation and match it with the numerical values.
- In our case, the exact solution of the differential equation is y = -1 + t + 1.5*exp(-t).
- So, select Cell E5 and type the formula below:

```
=-1+C5+1.5*EXP(-C5)
```

- After that, press Enter and drag the Fill Handle down.
- Finally, you will know the y-values of the exact solution.

STEP 7: Plot Exact Solution on Same Chart

- To compare the y-values of the exact solution with the numerical values, we need to plot them on the same chart.
- To do so, right–click on the chart to open the menu.
- Click on the Select Data option.
- In the Select Data Source dialog box, click on Add.
- Now, insert the Series X and Y values in the Edit Series box.
- Finally, click OK to get the plot of the exact solution.

Final Output

- Finally, if we change the delta_t value in Cell G5, then the whole dataset will automatically update and show the solution for the updated delta_t value.
- Furthermore, the graphs will also update automatically.