```cpp
//**** Solution Examen 2012 ************

//**** Exo1 *********


#include <iostream>

using namespace std;

const int TAB_MAX=100;

int affiche (float tab[])
{
    int i=0;
    do
    {
        cout << "tab[" << i <<"] = " << tab[i] << endl;
        i++;
    } while (tab[i]!=-1 && i<TAB_MAX);
    return i;
}

int saisi (float tab[])
{
    int i=0;
    do
    {
        cout << "tab[" << i<<"] = : ";
        cin >> tab[i];
        i++;
    } while (tab[i-1]!=-1 && i<TAB_MAX);
    return 0;
}

float moyenne (float tab[],float& min,float& max)
{
    float somme=0,moyen;
    int i=0;

    min=tab[0];max=tab[0];
    do
    {
        somme = somme + tab[i];
        if(tab[i]<min) min = tab[i];
        if(tab[i]>max) max = tab[i];
        i++;
    } while (tab[i]!=-1 && i<TAB_MAX);
    moyen = somme/i;
    return moyen;
}
```

```cpp
int main()
{
    float notes[TAB_MAX] = {15,10,2,2.5,18,5,11.5,15,18,8,4,-1};
    float moy,minnote,maxnote;
    int nbre;

    cout << "Tableau de default" << endl;
    nbre=affiche (notes);
    moy = moyenne(notes,minnote,maxnote);
    cout << "La moyenne des " << nbre
        << " notes = : " << moy << endl;
    cout << "note minimum = " << minnote << " note maxi = "
        << maxnote << endl;
    cout << endl;

    cout << "Entrez un tableau de notes" << endl;
    saisi (notes); cout << endl;
    nbre=affiche(notes);
    moy = moyenne(notes,minnote,maxnote);
    cout << "La moyenne des " << nbre
        << " notes = : " << moy << endl;
    cout << "note minimum = " << minnote << " note maxi = "
        << maxnote << endl;

    return 0;
}

//**** Exo2 *********


#include <iostream>
#include <cmath>

using namespace std;


double harm_somme(int nmax)
{
    double somme = 0;
    for(int n=1;n<nmax;n++)
    {
        somme = somme + 1./n;
    }
    return somme;
}

double log_somme( int nmax)
{
    double somme = 0;
    int sgn = 1;

    for( int n=1;n<nmax;n++)
    {
        somme = somme + sgn*1./n;
        sgn=-sgn;
    }
    return somme;
}
```

```cpp
int main()
{
    double somme,logsomme;
    int n;

    cout << "Entrez le nombre n "; cin >> n;

    somme = harm_somme(n);
    logsomme=log_somme(n);

    cout << "La somme harmonique = " << somme << endl;
    cout << "La log somme = " << logsomme << endl;
    cout << "Log 2 est : " << log(2) << endl;
    cout << "Comme vous voyez, la deuxieme serie converge vers ln(2)"
     << endl;

    return 0;
}

//**** Exo3 *********


#include <iostream>
#include <cstring>


using namespace std;

/* la fonction nombrechar compte le nombre de caratères ASCII */

int nombrechar(char ch[],int& i) /* i = longueur de chaine */
{
    int cpt=0,i=0;

    while(ch[i]!='\0')
    {
     if((ch[i] >='a' && ch[i] <='z')||(ch[i]>='A' && ch[i]<='Z')) cpt++;
     i++;
    }
    return cpt; /* cpt = nombre de caratères ASCII*/
}

int comptechar(char ch[],char car)
{
    int i=0,cpt=0;

    while(ch[i]!='\0')
    {
        if( ch[i] == car) cpt++;
        i++;
    }
    return cpt; /* cpt = nombre d'occurances de car*/
}
```

```cpp
int main()
{
  int len,nbrascii,nbrecar;
  char caractere='e';
  char phrase[]="You will hopefully feel better when this exam is "
  "over :). *** This character chain is in English because the C++ "
  "programming language uses ASCII coding which doesn't handle French "
  "diacritics like é, à, and ç, and ô very well";

  cout << phrase << endl << endl;

  nbrascii= nombrechar(phrase,len);

  cout << "Il y a " << nbrascii <<
    " caracteres ASCII dans cette chaine de " << len << " caracters"
    << endl;

  cout << "On remarque que la fonction standard 'strlen' comptes tous"
     "les caracteres" << endl << "strlen(phrase) = "
     <<  strlen(phrase) << endl;

  nbrecar=comptechar(phrase,caractere);

  cout << "La lettre \"" << caractere <<  "\" se trouve " << nbrecar
   << " fois dans la phrase" << endl;

  return 0;
}
```