1. Java Program to find Permutation value for a given Number

Aim:- To implement a program in Java to calculate Permutation of a Number

Description: - The permutation is a method or technique in which we can determine the possible arrangements in a set. The number of ways of selection and arrangement of items in which orders matters. In short, the permutation is the number of arrangements.
While determining the permutation, keep order in mind. It is denoted by the letter P.
Permutation is a technique by which we can arrange (or select) r objects out of given n objects in a particular order.
Mathematically, we can find the permutation of the numbers by using the following formula:

$$P(n,r) = \frac{n!}{(n-r)!}$$

Algorithm:-

STEP 1: START

STEP 2: DEFINE n, r, per, fact1, fact2

STEP 3: PRINT n, r

STEP 4: fact1 =n

STEP 5: REPEAT STEP 6 UNTIL i>=1

STEP 6: fact1 = fact1*i

STEP 7: DEFINE number

STEP 8: SET number = n - r

STEP 9: fact 2 = fact2*i

STEP 10: SET per = fact1/fact2

STEP 11: PRINT per

STEP 12: END

// Program:

```
import java.util.*;
   class Program
   {
     public static void main(String[] args)
      {
         int n, r, per, fact1, fact2;
         Scanner sc =  new Scanner(System.in);
         System.out.println("Enter the Value of n and r:");
         n = sc.nextInt();
         r = sc.nextInt();
         fact1 = n;
         for (int i = n - 1; i >= 1; i--)
         {
            fact1 = fact1 * i;
         }
         int number;
         number = n - r;
         fact2 = number;
         for (int i = number - 1; i >= 1; i--)
         {
            fact2 = fact2 * i;
         }
         per = fact1 / fact2;
         System.out.println("nPr = "+per);
   }
}
```

Output:

```
Enter the Value of n and r:
5
2
nPr = 20
```

2. Write a program in Java to find Combination for a given number

Aim: To implement a program in Java to calculate Combination of a Number

Description: Combination (nCr) can be defined as the combination of n things taken r at a time without any repetition. Combination can be calculated as

Combination = fact(n) / (fact(r) * fact(n-r));

Algorithm:-

STEP 1: START

STEP 2: RETURN fact(n) / (fact(r)*fact (n-r))

STEP 3: END

fact(n)

STEP 1: START

STEP 2: SET res= 1

STEP 3: REPEAT STEP 3 and STEP 4 UNTIL i<=n

STEP 4: res = res*i

STEP 5: RETURN res

STEP 6: END

//Program:

```
import java.util.*;
class Combination {
static int nCr(int n, int r)
{
   return fact(n) / (fact(r) *
   fact(n - r));
}
static int fact(int n)
{
   int res = 1;
        for (int i = 2; i <= n; i++)
        res = res * i;
       return res;
}
public static void main(String[] args)
{
int n,r;
System.out.println("Enter the value of n and r:");
Scanner sc = new Scanner(System.in);
n = sc.nextInt();
r = sc.nextInt();
System.out.println("nCr = "+nCr(n, r));
}
}
```

Output:

```
Enter the value of n and r:
   6
   4
  nCr = 15
```

3.**Write a program in Java to find HCF / GCD of Given Numbers**

Aim: Java Program to find HCF / GCD of Given Numbers

Description:- It is the highest number that completely divides two or more numbers. It isabbreviated for **GCD**. It is also known as the **Greatest Common Factor** (GCF) and the **Highest Common Factor** (HCF). It is used to simplify the fractions.

For Example: Find the GCF / HCF of 12 and 8.
Solution:
→ Factors of **12**: 1, 2, 3, 4, 6, 12
→Factors of **8:** 1, 2, 4, 8
→Common Factors: 1, 2, 4
→Greatest Common Factor: 4
→Hence, the GCF of 12 and 8 is 4.

Algorithm:
Step 1: Start
Step2:Read number A
Step 3: Read number B
Step 4: If A>B then A=A-B;
Else
B=B-A;
end if
Step 5: Repeat Step 3 until A!=B
Step 6: Print GDC /HCF B
Step 7: Stop

//Program:

```
import java.util. Scanner;
class Main {
public static void main (string {} args) {
int nl, n2;
//Reading the inputs values at runtime
Scanner cin = new Scanner( System.in);
System.out.println ("Enter the First Number :");
n1= (int) cin .next Int();
System.out.println("Enter the Second Number":);
n2 = (int) cin.next Int ();
//Closing the Scanner to Avoid Memory Loss
Scanner. close ();
while (n1!=n2)
{
if(n1 >n2)
n1= n1 -
n2;else
n2= n2-n1;
}
// Display the result
System.out.println ( "GCD / HCF of Given Numbers is :"+n2);
}
}
```

Output:

```
Enter First Number: 50
Enter Second Number: 60
GCD / HCF of Given Numbers is : 10
```

4. CARTESIAN PRODUCT OF TWO SETS

Aim: Java Program to Find Cartesian Product of Two Sets

Description:- Let A and B be two sets, Cartesian product **A × B** is the set of all ordered pair ofelements from A and B $A \times B = \{\{x, y\} : x \in A, y \in B\}$

→Let A = {a, b, c} and B = {d, e, f} The Cartesian product of two sets is
A x B = {{a, d}, {a, e}, {a, f}, {b, d}, {b, e}, {b, f}, {c, d}, {c, e}, {c, f}}

→In general, if there are m elements in set A and n elements in B, the number of element's inthe Cartesian Product is **m x n**

Example :

Input : A = {1, 2}, B = {3, 4}
Output : A × B = {{1, 3}, {1, 4}, {2, 3}, {2, 4}}

Algorithm:-

Step 1: Start
Step 2: read array of elements AA =[1,2,3]
Step 3: read array of elements BB=[4,5,6]
Step 4: call cart(A,B, length of A, length of B)
Step 5: Stop

Algorithm for Procedure cart(A,B,Alen,Blen)
Step 1: for(I=0 to A_len)for(j=0 to B_len)
Print (I,j)
Step2: return

//Java program to find Cartesian Product Two Sets

```
import java.io.*;
importjava.util.*;
class GFG {
  static void findCart(int arr1[], int arr2[],
                       int n1, int n2)
  {
    for (int i = 0; i < n1;
     i++) for(int j = 0; j <
     n2; j++)
      System.out.print("{"+ arr1[i]+", " + arr2[j]+"}, ");
  }
  // Driver code
  public static void main (String[] args) {

    // first set
    int arr1[] = { 1, 2, 3 };

    // second set
    int arr2[] = { 4, 5, 6 };

    int n1 = arr1.length;int n2
    =  arr2.length;
    findCart(arr1, arr2, n1,
    n2);
  }
}
```

Out put:

{(1,4) (1,5) (1,6) (2,4) (2,5) (2,6) (3,4) (3,5) (3,6) }

5. Java program to print the give Number in Reverse Order using Recursion

Aim:- Java to print the given number in Reverse order using Recursion

Description:- Recursion is a process by which a function calls itself repeatedly till it falls under the base condition and our motive is achieved.

To solve any problem using recursion, we should simply follow the below steps:

- ✓ Assume the smaller problem from the problem which is similar to the bigger/original problem.
- ✓ Decide the answer to the smallest valid input or smallest invalid input which would act as our base condition.
- ✓ Approach the solution and link the answer to the smaller problem given by recursive function to find the answer to the bigger/original problem using it.
- ✓

Example: Suppose, we want to reverse the number 1234.

In this example, we have taken three variables named number (the number to be reversed), remainder (stores the remainder), reverse (stores the reverse number) initialized 0.

Iteration 1:

number = 1234
remainder = 1234 % 10 = 4
reverse = 0 * 10 + 4 = 0 + 4 = 4
number = 1234 / 10 = 123

Now the value of the number and reverse variable is 123 and 4, respectively.

Iteration 2:

number = 123
remainder = 123 % 10 = 3
reverse = 4 * 10 + 3 = 40 + 3 = 43
number = 123 / 10 = 12

Now the value of the number and reverse variable is 12 and 43, respectively.

Iteration 3:

number = 12
remainder = 12 % 10 = 2
reverse = 43 * 10 + 2 = 430 + 2 = 432
number = 12 / 10 = 1

Now the value of the number and reverse variable is 1 and 432, respectively.

Iteration 3:

number = 1

remainder = 1 % 10 = 1

reverse = 432 * 10 + 1 = 4320 + 1 = 4321

number = 1 / 10 = 0

Now the variable number become 0. Hence, we get the reverse number **4321**.

Algorithm:-

Step 1:

Create a reverse(int n), a recursive function of void type.

Step 2:

Base condition will be : if (n <10) , then print(n) and return.

Step 3:

Otherwise, print(n%10) and call function reverse(n/10).

// Program

```
import java.util.Scanner;
public class ReverseNumber
{
//method for reverse a number
public static void reverseNumber(int number)
{
if (number < 10)
{
//prints the same number if the number is less than 10
System.out.println(number);
return;
}
else
{
System.out.print(number % 10);
reverseNumber(number/10);
}
}
public static void main(String args[])
{
System.out.print("Enter the number that you want to reverse: ");
Scanner sc = new Scanner(System.in);
int num = sc.nextInt();
System.out.print("The reverse of the given number is: ");
//method calling
reverseNumber(num);
}
}
```

Output:

```
Enter the number that you want to reverse: 76541
The reverse of the given number is: 14567
```

6.Net Present Value (NPV) and Internal Rate of Return (IRR) Financial Function in Excel

Aim : To demonstrate Net Present Value(NPV) and Internal Rate of Return (IRR) financial function inMs excel

Description:

Net Present Value(NPV) financial function is the sum total of positive and negative cash flows overthe years.Here's how we will represent it in excel

Formula

NPV = (Rate, Value 1, *Value 2+, *Value 3+…)

- Rate = Discount rate for a period
- Value 1, *Value 2+, *Value 3+… = Positive or negative cash flows
- Here, negative values would be considered as payments, and positive values would betreated asinflows.

Procedure:

Step1: Open Microsoft Excel

Step2: Create a table with 2 columns and enter data

Details	In US $
Rate of Discount	5%
Initial Investment	-1000
Return from 1st year	300
Return from 2nd year	400
Return from 3rd year	400
Return from 4th year	300

Step3: Select Formulas From Menubar

Choose Financial Functions Choose the Function NPV

Step4: Now enter the values from data **=NPV (5%, B4:B7) + B3** to Generatethe Result

IRR is used to understand whether any new project or investment is profitable or not, the firm uses IRR. Fullform of IRR is **Internal Rate of Return**

Formula :

IRR = (Values, [Guess])

- Values = Positive or negative cash flows (an array of values)
- [Guess] = An assumption of what you think IRR

should beStep1: Open Microsoft Excel

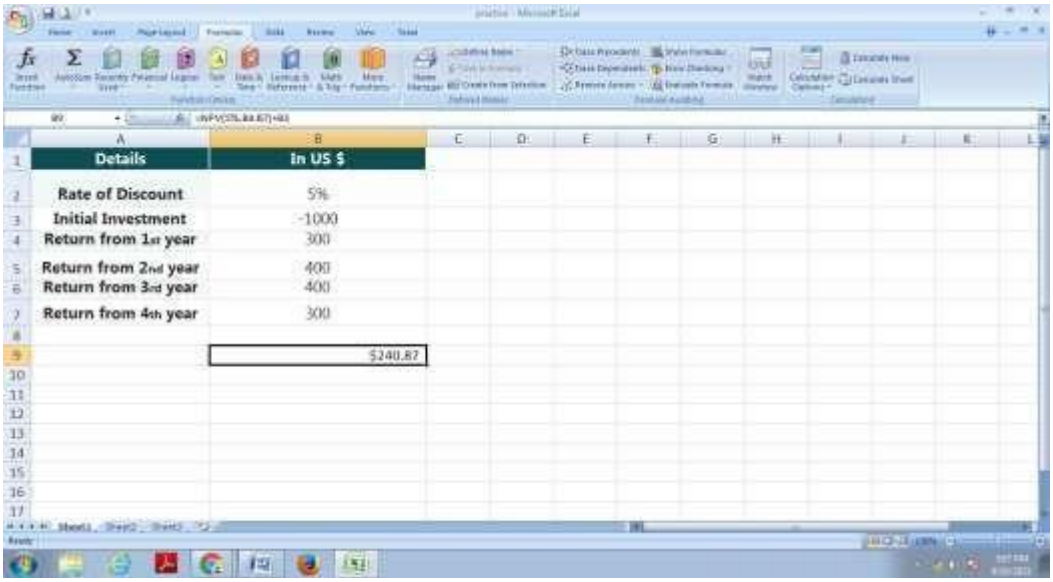
Step2: Create a table with 2 columns and enter data

Details	In US $
Initial Investment	-1000
Return from 1st year	300
Return from 2nd year	400
Return from 3rd year	400
Return from 4th year	300

Step3: Select Formulas From Menu bar Choose Financial Functions Choose the Function IRR

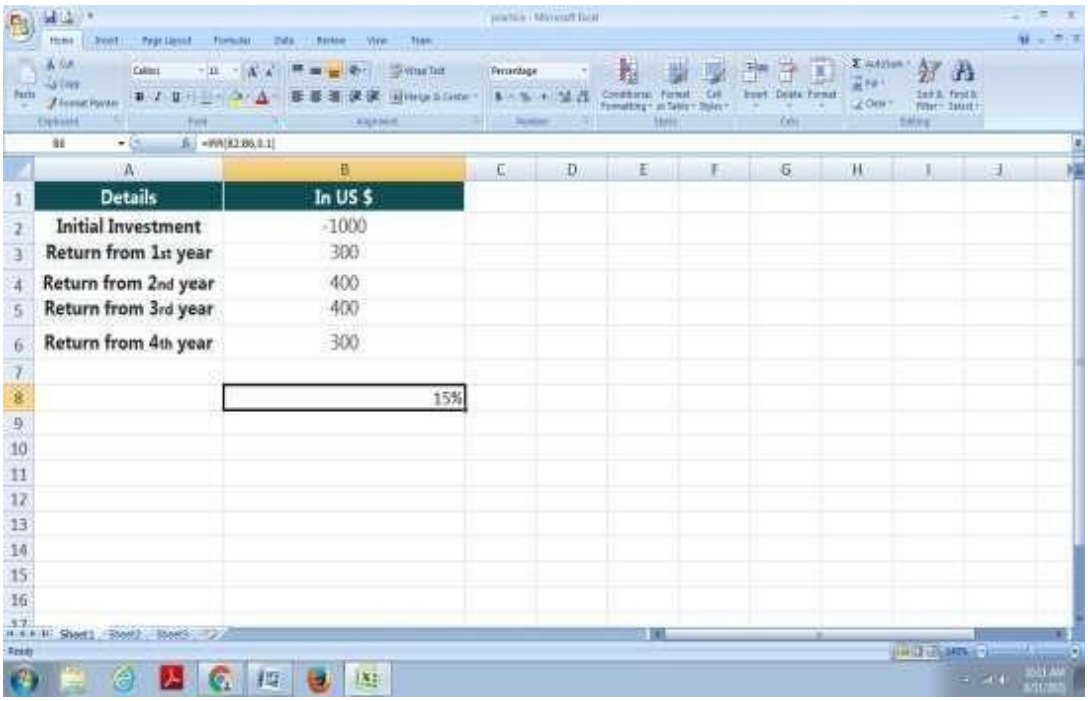
Step4: Now enter the formula **= IRR (Values, [Guess])** to Generate the Result

NPV result:



Details	In US $
Rate of Discount	5%
Initial Investment	-1000
Return from 1st year	300
Return from 2nd year	400
Return from 3rd year	400
Return from 4th year	300
	$240.87

IRR result:



Details	In US $
Initial Investment	-1000
Return from 1st year	300
Return from 2nd year	400
Return from 3rd year	400
Return from 4th year	300
	15%

7. NPER and EFFECT Financial Function in Ms Excel

Aim: To demonstrate **NPER and EFFECT** Financial Function in Ms excel
Description:
It is simply the number of periods one requires to pay off the loan.
NPER = (Rate, PMT, PV, [FV], [Type])

- Rate = It is the interest rate/period
- PMT = Amount paid per period
- PV = Present Value
- [FV] = An optional argument which is about the future value of a loan (if nothing is mentioned, FV isconsidered as “0”)
- *Type+ = When the payment is made (if nothing is mentioned, it’s assumed that the payment has beenmade at the end of the period)

Procedure:
Step1: Open Microsoft Excel
Step2: Create a table with 2 columns and enter data

Details	In US $
RATE	10%
PMT	-200
LOAN	1000

Step3: Select Formulas From Menu bar Choose Financial Functions

Choose the FunctionNPER

Step4: Now enter the formula **= NPER = (Rate, PMT, PV, [FV], [Type])** to Generate the Result

EFFECT function:

Through the **EFFECT function**, we can understand the effective annual interest rate. When we have the nominal interest rate and the number of compounding per year, it becomes easy to find out the effectiverate.

Formula :

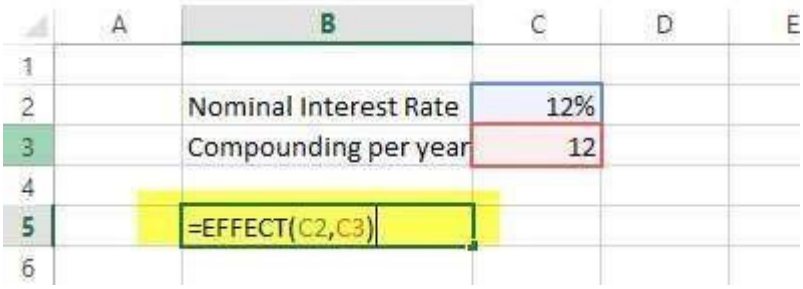
EFFECT = (Nominal_Rate, NPERY)

- **Nominal_Rate = Nominal Interest Rate**
- **NPERY = Number of compounding per**

yearProcedure :

Step1: Open Microsoft Excel

Step2: Create a table with 2 columns and enter data

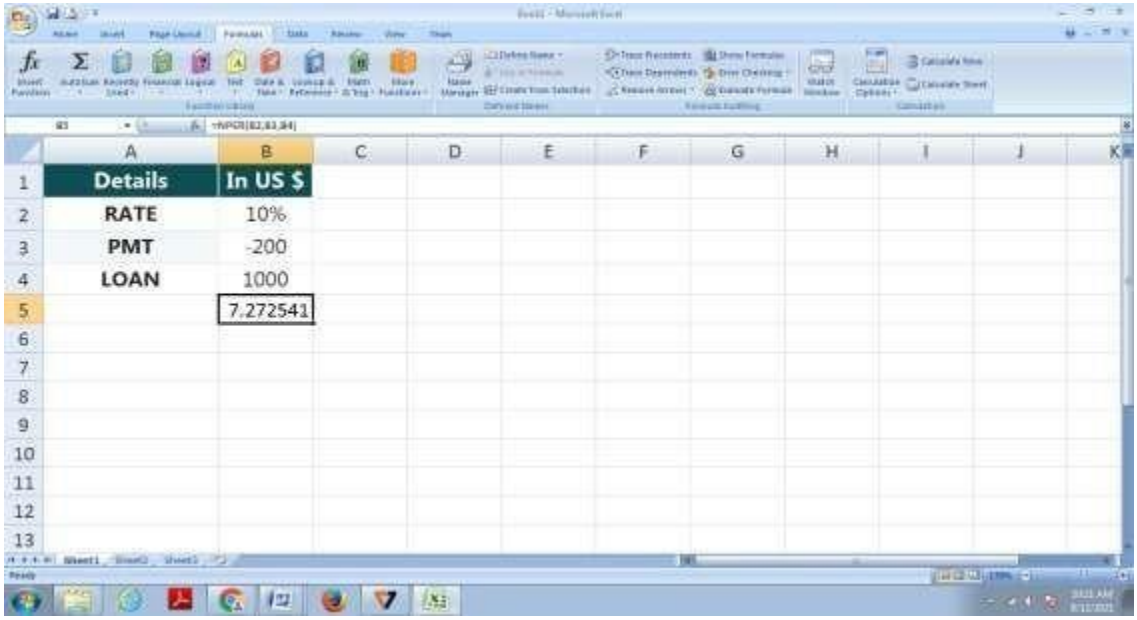


Step3: Select Formulas From Menu bar Choose Financial Functions

Choose the Function EFFECT

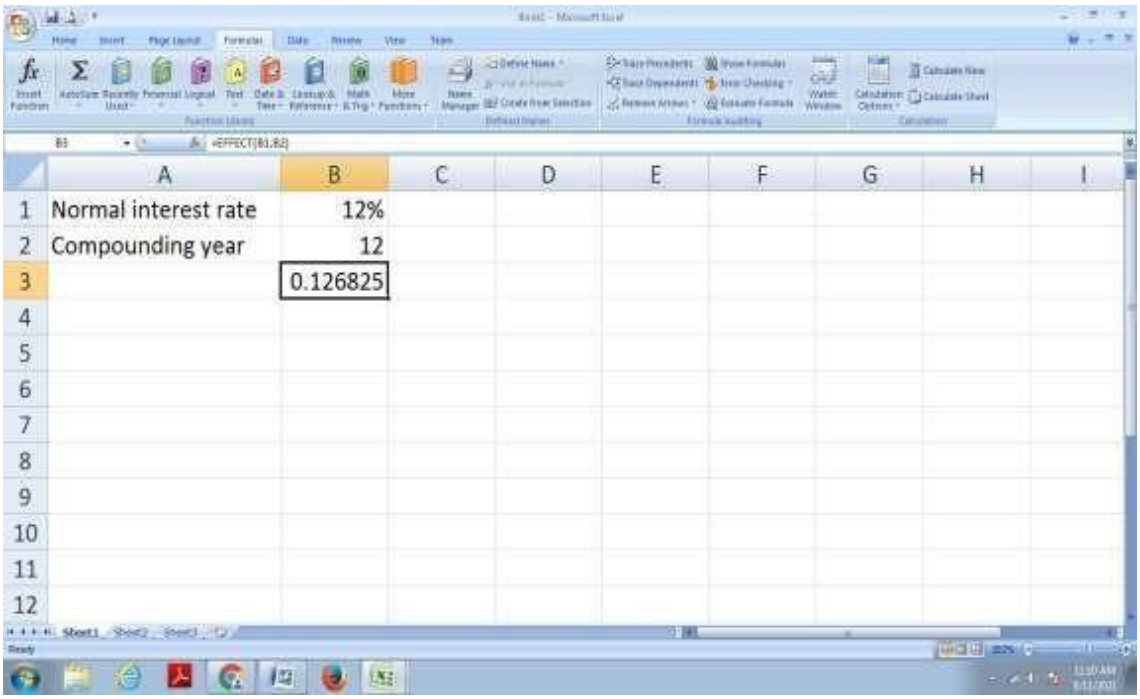
Step4: Now enter the formula **= EFFECT = (Nominal_Rate, NPERY)** to Generate the Result

NPER result:



	A	B
1	Details	In US $
2	RATE	10%
3	PMT	-200
4	LOAN	1000
5		7.272541

EFFECT result:



	A	B
1	Normal interest rate	12%
2	Compounding year	12
3		0.126825

8.SLN and NOMINAL Financial Function in Ms Excel

Aim : To demonstrate SLN and NOMINAL financial function in Ms excel

Description:

Through the SLN function, we can calculate depreciation via a straight-line method.

In excelSLN = (Cost, Salvage, Life)

- Cost = Cost of an asset when bought (initial amount)
- Salvage = Value of asset after depreciation
- Life = Number of periods over which the asset is being depreciated

Procedure:

Step1: Open Microsoft Excel

Step2: Create a table with 2 columns and enter data

COST OF MACHINARY	500000
SOLVAGE VALUE	300
YEARS	10

Step3: Select Formulas From Menu bar Choose Financial Functions Choose the Function **SLN**

Step4: Now enter the formula **SLN = (Cost, Salvage, Life)** to Generate the Result

NOMINAL FUNCTION:

When we have an effective annual rate and the number of compounding periods per year, we can calculatethe NOMINAL rate for the year.

NOMINAL = (Effect_Rate, NPERY)

- Effect_Rate = Effective annual interest rate
- NPERY = Number of compounding per year

Procedure:

Step1: Open Microsoft Excel

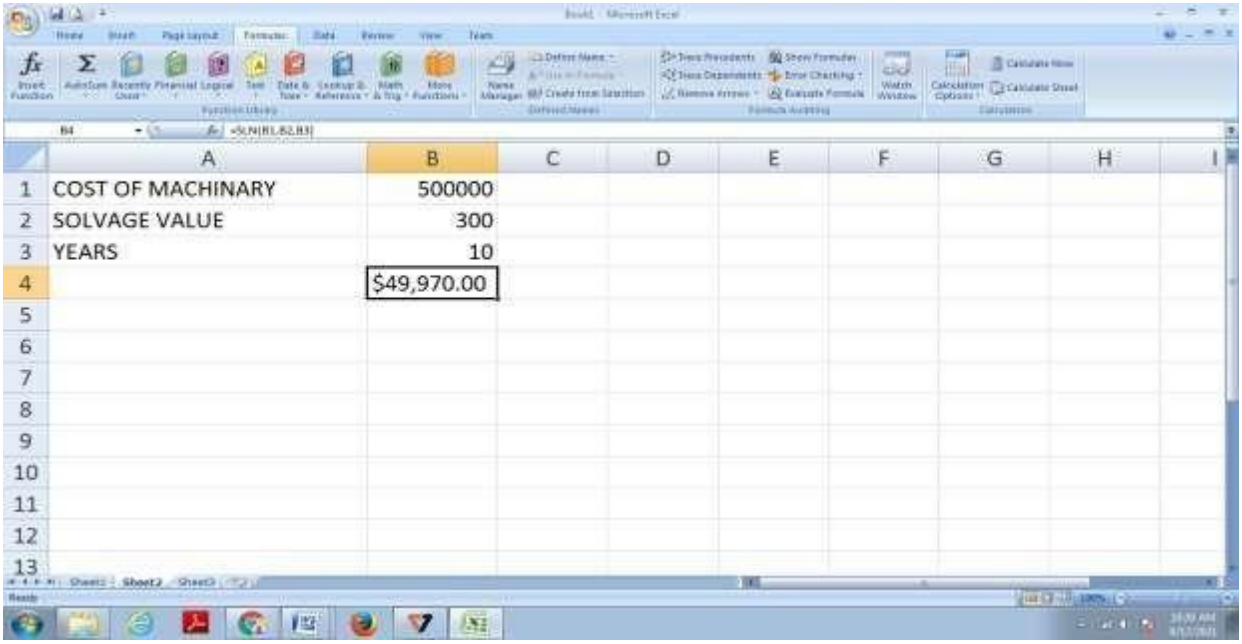
Step2: Create a table with 2 columns and enter data

Effective interest rate	12%
compounding per year	12

Step3: Select Formulas From Menu bar Choose Financial Functions Choose the Function **NOMINAL**

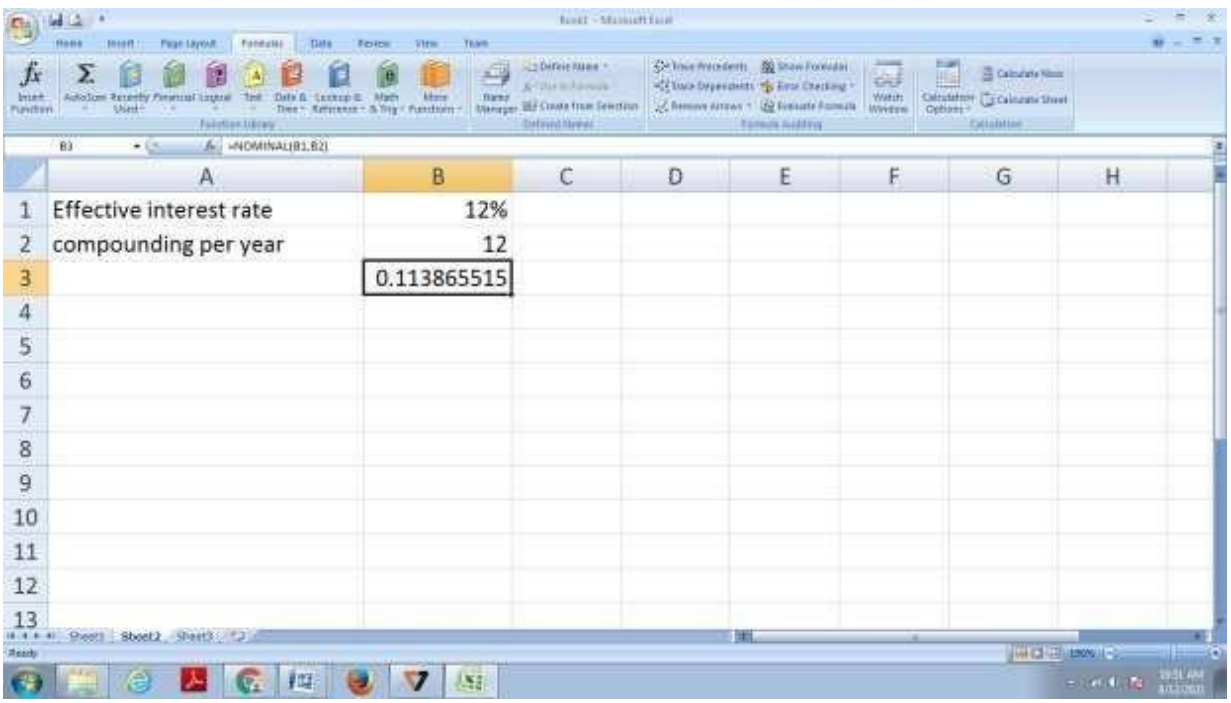
Step4: Now enter the values for **NOMINAL = (Effect_Rate, NPERY)** to Generate the Result

SLN Result



	A	B
1	COST OF MACHINARY	500000
2	SOLVAGE VALUE	300
3	YEARS	10
4		$49,970.00

NOMINAL Result:



	A	B
1	Effective interest rate	12%
2	compounding per year	12
3		0.113865515

9. Future Value (FV) Financial Function in Excel

Aim : to demonstrate future value inExcel

Description: To find out the future value of a particular investment which has a constant interest rate and periodic payment, use the following formula

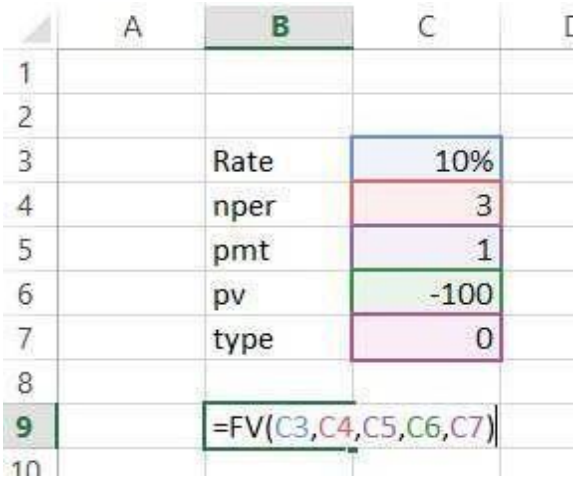
FV (Rate, Nper, [Pmt], PV, [Type])

- Rate = It is the interest rate/period
- Nper = Number of periods
- [Pmt] = Payment/period
- PV = Present Value
- *Type+ = When the payment is made (if nothing is mentioned, it's assumed that the payment has been made at the end of the period)

Procedure:

Step1: Open Microsoft Excel

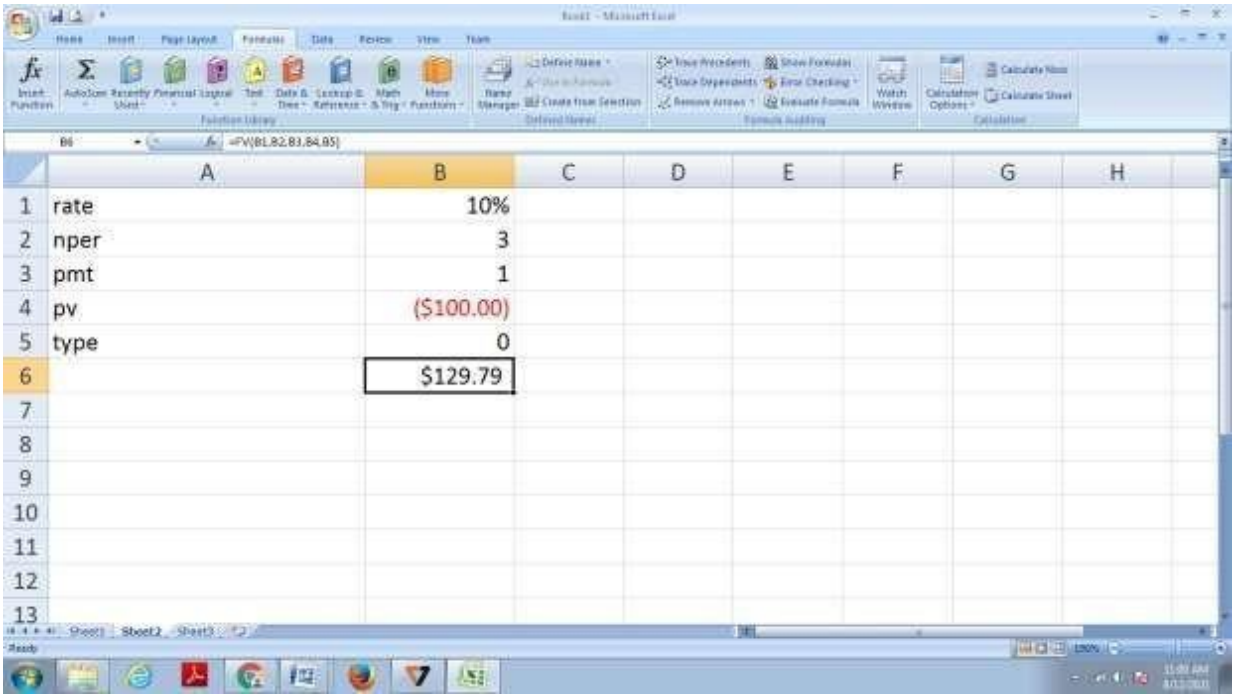
Step2: Create a table with 2 columns and enter data



Step3: Select Formulas From Menu bar

Choose Financial Functions Choose the Function **FV**

Step4: Now enter the values **FV (Rate, Nper, [Pmt], PV, [Type])** for to Generate the Result


=PV(B1,B2,B3,B4,B5)
A
B
C
D
E
F
G
H
1 rate 10%
2 nper 3
3 pmt 1
4 pv ($100.00)
5 type 0
6 $129.79
7
8
9
10
11
12
13

10. Write a Program in Java for Addition of Two Binary Numbers

Aim: To write a program to Add two binary numbers and to subtract two binary numbers.

Description : Binary number system has only two symbols 0 & 1 so a binary numbers consists of only 0's and 1's. Before we write a program for addition.In this program we are using Scanner to get the input from user (user enters the two binary numbers that we need to add and subtract).

Procedure (Addition of two binary numbers) :

Step1:start

Step2:Initialize the variables to hold the binary inputs.

Int i=0,carry=0

Step3:To read the i/p binary numbers entered by users.

Scanner scanner =new Scanner

(system. in)Step4:Next,getting first and

secondbinary numbers.

b1=Scanner.next

Long

b2=Scanner.next

Long

Step4:close the scanner after use to avoid memory leak.

Scanner.close()

Step5:we are adding them bit by bit using while loop and storing the result in an array.

Step6:Stop

//Java program for addition of two binary numbers

Source code:

```
import
java.util.Scanner;
public class Addition
{
public static void main (String[] args)
{
long b1,b2;
int i=0,carry=0;
int[] sum=new int[10];
Scanner scanner=new Scanner(System.in);
System.out.println("enter first binary
number:");b1=scanner.nextLong();
System.out.println("enter second binary
number:");b2=scanner.nextLong();
scanner.close();
while(b1!=0||b2!=
0)
{
        sum[i++]=(int)((b1%10+b2%10+carry)%2);
carry=(int)((b1%10+b2%10+carry)/2);
b1=b1/10
;
b2=b2/10
;
}
if(carry!=0)
{
sum[i++]=carry;
}
--i;
System.out.println("output:
");while(i>=0)
{
System.out.print(sum[i--]);
}
System.out.print("\n");
}
}
```

OUTPUT
:
Enter first binary number:11100
Enter second binary
number:10101Output:110001

11. Write a Program in Java for subtraction of Two Binary Numbers

Procedure(subtraction of two binary numbers) :

Step1:Start Step2:Initialize thevalues

String first=scnr.nextLine()String second=scnr.nextLine()

Step3:To take the difference between twostrings.

String Difference=subtract(first,second)

Step4: Calculate sum by first converting binary string to Binay number than subtracting by using binaryarithmetic.

Int sum=b1-b2Step5: return Integer.to Binary String(sum)

Step6:Stop

// Java program for subtraction of two binary numbers

Source code:

```
Importjava.util.Scanner; public class Main {
public static void main(String[] args) {
System.out.println("Welcome to Java program to add
two binarynumbers");Scanner scnr=new
Scanner(System.in);
System.out.println("Please enter first binary number");
String first=scnr.nextLine();
 System.out.println("Please enter second binarynumber");
String  second =scnr.nextLine();
String difference =subtract(first, second);
System.out.println("difference between two binary number is :"+difference);
scnr.close();
}
public static String subtract(String first,
Stringsecond) {int b1
=Integer.parseInt(first, 2);
int b2
=Integer.parseInt(second
,2);int sum = b1 - b2;
return Integer.toBinaryString(sum);
}
}
```

OUTPUT:

```
Welcome to Java program to add
two binary numbersPlease enter the
first binary number110101
Please enter the second
binarynumber100101
Difference between two binary number is:10000
```

12 .Write a program to demonstrate Multiplication of two binary numbers?

Aim:To Write a program to Multiply two binary numbers.

Description :In digital electronics and mathematics, a binary number is a number expressed in the base-2numeralsystem or binary numeral system. This system uses only two symbols: typically 1 (one) and 0 (zero).

Procedure :

Step1:start

Step2:Initialize the variables multiplier and multiplicands.

Sum[i++]=(b1%10+b2%10+rmndr)%2

rmndr=(b1%10+b2%10+rmnd2

Step3:If(rmndr!=0)

sum[i++]=rmndr--i

Step4:Now least significant bits of multiplier is checked.

if it is 1 add the content of registerA with multiplicandregisterBand result is assigned in A

Reg with carry bit.

Step5:content of EAQ is shifted to right by one position. i,e content of E is shifted to most most significantbit(MSB).

Step6:If the qn=0 only shift right operation on content of EAQ is performed in a decremented by 1.

Step7:content of sequence counter is decremented by 1.

Step8:check the content of sequence counter (SC) .if it is 0 end the process and final product is present in theregister Aand Q else repeat the process.

Step9:stop

//Write a java program for multiplication of two binary numbers

Source code:

```
import java.util.Scanner;
public class Main1 {
static long calc(long b1, longb2)
{
int i = 0;
long rmndr =0; long result= 0;
long[] sum = new long[20];while(b!= 0 || b2 != 0)
{
//actual multiplying process-heart of thisprogram
sum[i++] = (b1 % 10 + b2 % 10 + rmndr) % 2;
rmndr = (b1 % 10 + b2 % 10 +rmndr) / 2;
b1 = b1 /10;
b2 = b2/ 10;
}
if(rmndr != 0)
{
sum[i++] = rmndr;
}  --i;
while(i >= 0)
{//forming  theresultresult = result * 10 +sum[i--];
}
return result;
}
public static void main(String[]args)
{
long b1, b2, m = 0;
long d, f = 1;
Scanner sc = new Scanner(System.in);
System.out.println("Enter A: ");
b1 = sc.nextLong();
 System.out.println("\nEnter B: ");
b2 = sc.nextLong();
while(b2 != 0)
{    d = (b2 %10);
if(d == 1){ b1 = b1 *  fm = calc(b1, m);
```

```
}
else
{
b1 = b1 * f;
}
b2 = b2 /10;f = 10;
}
System.out.println("\nA X B is: " + m + "\n");
}
}
```

OUTPUT:

```
Enter A: 11100
Enter B: 10101
 A X B is: 1001001100
```

13 Write a program to demonstrate division of two binary numbers

Aim: To Write a program to demonstrate division of two binary numbers.

Description: Multiplication of two fixed point binary number in signed magnitude representation is done with processof successive shift and add operation. In the multiplication process we are considering successive bits of the multiplier, least significant bit first. If the multiplier bit is 1, the multiplicand is copied down else 0's are copied down. The numbers copied down in successive lines are shifted one position to the left from the previous number. Finally numbers are added and their sum form the product. The sign of the product is determined from the sign of the multiplicand and multiplier. If they are alike, sign of the product is positive else negative.

Procedure :

Step1:start

Step2:Initialize the scanner it is used for obtaining the input of the primitive types like int , double etc.Scanner scan=new Scanner(system.in);

Step3:Next,here the integer.parseint() method will convert the string value to the integer by

treatingthem as a binary number. Int dividend=Integer.parseInt(scan.nextLine(7,2))

Step5:Next,if the divisor is not equal to zero then enter into the strings quotient, remainder to read the values.String quotient=Integer.toBinaryString((dividend/divisor))

Step6:printthe quotient and remainder values

Step7:stop

Write a java program for division of two binary numbers

Source code:

```
import java.util.*;
public classMain{
public static void main(String[]args)
{
Scanner scan = new Scanner(System.in);
 System.out.println("Enter dividend:");
/*Iteger.parseInt() method will convert the string
value tothe integer by treating them as a binary
number*/
int dividend = Integer.parseInt(scan.nextLine(),2);
System.out.println("\nEnter divisor: ");
int divisor = Integer.parseInt(scan.nextLine(),2);
if(divisor!=0)
{

}
else

}
}
 String quotient = Integer.toBinaryString((dividend/divisor));
       String remainder = Integer.toBinaryString((dividend%divisor));
      System.out.println("\nquotient is: "+quotient+" and remainder is:"+remainder);
     System.out.println("\ndivisor can't be zero!");
```

OUTPUT:

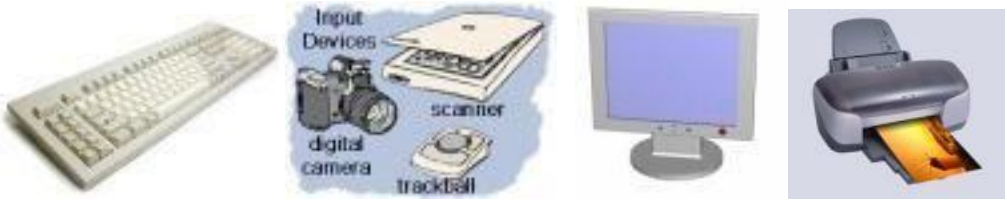
```
Enter dividend:
01000
Enter divisor:
100
Quotient is: 10 and remainder is: 0
```

14 Computer Hardware Basics

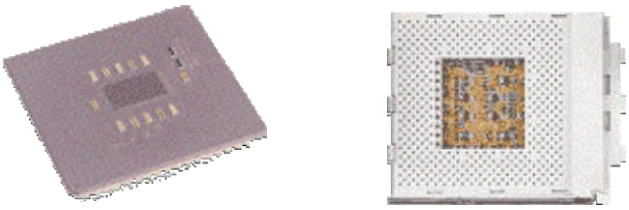
The Computer

A computer is made up of many parts:

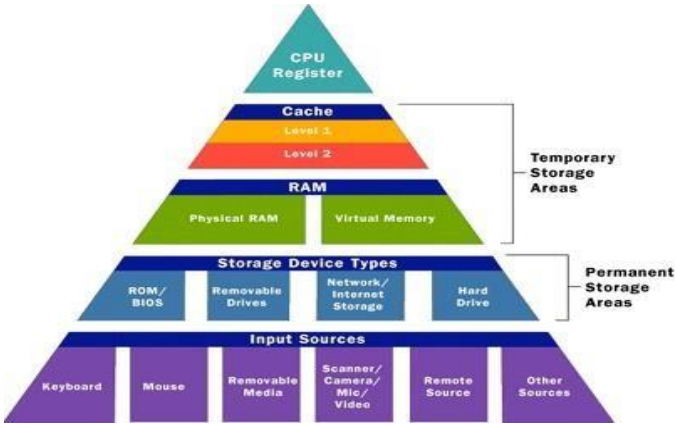
1. **Input/Output (I/O) devices** – These allow you to send information to thecomputer or get information from the computer.



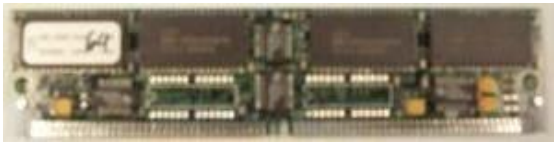
2. **Central Processing Unit** – CPU or Processor for short. The brain of a computer. Approximately 1.5 in X 1.5 in. Does all the computation/work forthe computer.



3. **Memory** – Although memory is technically any form of electronic storage, itis used most often to identify fast, temporary forms of storage. Accessing thehard drive for information takes time. When the information is kept in memory, the CPU can access it much more quickly.



a. **Random Access Memory** – RAM. Where information is stored temporarily when a program is run. Information is automatically pulled into memory, we cannot control this. RAM is cleared automatically when the computer is shutdown or rebooted. RAM isvolatile (non-permanent).



b. **Read Only Memory** – ROM. More permanent than RAM. Data stored in these chips is nonvolatile -- it is not lost when power is removed. Data stored in these chips is either unchangeable or requiresa special operation to change. The BIOS is stored in the CMOS, read-only memory.

c. **Hard Drive** – Where you store information permanently mostfrequently. This is also nonvolatile.

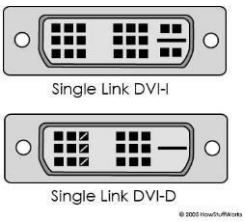
4. **Motherboard** – A circuit board that allows the CPU to interact with otherparts of the computer.

5. **Ports** – Means of connecting peripheral devices to your computer.
    a. **Serial Port** – Often used to connect a older mice, older external modems, older digital cameras, etc to the computer. The serial port has been replaced by USB in most cases. 9-pin connector. Small andshort, often gray in color. Transmits data at 19 Kb/s.

    b. **Monitor Ports –** Used to connect a monitor to the computer.

PCs usually use a VGA (Video Graphics Array) analog connector (also known as a D-Sub connector) that has 15 pins in three rows. Typicallyblue in color.

Because a VGA (analog) connector does not support the use of digital monitors, the Digital Video Interface (DVI) standard was developed.

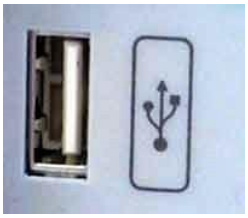


LCD monitors work in a digital mode and support the DVI format. At onetime, a digital signal offered better image quality compared to analog technology. However, analog signal processing technology has improved over the years and the difference in quality is now minimal.

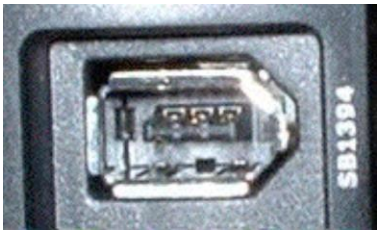
6.Parallel Port – Most often used to connect a printer to the

computer.25-pin connector. Long and skinny, often pink in color. Transmits data at 50-100 Kb/s.

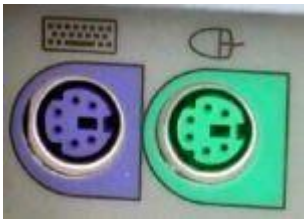
USB Port – Universal Serial Bus. Now used to connect almost all peripheral devices to the computer. USB 1.1 transmits data at 1.5 Mb/sat low speed, 12 Mb/s at fullspeed. USB 2.0 transmits data at 480 Mb/s.



c. **Firewire/ IEEE 1394 Port** – Often found on Apple Computers. Oftenused with digital camcorders. Firewire transmits data at 400 Mb/s. Firewire 1394B (the new firewire) transmits data at 3.2 Gb/s.



d. **PS/2 Port** - sometimes called a mouse port, was developed by IBM. Itis used to connect a computer mouse or keyboard. Most computers come with two PS/2 ports.



e. **Ethernet Port** – This port is used for networking and fast internet connections. Data moves through them at speeds of either 10 megabitsor 100 megabits or 1 gigabit (1,000 megabits) depending on what speed the network card in the computer supports. Little monitor lights on these devices flicker when in use.

6. **Power Supply** – Gives your computer power by convertingalternatingcurrent (AC) supplied by the wall connection todirect current (DC).

5. **Expansion Cards –** Used to add/improve functionality to the computer.
    a. **Sound Card –** Used to input and output sound under program control.Sound cards provide better sound quality than the built in sound control provided with most computers.

    b. **Graphics Card –** Used to convert the logical representation of animage to a signal that can be used as input for a monitor.

    c. **Network Card** – Used to provide a computer connection over anetwork. Transmit data at 10/100/1000 Mb/s.

6. **CD ROM –** A device used to read CD-ROMs. If capable of writing to theCD-ROM, then they are usually referred to as a ‘burner’ or CD-RW.

7. **DVD ROM –** A device that is used to read DVDs/CDs. If capable of writingto the DVD, then it is often referred to as a DVD-burner or a DVD-RW.

8. **Floppy Drive –** A device that is used to read/write to floppy diskettes.

9. **Fan** – Keeps your computer cool. If the inside of your computer becomes toohot, then the computer can overheat and damage parts.

10. **Heatsink –** Used to disperse the heat that is produced inside the

computer bythe CPU and other parts by increasing surface area.

The little parts – Capacitors – store energy, Resistors – allows a current through, Transistors – a valve which allows currents to beturned on or off.

11. **Case** – (Tower if standing upright.) What your motherboard, CPU, etc iscontained in.

The three main components of a computer:

1. **CPU** – Central Processing Unit, coordinates all actions that occur in the system,executes program instructions.
2. **Memory** – Used to store information.
3. **I/O Devices** – Input/Output devices, which allow you to obtain or display data.

15. Installation of windows 10 Operating System with BIOS Booting Options

Installation of Windows 10 Operating System with BIOS Booting Options

Part1

Booting to the Windows 10 Installer

1 Make sure your Windows 10 installation media is connected. **In order for you to install Windows 10, your Windows 10 installation file must be loaded onto a disc or flash drive, and thedisc or flash drive must be inserted into your computer.**

- If you haven't yet downloaded the Windows 10 installation tool, follow the instructionsfrom this Microsoft support page: https://www.microsoft.com/en-us/software- download/windows10

2 Open the Start menu. **Either click the Windows icon in the bottom-left corner ofthe screen, orpress the ⊞ Win key.**

3 Click the power icon. **This is the circle with a line through its top that's in thebottom-left cornerof the Start window.**

4 Click Restart. **It's in the pop-up menu above the power icon. Doing so will restart yourcomputer.**

5 Press and hold Del or F2 to enter setup.

This key may also be a different key— most computers will display a message on startup that says "Press [key] to entersetup" or somethingsimilar, so look for this message when your computer restarts to confirm the key you should press to access the BIOS.

- Consult your computer's manual or online support page to confirm your computer'sBIOS key.

6 Navigate to the Boot tab. **You'll use the arrow keys to select it.**
The **Boot** tab may instead say **Boot Options**, depending on your computer'smanufacturer.

7 Select a device from which to boot. **You have a couple of options here:**

- For a **USB flash drive**, select the **Removable Devices** option.
- For a **disc installation**, select the **CD-ROM Drive** option.

8Press the + key until your boot option is first. **Once either** Removable Devices **or** CD-ROM Drive **is at the top of the list, your computer will select your choiceas its default boot option.**

- On some computers, you'll instead press one of the function keys (e.g., F5) to navigate an option up to the top of the menu. The key will be listedon the right side of the screen.

9 Save your settings. You should see a key prompt (e.g., F10) at the bottom ofthe screen that correlates to "Save and Exit"; pressing it should save your settings and restart your computer.

- You may have to press ↵ Enter to confirm the changes.

10 Wait for your computer to restart. **Once your computer finishes restarting,** you'll see a window here with your geographical data. You're now ready to begin setting up your Windows10 installation.

Part2

Installing

11

Click Next when prompted. You can also change the options on this page (e.g., the setuplanguage) before continuing if need be.

12

Click Install Now. It's in the middle of the window.

13

Enter your Windows 10 key, then click Next. If you don't have a Windows 10 key, insteadclick **Skip** in the bottom-right corner of the screen.

14

Click the "Accept" box and click Next. This will indicate that you accept the terms of use.

15

Click Upgrade. It's at the top of the "Which type of installation do you want?" window. Thisoption installs Windows 10 while preserving your files, apps, and settings.

- You can click **Custom** instead to clean install Windows 10 on your computer. Doingso will prompt you to select a partition to format before continuing.

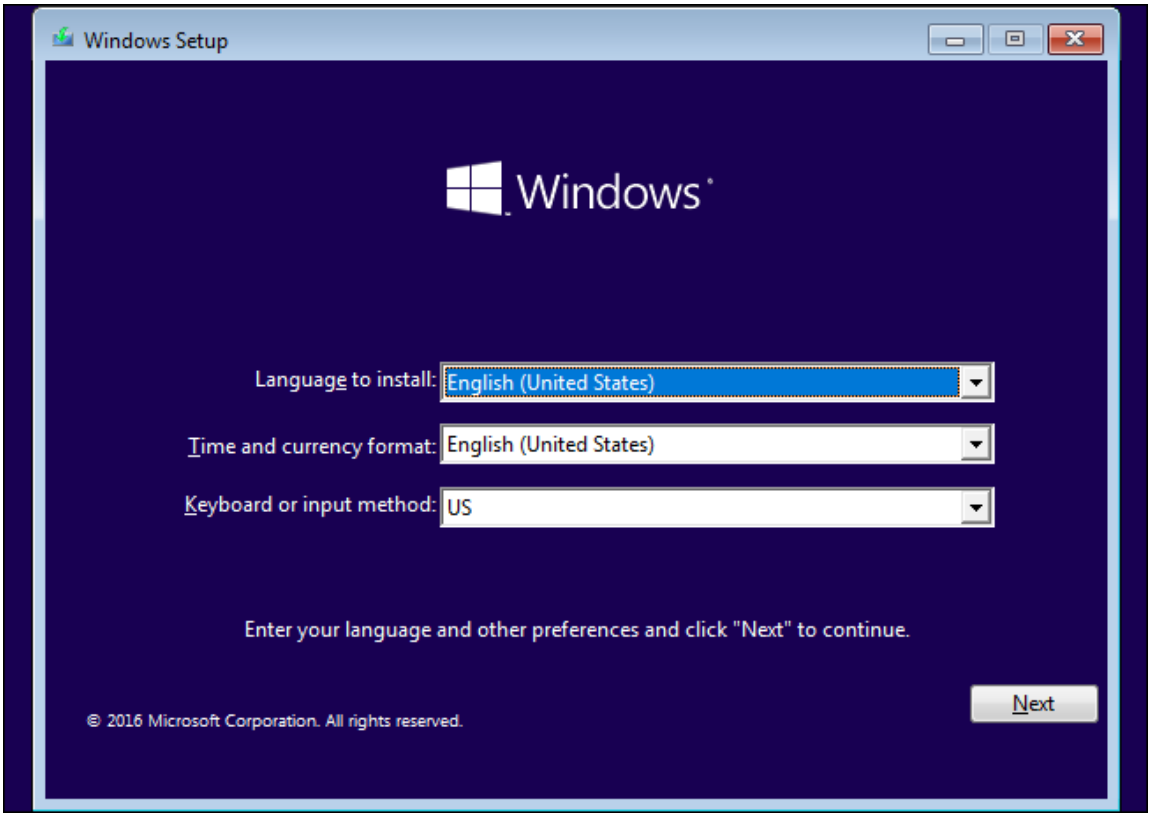
16 Wait for Windows 10 to install. This process may take anywhere from half an hour to severalhours, depending on your computer's previous operating systemand processing speed.

- If prompted to press a key in order to boot from a CD, *do not press a key*.

17 Follow the on-screen setup instructions. **Once Windows 10 has been installed on your computer, you'll be able to customize its settings (e.g., yourregion, your preferred language,location settings, etc.). Once you finish this process, you will be taken to your computer's desktop.**

- You can also click **Express Settings** to set up Windows 10 with the recommended settings.


Windows 10 Setup
Select language, architecture, and edition
Please select from one of the available options to continue.
Language
English (United States)
Edition
Windows 10
Architecture
64-bit (x64)
Use the recommended options for this PC


Windows Setup
Windows
Language to install:
English (United States)
Time and currency format:
English (United States)
Keyboard or input method:
US
Enter your language and other preferences and click "Next" to continue.
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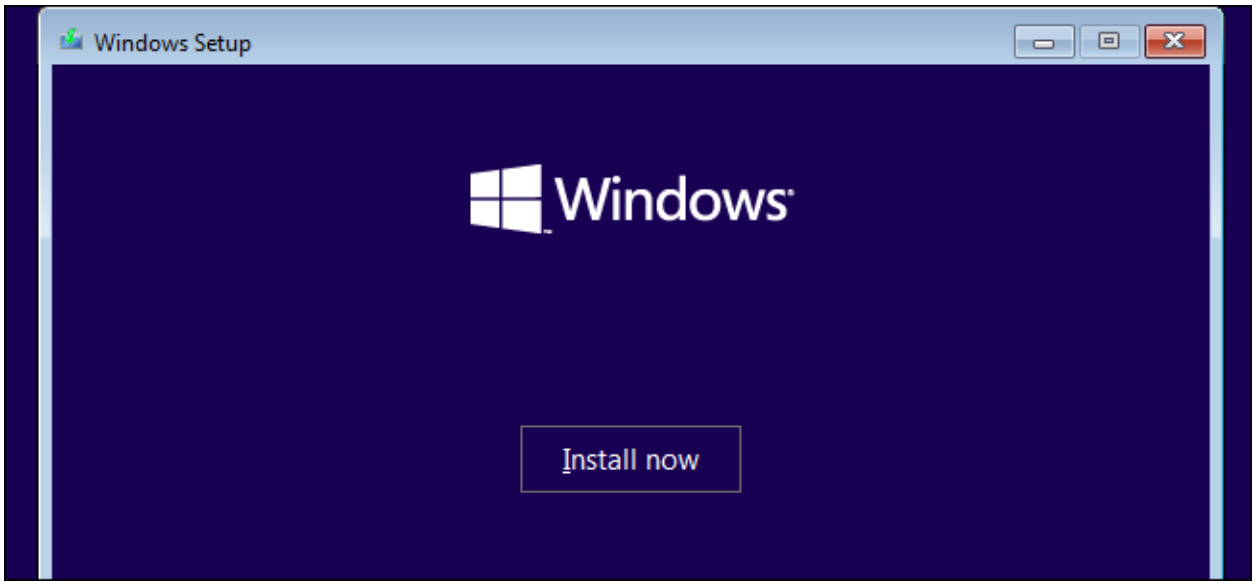
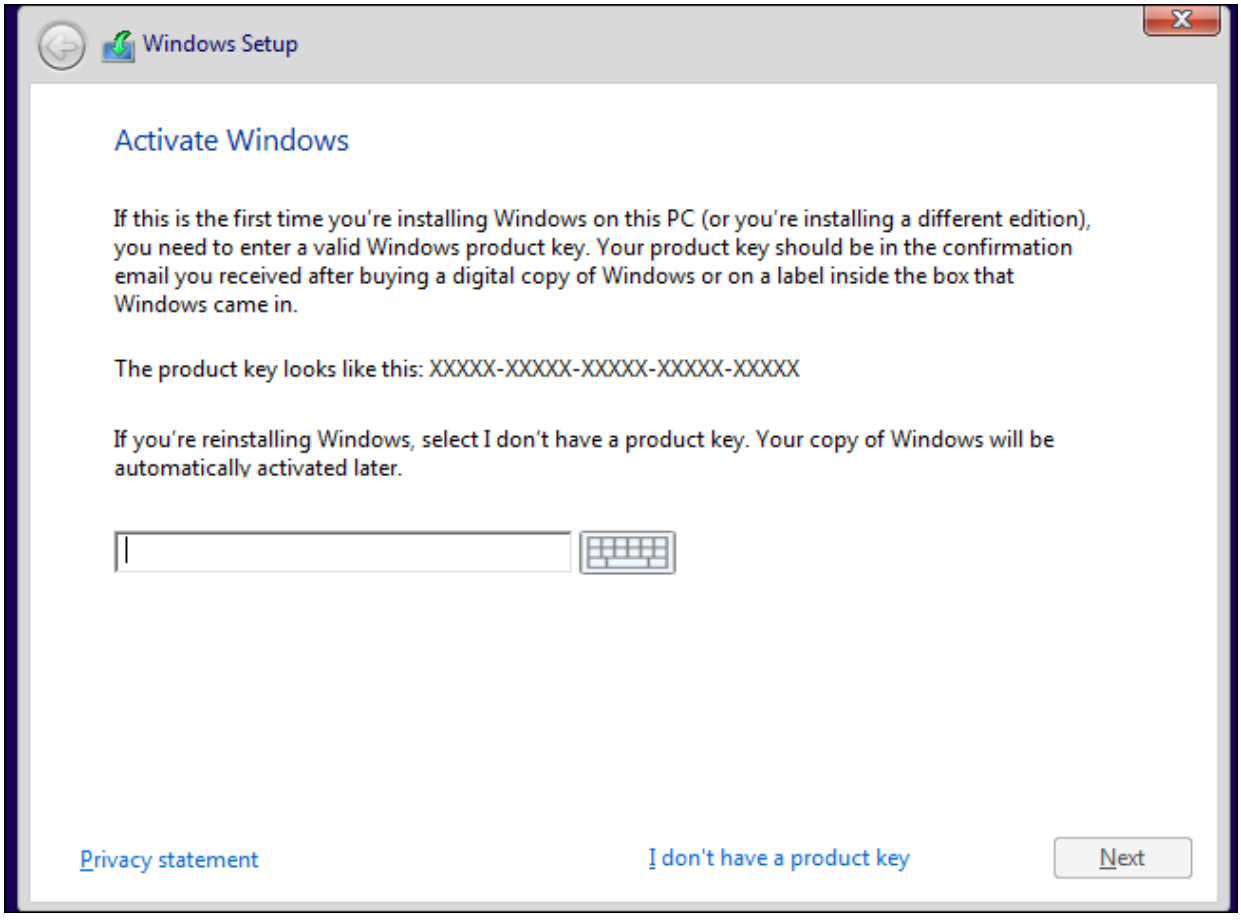
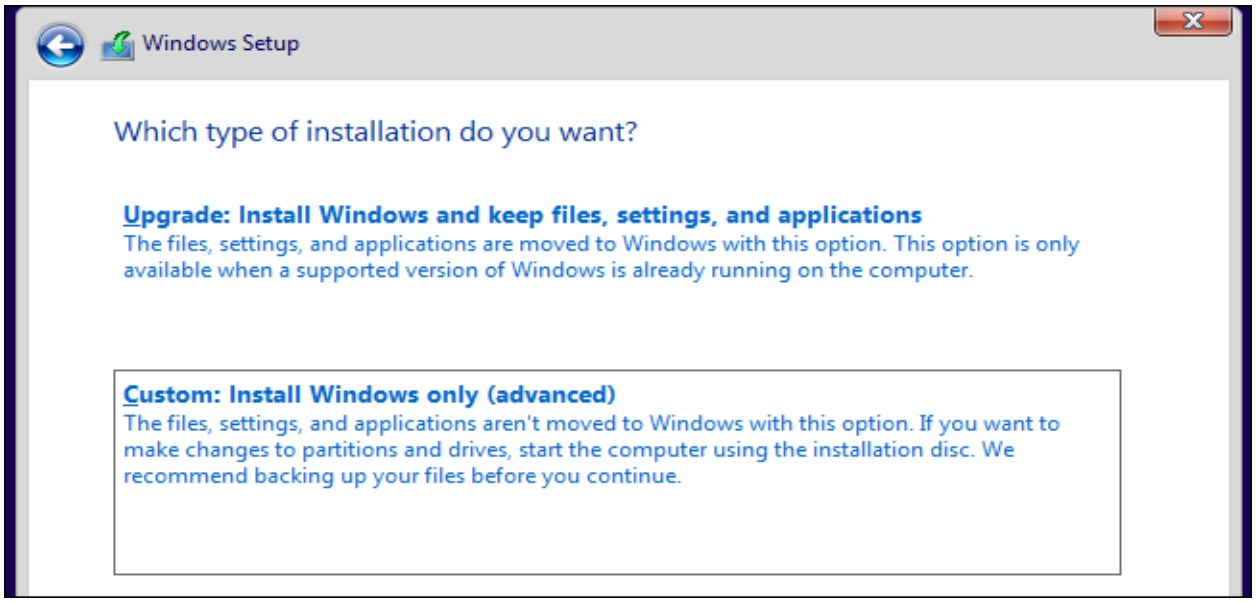
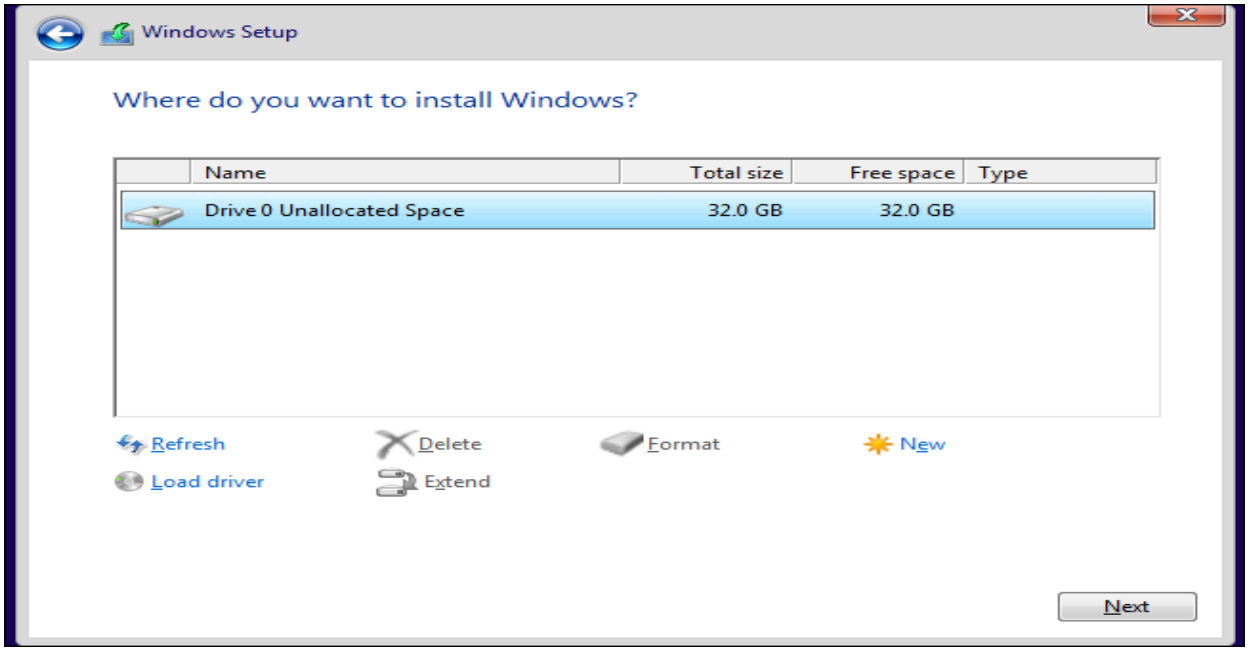
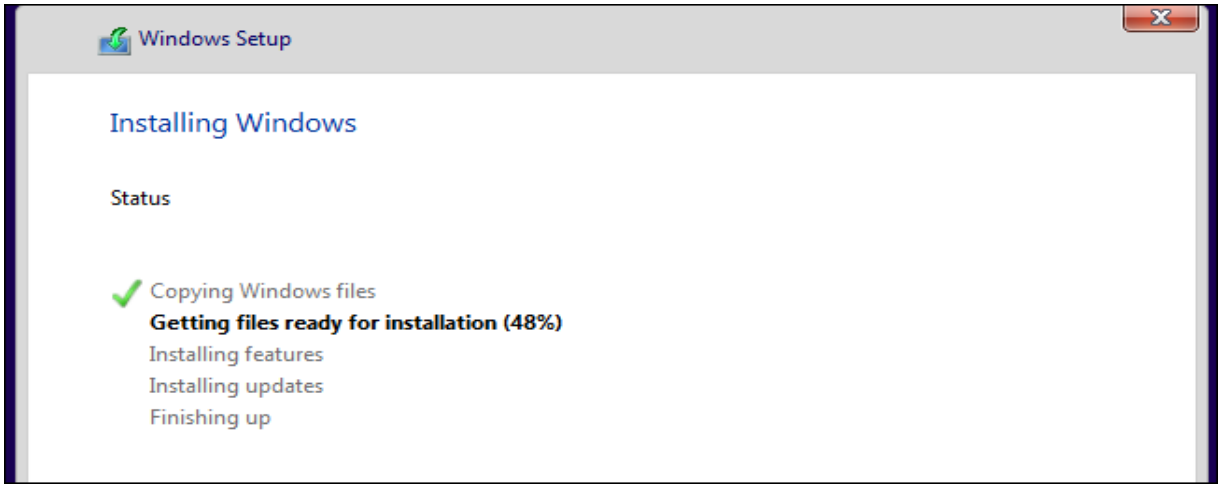
Next


Windows Setup
Windows
Install now


Windows Setup
Activate Windows
If this is the first time you're installing Windows on this PC (or you're installing a different edition), you need to enter a valid Windows product key. Your product key should be in the confirmation email you received after buying a digital copy of Windows or on a label inside the box that Windows came in.
The product key looks like this: XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
If you're reinstalling Windows, select I don't have a product key. Your copy of Windows will be automatically activated later.
Privacy statement
I don't have a product key
Next


Windows Setup
Which type of installation do you want?
Upgrade: Install Windows and keep files, settings, and applications
The files, settings, and applications are moved to Windows with this option. This option is only available when a supported version of Windows is already running on the computer.
Custom: Install Windows only (advanced)
The files, settings, and applications aren't moved to Windows with this option. If you want to make changes to partitions and drives, start the computer using the installation disc. We recommend backing up your files before you continue.


Windows Setup
Where do you want to install Windows?
Name
Total size
Free space
Type
Drive 0 Unallocated Space
32.0 GB
32.0 GB
Refresh
Delete
Format
New
Load driver
Extend
Next


Windows Setup
Installing Windows
Status
Copying Windows files
Getting files ready for installation (48%)
Installing features
Installing updates
Finishing up

15 Installation of Linux Operating System:

We normally begin the installation process by booting of the first CD, you need to have the machine switched on, so that you can open your CD-ROM drive. Insert Disk 1 of your Red Hat Linux distribution into your CD-ROM drive, and then restart the machine. The installation process should start automatically, as soon as the computer's power-on self test is complete.

If you don't get this Linux Boot screen, then it may be because your computer is not configured to boot off the CD-ROM drive by default. In this case, you may need to adjust the configuration of your machine by changing the boot sequence of your computer, so that it begins with the CD- ROM drive.

The best way to do this is to reboot your computer, and take it into the BIOS setup menu immediately after boot up. The exact way to access the BIOS setup menu varies from machine to machine, but it usually involves hitting a button such as F2 or F10 or Escape. Check your motherboard's manual if youhave it, or follow the instructions on screen immediately after the reboot.

1) Red Hat Linux Boot screen:

After configuring the system for booting from a CD, the Red Hat Linux Boot screen appears.At this point, press Enter for the graphical Setup.

2) Welcome to Red Hat:

The "Welcome to Red Hat" screen appears with the option of **Hiding the help pane** (left side) or viewingthe **Release Notes**.
Select **Next** when ready.

3) Language Selection:

The **Language Selection** screen displays all of the languages available to install Red Hat with.I chose **English** here, then **Next**.

4) Keyboard Configuration:

Keyboard Configuration is next.
Highlight the best match for your particular system. Usually, the default works best.Select **Next** when complete.

5) Mouse Configuration:

Mouse Configuration is next.
Again, highlight the best match for your particular system.Select **Next** when finished.

6) Installation type:

Selection of a standard installation type is now available.
The options include **Personal Desktop**, **Workstation**, **Server**, or

Custom.For this particular guide, I selected **Personal Desktop** and then **Next**.

7) Partitioning your system:

You are now faced with the option of automatically partitioning your system with the default values orselecting a more expert approach of choosing exactly what values each partition will be.

I chose **Automatic**, then selected **Next**.

8) Warning dialog box:

If this is a new hard drive or a hard drive that no partitions currently exist, a warning dialog box willappear. Select **Yes** to continue.

9) Automatic Partitioning:

Here are the options of deleting all Linux partitions, deleting all partitions, or keep the disk structure as italready is.

If this is a new drive, any options work just fine, but, if you already have partitions defined, as in a Multi-Boot environment, be careful as to which selection and drive volume you choose.

Also, check the **Review and modify** box at the bottom to retain control over what happens to the harddrive and view the recommended configuration.

10) New hard drive structure:

If you checked the **Review and modify** box, the new hard drive structure is displayed.This fits my purposes, so I chose **Next** to continue.

11) Boot loader options:

Boot Loader options are displayed.
If this is the only OS to be installed, I recommend to install a boot loader, such as Grub (the default). If this is part of a Multi-Boot System, I recommend to not install a boot loader and use a boot floppy, created later on in the install process, instead.

Important: If you chose to NOT install a boot loader and NOT make a boot floppy, your Red Hatinstallation will NOT work.

12) Install a boot loader:
Please view my Multi-Boot Guide for more information about Boot Floppies.

13) Network setup:

Network setup options are next.
Enter in the required information for your particular setup, here.I chose the default, **DHCP setup**, then selected **Next**.

14) Firewall setup:

Firewall setup is very important!
If this system will be connected directly to the internet, choose **High** to start out with.
If this system is already behind a hardware firewall or router, choose **Medium** as a good starting point.

15) Language Selection:

Additional Language options are also available.
Since I understand no other language besides **English**, the default was fine.

16) Time Zone Selection:

Configure your Time Zone with this display.
Being on the West Coast, Pacific Time was selected here.
Choose what is right for your location and then select **Next** to continue.

17) Create a root or administrator password:

Another important part of the installation process is to create a root or administrator password and a"normal" user account for everyday tasks.
DO NOT leave your root password as blank or easily guessable.

18) Add users:

After acceptance of your root password, select the **Add** button to create an additional account for everyday tasks. Do not worry. If at anytime you need to use the root account to change system settings,you can. You will be prompted for the password even if you are logged in as a regular user.
After creating a new account and selecting a "good" password, select the **OK** button.

19) Add as many users as you wish:

Your display could look something like this.

Add as many users as you wish, then select **Next** to continue.

20) Default package configuration:

Here, you have the option of accepting the default package configuration, or selecting exactly whatapplications and services you desire.

If you wish, you can skip this step and select **Next** as the default option and your system will beconfigured accordingly.

However, if you desire to add or subtract particular applications, choose the **Customize packages to beinstalled** button and select **Next**.

21) Selecting exactly what packages:

Here you will have the option of selecting exactly what packages and applications you wish to install.Detailed descriptions about each are also available, after selecting the check box on the left of the category, by selecting the **details** button.

Upon completing your options, select **Next** to continue.

22) Installation will now start:

Installation will now start after selecting the **Next** button.

23) Formatting of the hard drive:
Formatting of the hard drive or partitions will begin.
Depending on the size of the hard drive, this may take much time.

24) Transfer of the install image:
Transfer of the install image to the hard drive now takes place. Again, if you selected many packages, this could take some time.

25) Installation of all selected packages:
Installation of all selected packages and applications are now underway. Depending on what was selected and system configuration, this could take 15 minutes to over an hour.

26) Insert the next CD soon:
Do not go far, though, as you may be required to insert the next CD soon.

27) Boot floppy creation:
If this is the only OS to be installed, I recommend to install a boot loader previously, such as Grub (thedefault). This does NOT mean that you should forget about creating a boot floppy, also.
If this is part of a Multi-Boot System, I recommend a boot floppy, created here, and not to use a bootloader.

Important: If you chose to NOT install a boot loader and NOT make a boot floppy, your Red Hatinstallation will NOT work.
Please view my Multi-Boot Guide for more information about boot floppies.

28) Graphics card setup:
Select your graphics card setup and memory configuration here.Chose **Next** after highlighting your selection.

29) Monitor Setup:
Enter the proper values or highlight the model of your display here.After selecting the configuration for your system, chose **Next**.

30) Desktop resolution:
Choose your desktop resolution and bit-depth. Capabilities beyond your card should not be displayed.

31) Install complete:
Installation is completed and the system will reboot after selecting **Next**.

32) Grub boot loader:
Upon reboot, the Grub (if selected previously in the install process) is displayed with the option ofbooting your Linux installation.
If you opted for a boot floppy, ensure that your system is configured to boot from "A:" first, then yourhard drive, otherwise, your system may skip to your previous OS by default.

33) Boot Red Hat:

Keep in mind, while the OS is loading, Linux is famous for allowing the USER to choose exactly what,how and why everything happens.
This is not Windows.
You will see all kinds of information about the internal workings of your system.Do not be alarmed. You will come to enjoy that information in due time. :)

34) Logon:

If you opted for a graphical install screen, the **user name** prompt is displayed. Log in as one of the users you created previously (not root) and enter in your password (not blank).

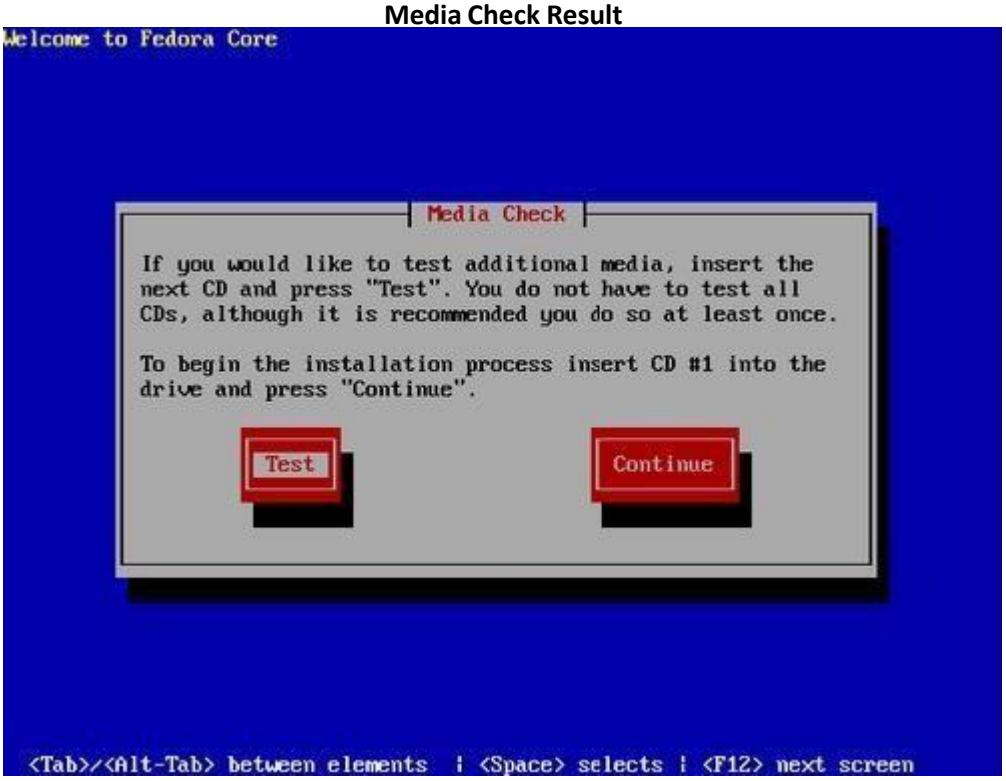
35) Gnome Desktop:

The Red Hat 8.0 default desktop is now displayed. If you selected KDE and not Gnome, your view willbe slightly different.
Remember, anything that you wish to do, you can, including messing with system files.When in doubt, think twice. :)

Boot Screen

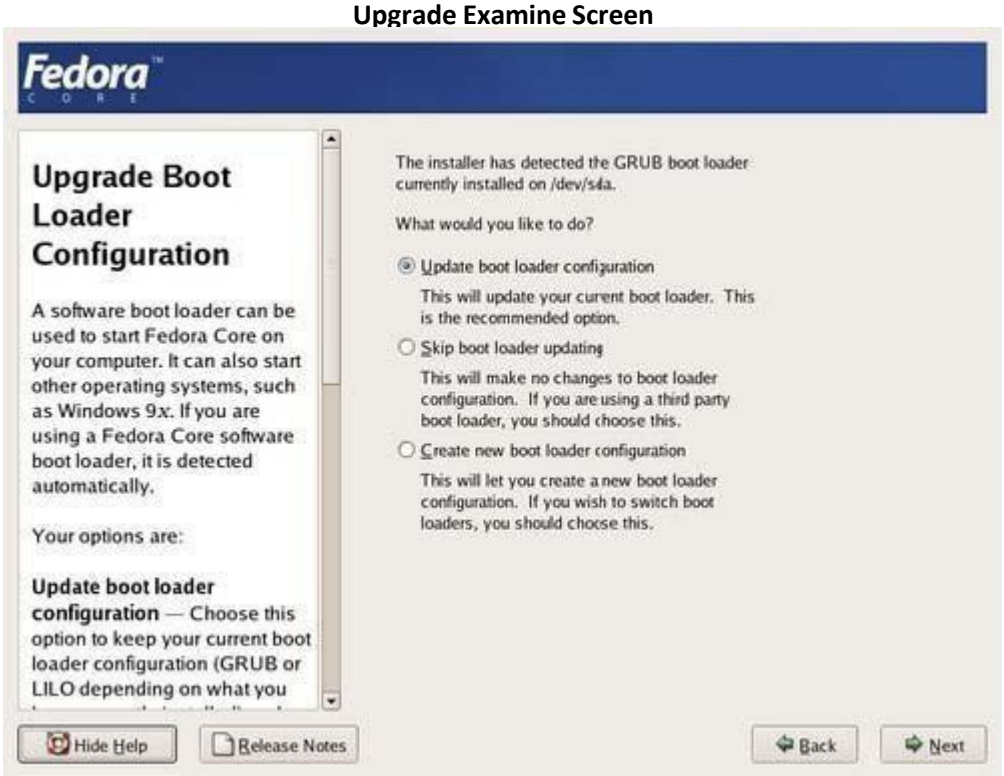
Media Test Screen

Media Check Result

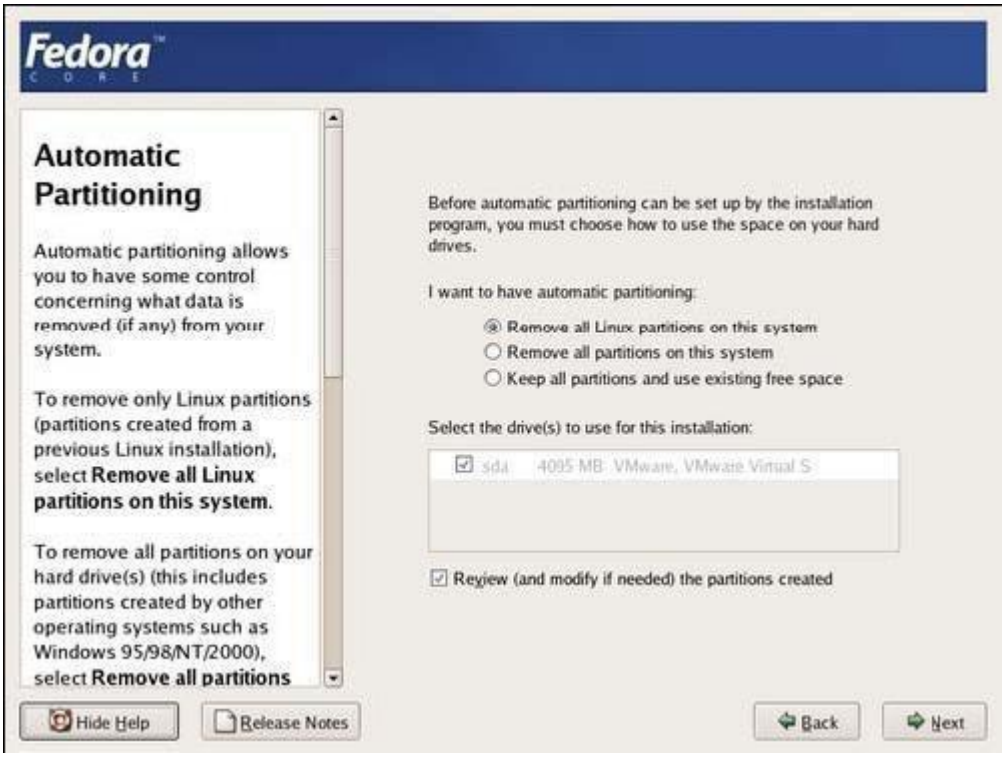


Language Selection Screen

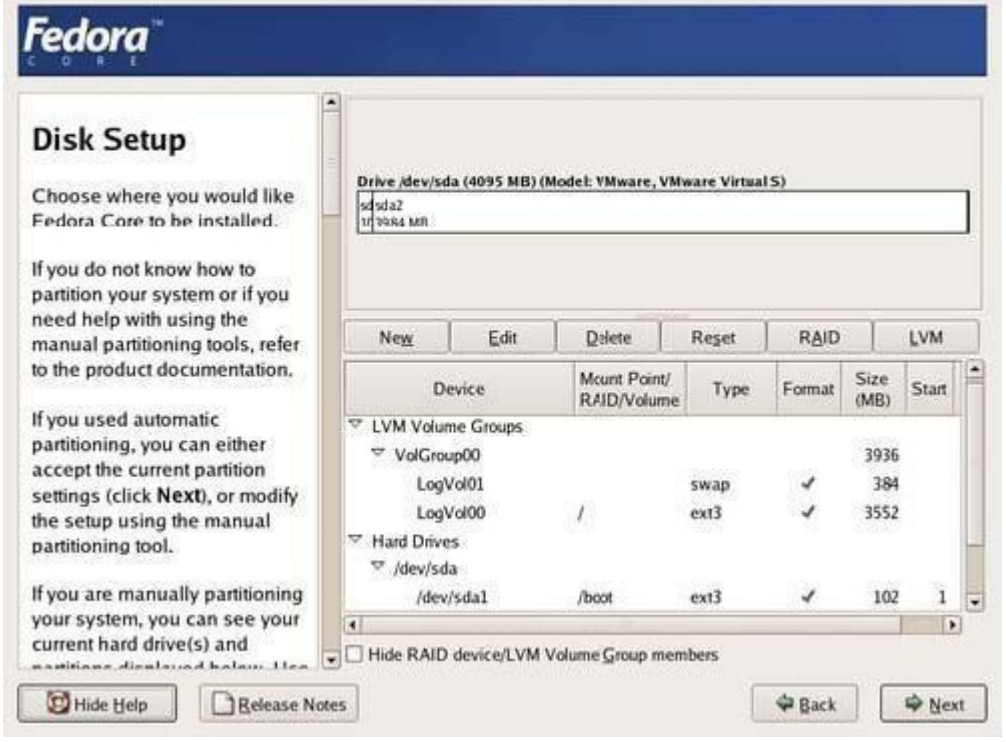
Upgrade Examine Screen

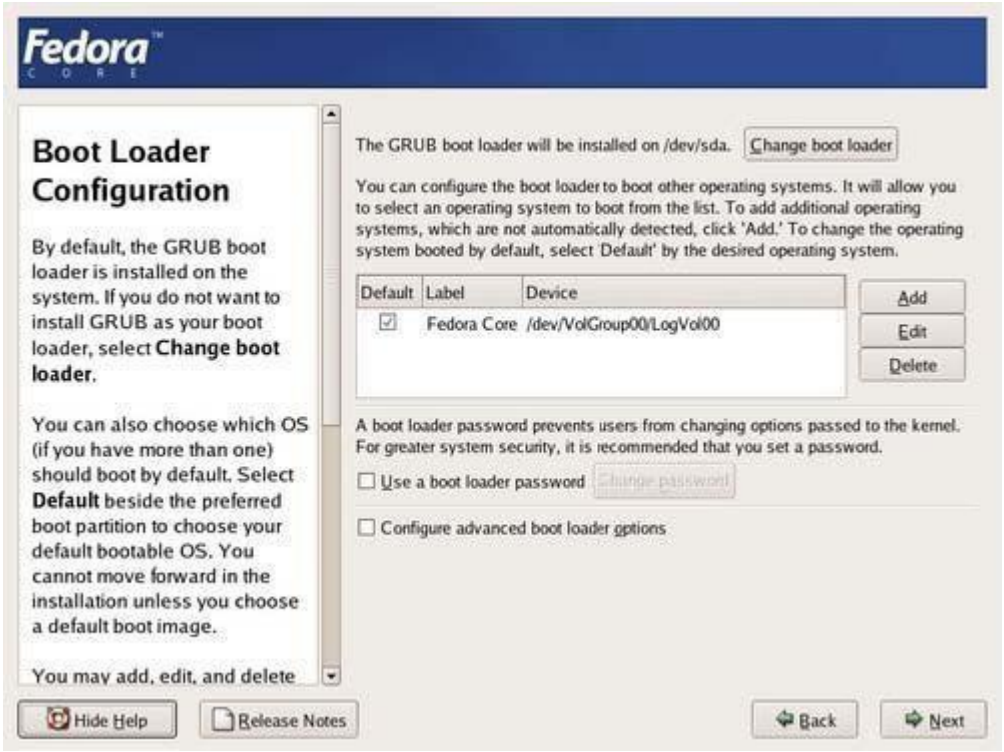


Installation Type Screen

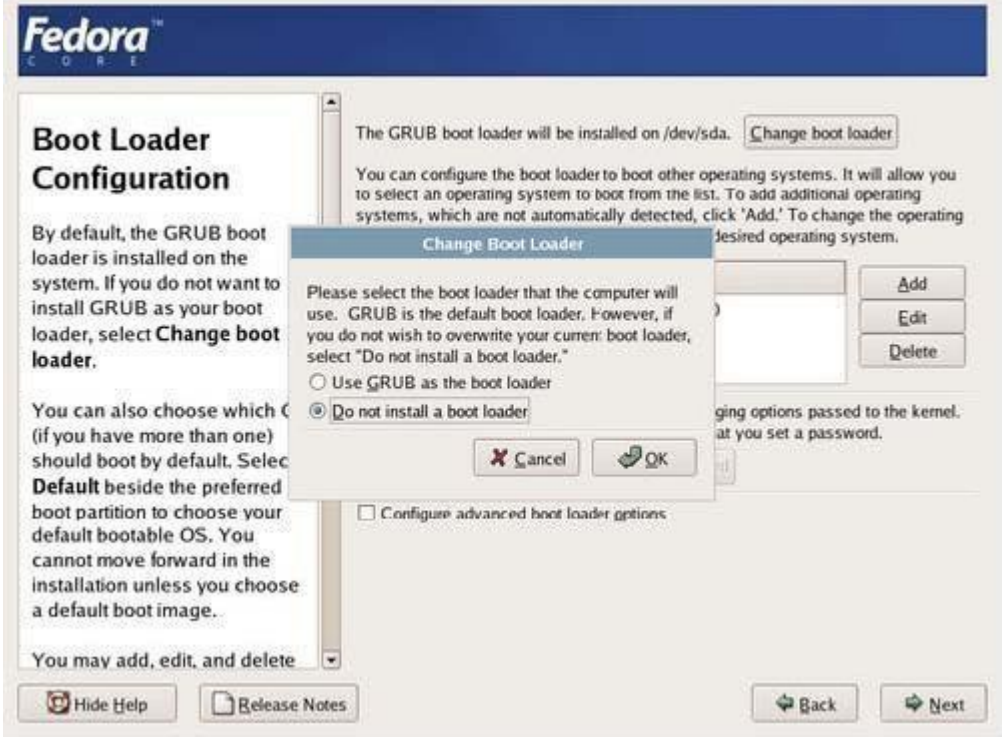


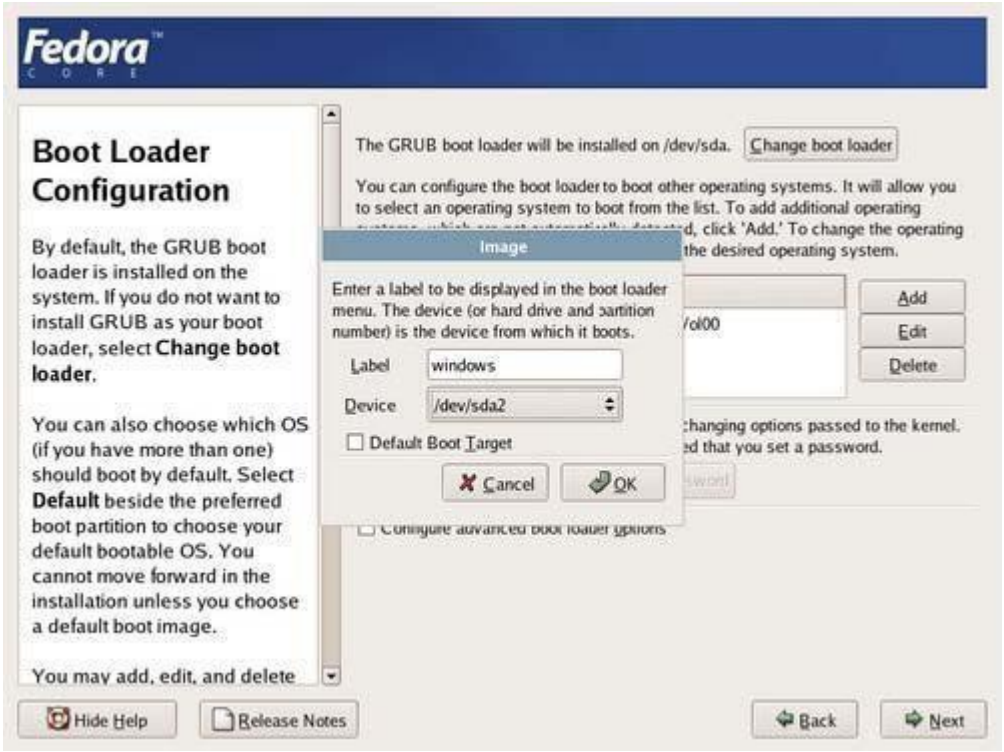
Automatic Partitioning Setup Screen



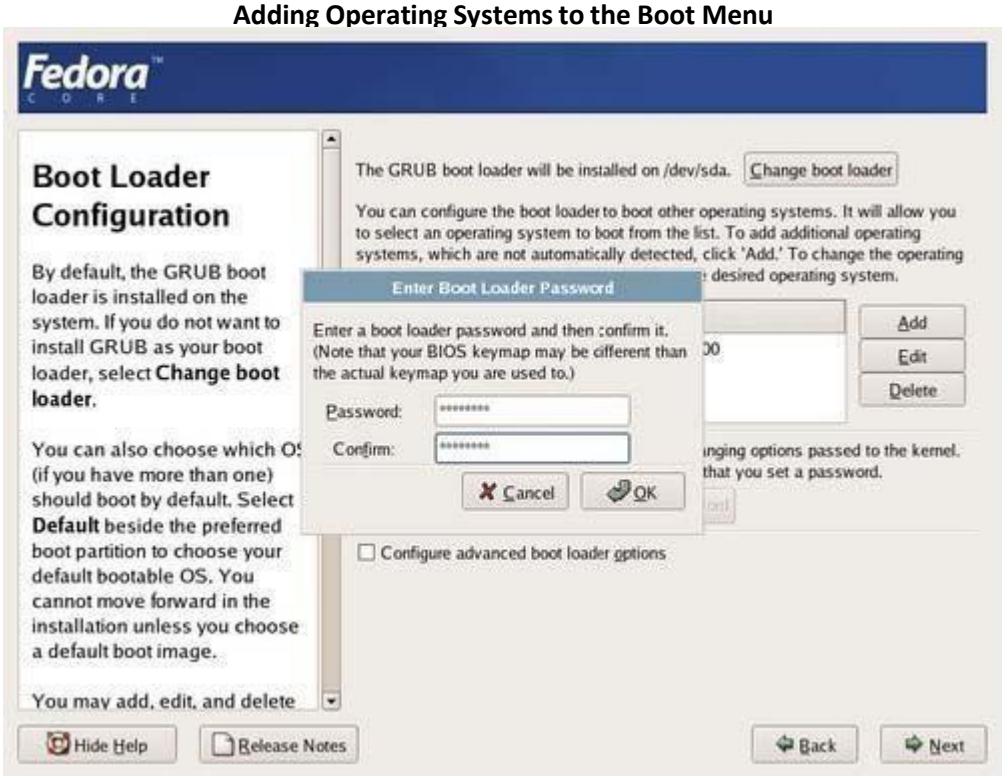


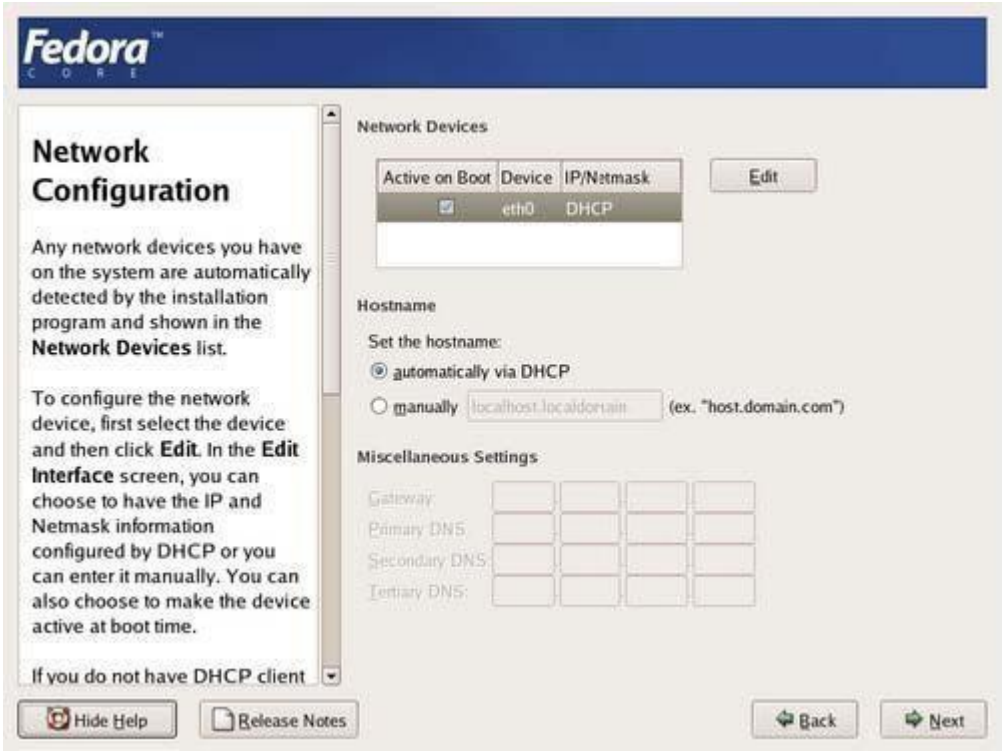
Boot Loader Configuration Screen



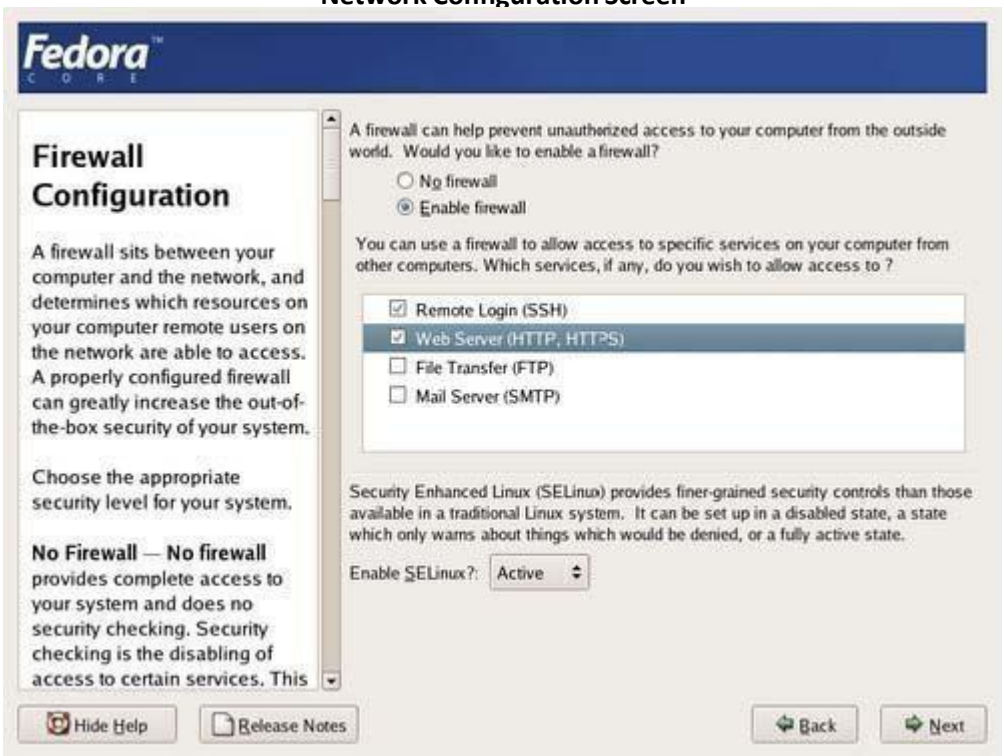


Adding Operating Systems to the Boot Menu





Network Configuration Screen



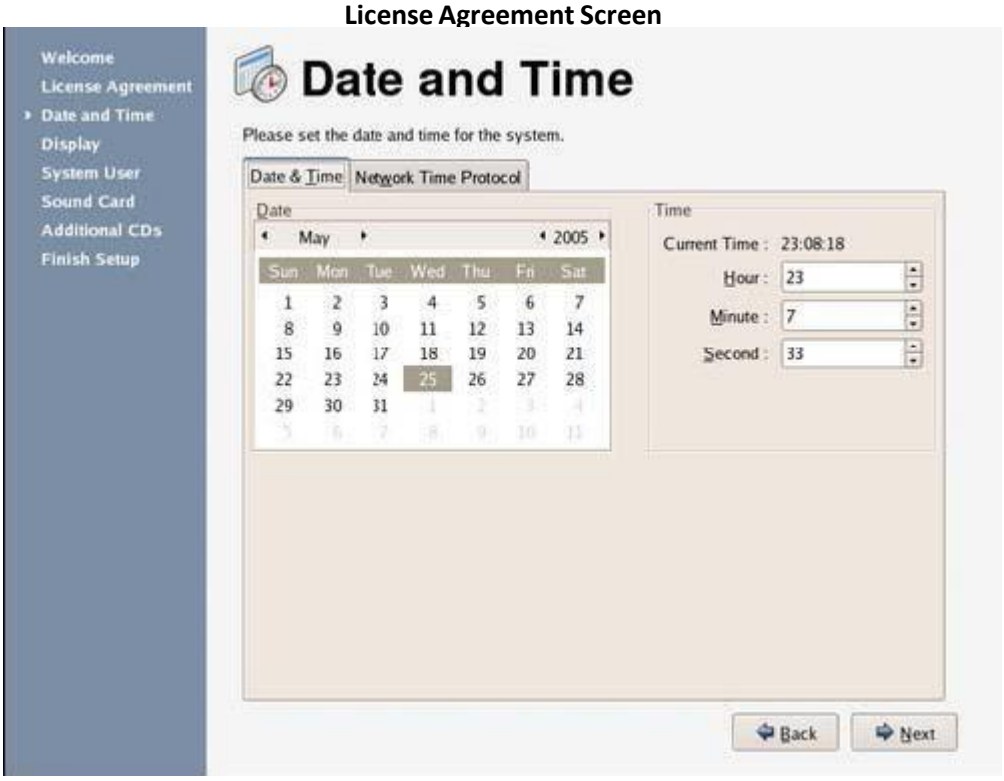
Time Zone Selection Screen

Package Installation Defaults Screen

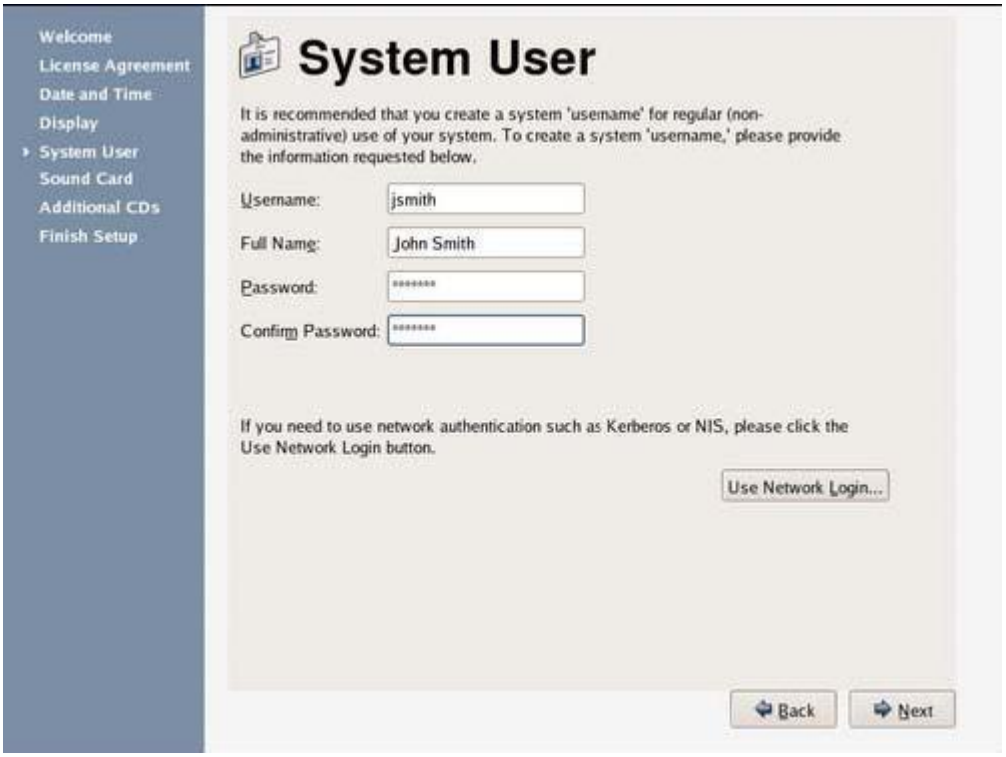
Package Group Details Dialog

Installing Packages Screen

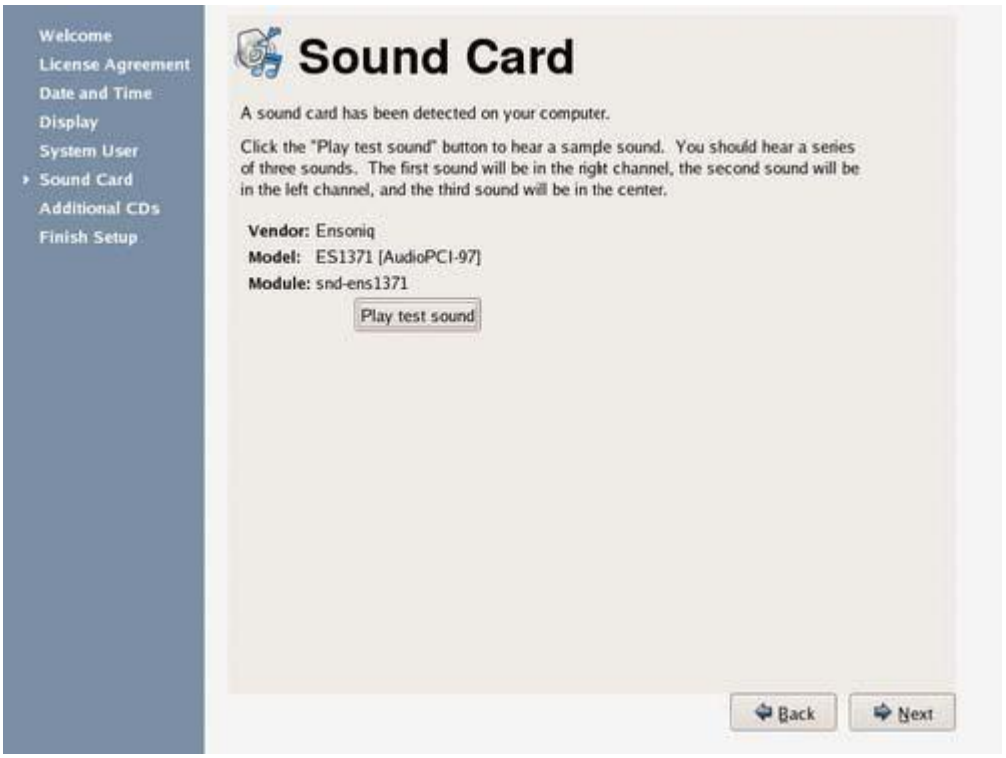
License Agreement Screen

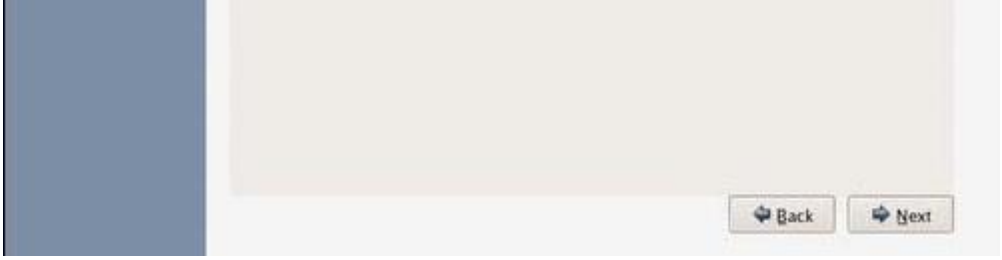


Display Screen



System User Screen



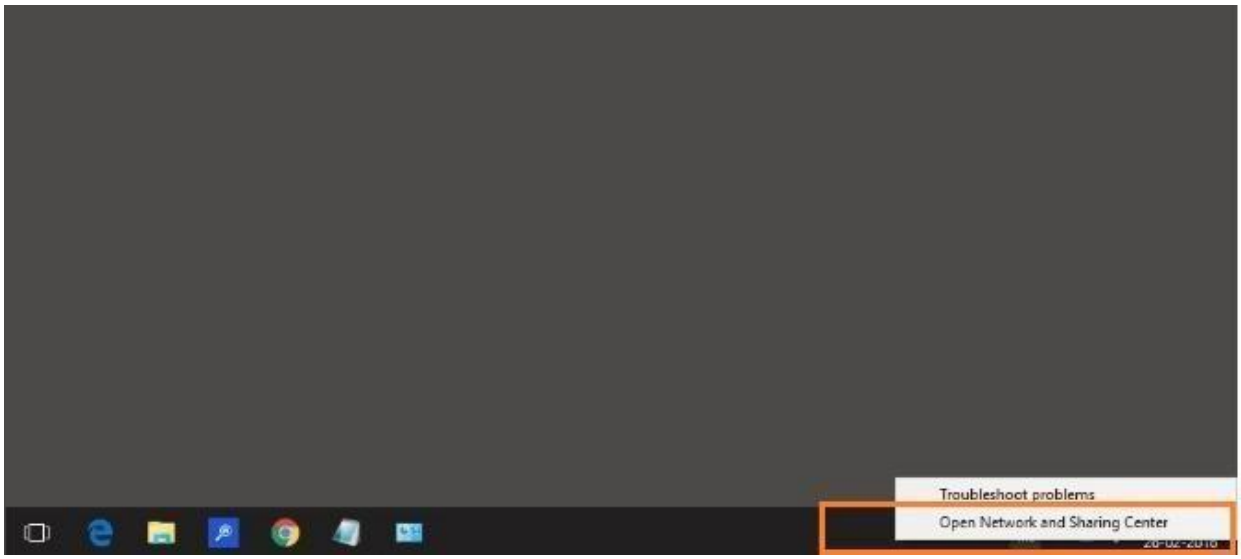


Additional CDs Sc

16 Configuration of wired TCP/IP Properties of My Computer

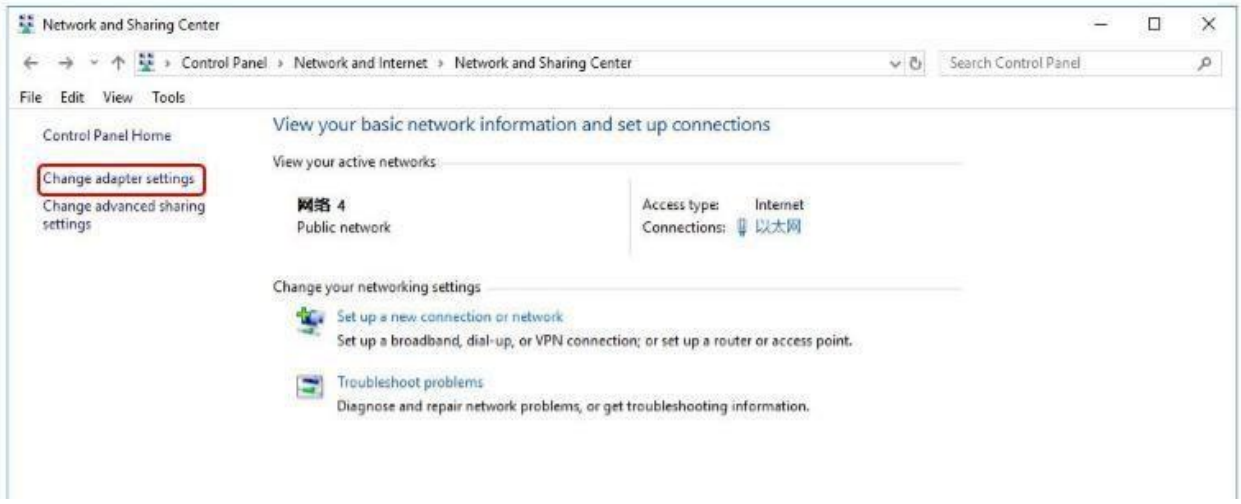
Step 1

Right click the internet icon in the task tray, select **Open Network and Sharing Center**.



Step 2

Click **Change adapter settings.**

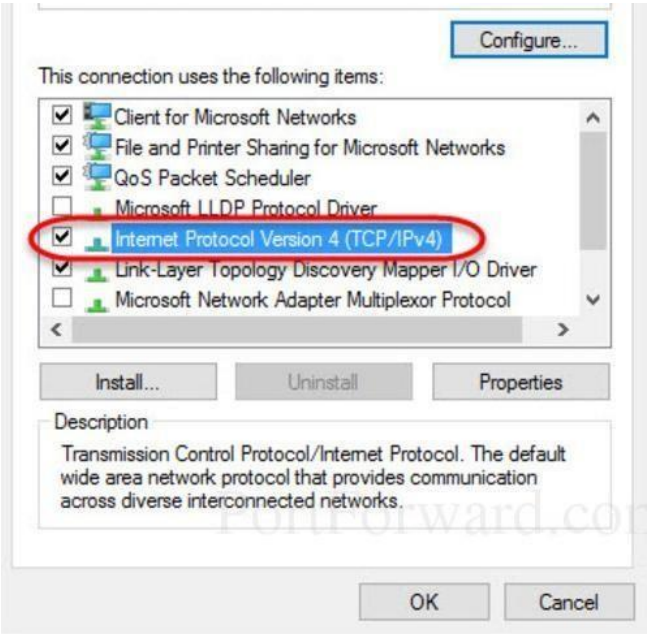


Step 3

Highlight and right click on **Ethernet**, then select **Properties**.

Step 4

Select **Internet Protocol Version 4**



Step 5

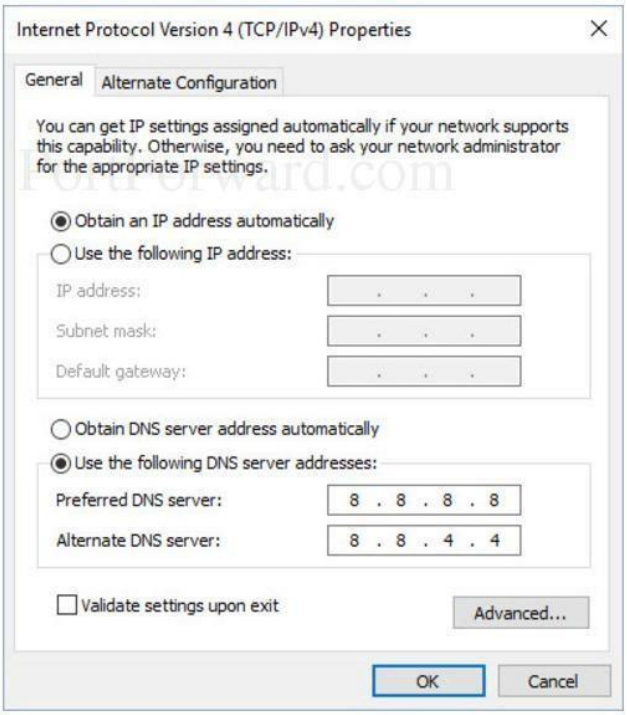
To get IP settings assigned automatically, select **Obtain an IP address automatically** and **Obtain DNS server address automatically**.

To get fixed IP settings, select **Use the following IP address** and **Use the following DNS server addresses**, then enter the IP address, subnet mask, default gateway and DNS server manually.

IP Address: 192.168.0.2

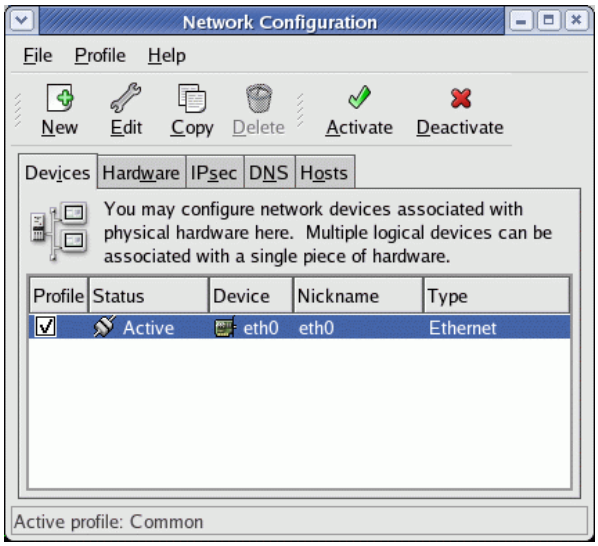
Subnet mask: 255.255.255.0

Default gateway: 192.168.0.1



Configuration of wired TCP/IP Properties of my computer (Linux)

On most Linux systems, you can access the TCP/IP connection details within '**X Windows**' from **Applications > Others > Network Connections**. The same may also be reached through **Application > System Settings > Network > Configure**. This opens up a window, which offers configuration of IP parameters for wired, wireless, mobile broadband, VPN andDSL connections:



The values entered here modify the files:

/etc/sysconfig/network-scripts/ifcfg-eth0

/etc/sysconfig/networking/devices/ifcfg-eth0

/etc/resolv.conf

/etc/hosts

The static host IP assignment is saved in **/etc/hosts**

The DNS server assignments are saved in the **/etc/resolv.conf**

IP assignments for all the devices found on the system are saved in the **ifcfg-*<interface>*** filesmentioned above.

If you want to see all the IP assignments, you can run the command for interface configuration:

THE BASIC COMMANDS FOR NETWORKING IN LINUX

The basic commands used in Linux are common to every distro:

ifconfig - Configures and displays the IP parameters of a network interface

route - Used to set static routes and view the routing table

hostname - Necessary for viewing and setting the hostname of the system

netstat - Flexible command for viewing information about network statistics, currentconnections, listening ports

arp - Shows and manages the arp table

mii-tool - Used to set the interface parameters at data link layer (half/full duplex, interface speed,autonegotiation, etc.)

Many distro are now including the iproute2 tools with enhanced routing and networking tools:

ip - Multi-purpose command for viewing and setting TCP/IP parameters and routes.

tc - Traffic control command, used for classifying, prioritizing, sharing, and limiting both inbound and outbound traffic.