

## Payroll Project

### 1. Payroll solutions

A payroll solution relates to the payroll computations of employees of a given organization. Every organization has its some rules to compute pay for its employees under the aegis of rules and regulations of the Government of the land.

### 2. Objectives of payroll solutions

Payroll solutions are prepared in following forms

1. Pay Stub for one employee for one pay cycle (monthly/fortnightly/weekly)
2. Payroll of one employee for all the pay cycles in a particular financial term
3. Payroll of a group of employees for one pay cycle

### 3. Components of payroll solutions

The pay given to an employee is usually prepared as the net sum of various components of income and various components of deductions. Following is the list of some commonly used components in the problems we deal with.

1. Income Components - Basic salary (BS), grade pay (GP), dearness allowance (DA), house rent allowance (HRA), child care allowance (CCA), arrears (sometimes), etc.
2. Deductions - Income Tax (IT), Group Insurance Scheme (GIS), etc.

### 4. Factors affecting computations of computations

Some of the factors affecting the computations of the above given components may be increment, rates for DA, HRA, IT, GIS etc., Rates in Slabs, Pay scale, Category an employee belongs to, minimum amounts, maximum ceilings.

#### 1.1. Commonly used computations in Payroll Computations

1.1.1. **Pay Scale Oriented Computations** - This may include the computations like 1) computing the minimum basis salary, increment and maximum basis salary for a given pay scale or 2) computing a list of all possible basic salaries in a given pay scale etc.

**Example:** Given a pay scale, find the values of minimum basic pay, increment and maximum basic pay.

**Solution:** This can be done by using some text processing functions as shown below. The main approach is to find the position of the separator "-" and extract different parts of the given pay scale.

	A	B	C	D
1	Pays Scale	10000-325-15200	Min Basic Pay	<b>=LEFT(B1,SEARCH("-",B1)-1)</b>
2	Temp Data	<b>=RIGHT(B1,LEN(B1)-LEN(D1)-1)</b>	Increment Amount	<b>=LEFT(B2,SEARCH("-",B2)-1)</b>
3	Temp Data	<b>=RIGHT(B2,LEN(B2)-LEN(D2)-1)</b>	Maximum Basic Pay	<b>=B3</b>

Formula view - Bold Formulas are written manually, other formulas are copied from the adjacent cells

	A	B	C	D
1	Pay Scale	10000-325-15200	Min Basic Pay	10000
2	Temp Data	325-15200	Increment Amount	325
3	Temp Data	15200	Maximum Basic Pay	15200

Data View

**Example:** Given a pay scale, generate all the possible basic salaries any employee can have.

**Solution:** The list can be prepared by

1. generating the first basic pay as the minimum basic pay by using formula = B2
2. generating the second basic pay in the list by incrementing previous basic pay by the amount of increment i.e. using the formula =A6+\$B\$2
3. generating the remaining basic pays of the list by dragging the formula of the second basic pay till you reach to the maximum value of the basic pay.

	A	B		A	B
1	Min Basic Pay	10000	1	Min Basic Pay	10000
2	Increment Amount	325	2	Increment Amount	325
3	Maximum Basic Pay	15200	3	Maximum Basic Pay	15200
4			4		
5	Possible Basic Pays		5	Possible Basic Pays	
6	=B1		6	10000	
7	=A6+\$B\$2		7	10325	
8			8	10650	
9			9	10975	
10			10	11300	
11			11	11625	
12			12	11950	
13			13	12275	
14			14	12600	
15			15	12925	
16			16	13250	
17			17	13575	
18			18	13900	
19			19	14225	
20			20	14550	
21			21	14875	
22			22	15200	

Formula view Data view

1.1.2. **Increment oriented computations** - This may include the computations like incrementing a basic salary at the time of increment.

**Example:** Given a pay scale and the basic salary of first month, compute the basic salaries for next 12 months.

**Solution:** The solution is found by doing the following:

1. Enter the data for minimum basic, pay, increment amount, maximum basic pay, month of increment. Also assume the basic salary of the first month.
2. Create a column for month values as Apr 2050, May 2050, etc.
3. Create a column for basic salaries
  - a. Compute the first month's basic salary by equating it to the assumed basic salary and using the function =C7
  - b. Compute the basic salary for the second month by using any of the following formula
    - i. =IF(A11=\$C\$5, IF(B10+\$C\$2<\$C\$3,B10+\$C\$2,\$C\$3),B10) – This formula increments the basic salary if the current month is the month of increment and the incremented value is less than the maximum basic pay
    - ii. =IF(A11=\$C\$5,MIN(C10+\$C\$2,\$C\$3),C10) – This formula computes the minimum of the two values – 1) incremented value if the current month was the month of increment and 2) maximum basic pay
    - iii. =IF(A11=\$C\$5,MIN(D10+\$C\$2,\$C\$3),D10)- This formula computes the minimum of incremented value and maximum if the current month is the month of increment or else copies the basic salary of the previous month

- c. Copy the formula for the basic pay for the second month in all the remaining cells of basic pay.

The months can also be specified as Jan-2050 style. In this case the month of the

	A	B	C	
1	Min Basic Pay		10000	
2	Increment Amount		325	
3	Maximum Basic Pay		15200	
4				
5	Month of increment		6	
6				
7	Basic Salary of the first month		10000	
8				
9	Months	Basic Salary Method 1	Basic Salary Method 2	Basic Salary Method 3
10	Apr-2050	=C7	=C7	
11	May-2050	<b>=IF(MONTH(A11)=\$C\$5, IF(B10+\$C\$2&lt;\$C\$3, B10+\$C\$2,\$C\$3), B10)</b>	<b>=IF(MONTH(A11)=\$C\$5, MIN(C10+\$C\$2,\$C\$3), C10)</b>	<b>=IF(A11=\$C\$5, MIN(D10+\$C\$2,\$C\$3), D10)</b>
12	Jun-2050			
13	Jul-2050			
14	Aug-2050			
15	Sep-2050			
16	Oct-2050			
17	Nov-2050			
18	Dec-2050			
19	Jan-2050			
20	Feb-2050			
21	Mar-2050			

Formula view - Bold Formulas are written manually, other formulas are copied from the adjacent cells

	A	B	C	
1	Min Basic Pay		10000	
2	Increment Amount		325	
3	Maximum Basic Pay		15200	
4				
5	Month of increment		6	
6				
7	Basic Salary of the first month		14875	
8				
9	Months	Basic Salary Method 1	Basic Salary Method 2	Basic Salary Method 3
10	1	14875	14875	14875
11	2	14875	14875	14875
12	3	14875	14875	14875
13	4	14875	14875	14875
14	5	14875	14875	14875
15	6	14875	14875	14875
16	7	15200	15200	15200
17	8	15200	15200	15200
18	9	15200	15200	15200

19	10	15200	15200	15200
20	11	15200	15200	15200
21	12	15200	15200	15200

Data view

**1.1.3. Simple rate oriented computations** - This may include the computations like computing a component as a percentage of some other components.

**Example:** Assuming the basic salaries for 5 employees is given, Compute HRA and CCA for 5 employees provided HRA is equal to 20% of basic pay and CCA is 15% of the basic pay.

**Solution:** The solution is found by doing the following:

1. Enter the names and TA allowance in two columns as shown below.
2. Compute the HRA for the first employee by using the formula  
=IF(B2="A",4000, IF(B2="B", 3000,2000))
3. Copy the formula for the HRA for the first employee in all the remaining cells of HRA.

Employee Name	Category	HRA
Nidhi	B	=IF(B2="A", 4000, IF(B2="B", 3000, 2000))
Keshav	A	
Raghav	A	
Prinyanka	C	
Atul	B	

Formula view

Employee Name	Category	HRA
Nidhi	B	3000
Keshav	A	4000
Raghav	A	4000
Prinyanka	C	2000
Atul	B	3000

Data view

**1.1.4. Category oriented computations** - This may include the computations like computing a payroll component differently for different categories an employee belongs. The categories can be like A/B/C, Married/Unmarried, yes/no, Male/Female, B.Com./BA/B.Sc. etc.

This can easily be solved by using IF, nested if or VLOOKUP functions.

**Example:** Assuming that data about names and marital status of 5 employees is given, compute the HRA provided HRA for married employee is Rs. 4000 and for unmarried employees is Rs. 2000.

**Solution1:** The solution is found by doing the following:

1. Enter the names and marital status for 5 employees in two columns as shown below.
2. Compute the HRA for the first employee by using the formula =IF(B2="A",4000,IF(B2="B", 3000,2000)).
3. Copy the formula for the HRA for the first employee in all the remaining cells of HRA.

Employee Name	Category	HRA
Nidhi	B	=IF(B2="A", 4000, IF(B2="B", 3000, 2000))
Keshav	A	
Raghav	A	
Prinyanka	C	

Atul	B	
------	---	--

Formula view

Employee Name	Category	HRA
Nidhi	B	3000
Keshav	A	4000
Raghav	A	4000
Prinyanka	C	2000
Atul	B	3000

Data view

**Solution2:** The solution is found by doing the following:

1. Enter the names and marital status for 5 employees in two columns as shown below.
2. Enter Different categories names and corresponding HRA amounts in a small table from D2 to E4, i.e., D2:E4. This table only acts as a reference table.
3. Compute the HRA for the first employee by using the following formula. The formula means to vertically look up the value in cell B1 in the lookup table D2:E4 and if the value is found, return the data value available in column 2 of the data table.  

$$=VLOOKUP(B2, \$D\$2: \$E\$4, 2)$$
4. Copy the formula for the HRA for the first employee in all the remaining cells of HRA.

Employee Name	Category	HRA	Categories	HRA
Nidhi	B	<b>=VLOOKUP(B2, \$D\$2: \$E\$4, 2)</b>	<b>A</b>	<b>4000</b>
Keshav	A		B	3000
Raghav	A		C	2000
Prinyanka	C			
Atul	B			

Formula view

Employee Name	Category	HRA
Nidhi	B	3000
Keshav	A	4000
Raghav	A	4000
Prinyanka	C	2000
Atul	B	3000

Data view

### 1.1.5. Slabs oriented computations

- Find HRA for employee if the basic salary is “less than 10000”, “between 10000 and 20000” and “above 20000”
- Find income tax on gross salary if income tax for the first 10000 as 10%, for more than 10000 but up to 20000 is 20% and more than 20000 as 30%.

### 1.1.6. Minimum and maximum caps oriented computations

- Compute HRA as 20% of basic or 2000 whichever is more
- Compute HRA as 10% of basic pay such that HRA cannot exceed 3000
- Compute TA as 10% of basic pay or at least 1200

### 1.1.7. Varying Rates

- Compute DA for each month on the basis of rate applicable in that month

1.1.8. **Arrears oriented computations** - This may include the computations for some payroll component(s) if some change in the component computation is applied retrospectively i.e., from some previous date/month/year etc. than the current one.

The key point in arrear computations is to find the difference in the amounts that should have been made and the amounts that were actually made.

$$\text{Arrear} = \text{amounts should have been made} - \text{amounts that were actually made}$$

**Example:** In Nov 2050, a company revised travel allowance for its employees and increased it from existing Rs 800 pm to Rs 1000 pm. It was also decided that the change will be applied retrospectively from March 2050 and the TA arrears will be given in with the salary of Nov. Prepare the revised travel allowance details for an employee for the entire financial year 2050-2051.

**Solution1:** The solution is found by doing the following:

- Step 1: Enter the Months of the financial year in one column.
- Step 2: Enter the TA rates in some place e.g. D2:E3.
- Step 3: Compute the TA for the first month by using the following formula  
=VLOOKUP(A2, \$D\$2:\$E\$3), 2)

Here the TA rate is searched from the reference table D2:E3 by searching for current month

- Step 4: Copy the formula for the TA for the first month in all the remaining cells TA column.
- Step 5: As we know that arrears are to be computed only for the month of Nov, so if we wish we can write only one formula for TA arrears as  
=COUNT(B2:B9) \* ( VLOOKUP(A2, \$D\$2:\$E\$3), 2) - VLOOKUP(EDATE(A2,-1), \$D\$2:\$E\$3), 2)

	A	B	C	D	E
1	Month	TA	TA Arrears	Date	TA Rate
2	Mar-2050	=VLOOKUP(A2, \$D\$2:\$E\$3), 2)		Mar-2050	800
3	Apr-2050			Nov-2050	1000
4	May-2050				
5	Jun-2050				
6	Jul-2050				
7	Aug-2050				
8	Sep-2050				
9	Oct-2050				
10	Nov-2050		=COUNT(B2:B9)*( VLOOKUP(A10, \$D\$2:\$E\$3), 2) - VLOOKUP(A2, \$D\$2:\$E\$3), 2)		
11	Dec-2050				
12	Jan-2050				
13	Feb-2050				

Formula view

Month	TA	TA Arrears	Date	TA Rate
Mar-2050	800		<b>Mar-2050</b>	<b>800</b>
Apr-2050	800		Nov-2050	1000
May-2050	800			
Jun-2050	800			

Jul-2050	800			
Aug-2050	800			
Sep-2050	800			
Oct-2050	800			
Nov-2050	1000	1600		
Dec-2050	1000			
Jan-2050	1000			
Feb-2050	1000			

Data view

**Solution2:** Alternatively the step 5 of the solution 1, can also be computed in the following manner:

Step 5: write the following formula for the first month arrears as given below and copy it down to all the other cells of the column

=IF(MONTH(A2)=11, COUNT(B2:B9)\*( VLOOKUP(A2, \$D\$2:\$E\$3), 2)  
- VLOOKUP(EDATE(A2,-1), \$D\$2:\$E\$3), 2), 0)

Step 6: Copy the formula for the TA arrears for the first month in the remaining cells

**Example:** In the following situation, compute the payroll for a complete financial year Mar-2050 to Feb-2051 about one employee related to its components of basic pay, dearness allowance and arrears for dearness allowance.

Assume the any basic salary for an employee in the pay scale of 1000-325-15200 and the month of increment. The basic salary of an employee gets incremented every year in the month of increment. DA is computed by using the existing DA Rates. However, every year Government revises the DA rates in the month of Apr and Oct which are applied retrospectively from the month of Jan and July. Hence, DA arrears are given to the employees along with their salaries of the month of Apr and Oct each year. The DA rates declared by the Government are as follows.

with effect from	DA Rate
Jan-49	35%
Jul-49	45%
Jan-50	51%
Jul-51	58%
Jan-52	65%

**Solution1:** The solution is found by doing the following:

Step 1: Enter any basic salary for the first month (Mar-2050) in some cell e.g. Cell B1.

Step 2: Enter the month of increment in some cell e.g. B2

Step 3: Enter the increment amount in some cell e.g. B3

Step 4: Enter the months of the financial year in one column.

Step 5: Compute the basic salary of the first month by using the following formula. Here we already know that the basic salary of the first month is same as that chosen by the user in cell B1  
=B1

Step 6: Compute the basic salary of the second month by using the following formula. Here we check that the basic salary of any month should be equal to basic salary of the previous month except in case the current month is the month of increment.

=IF(MONTH(A7)=\$B\$2,B6+ \$B\$3, B6)

Step 7: Copy the formula for the basic salary for the second month in the remaining cells down

Step 8: Compute the DA for the first month by using the following formula. Here we cannot use the da rates from the given table directly as they are declared late. So the main point is to search for a da rate which is for a month which is 3 month prior to the current month.

=VLOOKUP(EDATE(A6,-3),\$E\$2:\$F\$7,2)\*B6

Step 7: Copy the formula for the DA for the first month in the remaining cells down

Step 8: Compute the da arrears for the first month in DA arrears column using the following formulas

$$=(VLOOKUP(A6,\$E\$2:\$F\$7,2) - VLOOKUP(EDATE(A6,-4),\$E\$2:\$F\$7,2)) * IF(OR(MONTH(A6)=4, MONTH(A6)=10), IF(MONTH(A6)-1=B2, B6*1+(B6-\$B\$3)*2, IF(MONTH(A6)-2=\$B\$2,B6*2+(B6-\$B\$3),B6*3)),0)$$

Here we use the following logic to compute the arrears.

If current month -1 = month of increment then

Basic pay arrear = current basic \*1 + (current basic – increment) \*2

If current month -2 = month of increment then

Basic pay arrear = current basic \*2 + (current basic – increment) \*1

Else

Basic pay arrear = current basic \*3

Therefore, VLOOKUP(A6,\$E\$2:\$F\$7,2) finds the DA rate for the current month, VLOOKUP(EDATE(A6,-4),\$E\$2:\$F\$7,2) finds the old DA rate by referring 4 months back in time. OR(MONTH(A6)=4, MONTH(A6)=10) finds if the current month is Apr or Oct. MONTH(A6)-1=B2 checks if the current month – 1 is equal to month of increment. B6\*1 + (B6-\$B\$3)\*2 computes the basic pay difference in this case. Similarly, B6\*1+ (B6-\$B\$3)\*2 finds if the current month -2 is equal to the month of increment and =\$B\$2, B6\*2 + (B6-\$B\$3) computes the basic pay difference in this case. B6\*3 computes the basic pay difference of past three months in all other cases. 0 computes basic salary difference if the current month is neither Apr nor Oct.

Step 4: Copy the formula for the first cell of DA Arrears column to all the remaining cells down.

	A	B	C	D	E	F
1	Initial Basic Pay	10000			Date	DA Rate
2	Month of Increment	4			Jan-49	0.35
3	Increment Amount	325			Jul-49	0.45
4					Jan-50	0.51
5	Month	Basic Pay	DA	DA Arrears	Jul-50	0.58
6	Mar-2050	=B1	=VLOOKUP(EDATE(A6,-3), \$E\$2:\$F\$7,2) *B6	=(VLOOKUP(A6,\$E\$2:\$F\$7,2) -VLOOKUP(EDATE(A6,-4), \$E\$2:\$F\$7,2)) * IF(OR(MONTH(A6)=4, MONTH(A6)=10), IF(MONTH(A6)-1=B2,B6*1+(B6-\$B\$3)*2, IF(MONTH(A6)-2=\$B\$2,B6*2+(B6-\$B\$3),B6*3)),0)	Jan-51	0.65
7	Apr-2050	=IF(MONTH(A7)=\$B\$2, B6+ \$B\$3, B6)			Jul-51	0.65
5	May-2050					
6	Jun-2050					
7	Jul-2050					
8	Aug-2050					
9	Sep-2050					
10	Oct-2050					
11	Nov-2050					



12	Dec-2050				
13	Jan-2051				
14	Jan-2051				
15	<b>Total</b>	=SUM(B6:B17)	=SUM(C6:C17)	=SUM(D6:D17)	

Formula view

Initial Basic Pay	10000			Date	DA Rate
Month of Increment	4			Jan-49	0.35
Increment Amount	325			Jul-49	0.45
				Jan-50	0.51
Month	Basic Pay	DA	DA Arrears	Jul-50	0.58
Mar-50	10000	4500	0	Jan-51	0.65
Apr-50	10325	5265.75	1858.5	Jul-51	0.65
May-50	10325	5265.75	0		
Jun-50	10325	5265.75	0		
Jul-50	10325	5265.75	0		
Aug-50	10325	5265.75	0		
Sep-50	10325	5265.75	0		
Oct-50	10325	5988.5	2168.25		
Nov-50	10325	5988.5	0		
Dec-50	10325	5988.5	0		
Jan-51	10325	5988.5	0		
Feb-51	10325	5988.5	0		
<b>Total</b>	<b>123575</b>	<b>66037</b>	<b>4026.75</b>		

Data view

### 1.1.9. Summary

- Find the total income tax deposited by the organization on its employees
- Find the total net pay to be given to all the employees of an organization

### 1.1.10. Combined

- Compute full pay roll of 10 employees by computing the Basic pay, DA, DA Arrears, CCA, HRA, TA , Gross Salary, IT, GIS and Net Salary
- Compute full payroll of an employee for all months of a financial year by computing Basic pay, DA, DA Arrears, CCA, HRA, TA , Gross Salary, IT, GIS and Net Salary

### Converting the solution as a project

Add all the other features like garbage cleaning, generalization, formatting, segmentation (dividing the work in parameter and solution sheets), protection, user friendliness, fully qualified, graph etc.