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Supplementary Data

A handy tool for forecasting population to aid estimation of water demand

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Appendix SI: C language code

```
#include<stdio.h>

#include<conio.h>

#include<math.h>

#include<string.h>

#include<time.h>

struct Data

{

int year[100];

double pop[100],c[100],d[100],g[100];

}amm;

void main()
```

```
{
int i,n,m[50],select,d3;
double ig=1.0,c2=0,d2=0,result[50],dum,q,cpu_time_used;
clock_t t;
t=clock();
printf("Select the method you want to use :\n1. Arithmetic Increase Method\n2. Geometric Increase Method\n3. Incremental Increase Method\n");
scanf("%d",&select);
printf("Enter the number of years for which data is available with you :\n");
scanf("%d",&n);
printf("Enter the years for which the population is to be forecasted in ascending order. Type '0' to finish the year count.\n");
for(i=0;i<25;i++)
{
scanf("%d",&m[i]);
if(m[i]==0)
break;
}
printf("Enter the year and respective population of the available data :\n");
for(i=0;i<n;i++)
{
printf("Year %d : ",i+1);
scanf("%d",&amm.year[i]);
printf("Population %d : ",i+1);
scanf("%lf",&amm.pop[i]);
```

```
}
for(i=0;i<n-1;i++)
{
amm.c[i+1]=amm.pop[i+1]-amm.pop[i];
c2+=amm.c[i+1];
}
c2/=(n-1);
switch(select)
{
case 1:
{
for(i=0;i<25;i++)
{
q=m[i]-amm.year[n-1];
if(q<0)
{
break;
}
result[i]=amm.pop[n-1]+((q/10)*c2);
printf("P(%d) = %.0lf\n",m[i],result[i]);
printf("Estimated water demand for the year %d = %.001f lpcd",m[i],result[i]*135);
}
break;
}
case 2:
```

```
{
for(i=0;i<n-1;i++)
{
amm.g[i+1]=amm.c[i+1]/amm.pop[i];
ig*=amm.g[i+1];
}
dum=n-1;
dum=1/dum;
ig=fabs(ig);
ig=pow(ig,dum);
dum=1+ig;
for(i=0;i<25;i++)
{
q=m[i]-amm.year[n-1];
q/=10;
if(q<0)
{
break;
}
result[i]=(amm.pop[n-1])*(pow(dum,q));
printf("P(%d) = %.0lf\n",m[i],result[i]);
printf("Estimated water demand for the year %d = %.001f lpcd",m[i],result[i]*135);
}
break;
}
```

```
case 3:
{
for(i=0;i<n-2;i++)
{
amm.d[i+2]=amm.c[i+2]-amm.c[i+1];
d2+=amm.d[i+2];
}
d2/=(n-2);
for(i=0;i<25;i++)
{
q=m[i]-amm.year[n-1];
q/=10;
if(q<0)
{
break;
}
d3=(int)(d2+0.5);
result[i]=(amm.pop[n-1])+(q*c2)+(q*(q+1)*d3/2);
printf("P(%d) = %.01f\n",m[i],result[i]);
printf("Estimated water demand for the year %d = %.001f lpcd",m[i],result[i]*135);
}
break;
}
default:
printf("Your selection is wrong..... Try again!!");
```

```
}
getch();
t=clock()-t;
cpu_time_used=((double)t)/CLOCKS_PER_SEC;
printf("/ntook  %fseconds to execute \n", cpu_time_used);
}
```