#include <stdio.h>

#include <math.h>

double sintheta(double p,double q,double x1,double y1)

{

double up,down;

up=y1\*p\*p;

down=sqrt(pow(y1,2)\*pow(p,4)+pow(x1,2)\*pow(q,4));

if((x1\*y1)>=0)

{

printf("%lf sinth \n",up/down);

return up/down;

}

if((x1\*y1)<0)

{

printf("%lf sinth \n",-1\*up/down);

return -1\*up/down;

}

}

double costheta(double p,double q,double x1,double y1)

{

double up,down;

up=x1\*q\*q;

down=sqrt(pow(y1,2)\*pow(p,4)+pow(x1,2)\*pow(q,4));

printf("%lf costh \n",up/down);

return up/down;

}

double sinpi(double a, double b, double x1, double y1, double sinth, double costh)

{

double up,down;

up=(a-x1)\*costh+(b-y1)\*sinth;

down=sqrt(pow((a-x1),2)+pow((b-y1),2));

printf("%lf sinpi \n",up/down);

return up/down;

}

double cospi(double a, double b, double x1, double y1, double sinth, double costh)

{

double up,down;

up=(b-y1)\*costh-(a-x1)\*sinth;

down=sqrt(pow((a-x1),2)+pow((b-y1),2));

printf("%lf cospi \n",up/down);

return up/down;

}

double c(double sp,double st,double cp,double ct,double a,double b,double p,double q)

{

double up,down;

if (a>0&&b>0)

{

up=(3\*cp\*sp\*ct-st\*(3\*cp\*cp-1))\*b\*p\*p-(3\*cp\*sp\*st+ct\*(3\*cp\*cp-1))\*a\*q\*q;

down=sqrt(pow(a\*q\*q,2)+pow(b\*p\*p,2));

}

else if(a<0&&b>0)

{

up=(3\*cp\*sp\*ct-st\*(3\*cp\*cp-1))\*b\*p\*p-(3\*cp\*sp\*st+ct\*(3\*cp\*cp-1))\*a\*q\*q;

down=sqrt(pow(a\*q\*q,2)+pow(b\*p\*p,2));

}

else if(a>0&&b<0)

{

up=(3\*cp\*sp\*ct-st\*(3\*cp\*cp-1))\*b\*p\*p-(3\*cp\*sp\*st+ct\*(3\*cp\*cp-1))\*a\*q\*q;

down=sqrt(pow(a\*q\*q,2)+pow(b\*p\*p,2));

}

else if(a<0&&b<0)

{

up=(3\*cp\*sp\*ct-st\*(3\*cp\*cp-1))\*b\*p\*p-(3\*cp\*sp\*st+ct\*(3\*cp\*cp-1))\*a\*q\*q;

down=sqrt(pow(a\*q\*q,2)+pow(b\*p\*p,2));

}

printf("%lf const \n",up/down);

return up/down;

}

double magneticfield(double constant, double r)

{

if (r<=20)

{

return (0.017\*pow(r,4)-1.0533\*pow(r,3)+24.042\*pow(r,2)-243.87\*r+975.88)\*constant;

}

else if(r>20)

{

return (-0.4833\*r+19.167)\*constant;

}

}

double yyy(double p,double q, double s)

{

return q\*cos(s/(sqrt((q\*q+p\*p)/2)));

}

double xxx(double p,double q, double s)

{

return p\*sin(s/(sqrt((p\*p+q\*q)/2)));

}

/// 데이터 26.03 -10.93 30 22 22.74 -14.34 234

/// 데이터 8.594 -21.078 30 22 3.008 -21.889 234

int main(void)

{

double a,b,p,q,x1,y1,hall,r[5][5],magnet[5]={0,0,0,0,0};

double xhall[5],xmag[5],yhall[5],ymag[5];

printf("a,b,p,q,x1,y1,hall을 순서대로 입력하시오.");

scanf("%lf %lf %lf %lf %lf %lf %lf",&a,&b,&p,&q,&x1,&y1,&hall);

double st,ct,sp,cp,constant;

st=sintheta(p,q,x1,y1);

ct=costheta(p,q,x1,y1);

sp=sinpi(a,b,x1,y1,st,ct);

cp=cospi(a,b,x1,y1,st,ct);

constant=c(sp,st,cp,st,a,b,p,q);

for(int i=1;i<=5 ;i++)

{

xhall[i]=xxx(p,q,35+20\*i);

yhall[i]=yyy(p,q,35+20\*i);

xmag[i]=xxx(p,q,40+20\*i);

ymag[i]=yyy(p,q,40+20\*i);

}

for(int i=1 ; i<=5 ; i++)

{

for(int j=1 ; j<=5 ; j++)

{

r[i][j]=sqrt((xhall[i]-xmag[j])\*(xhall[i]-xmag[j])+(yhall[i]-ymag[j])\*(yhall[i]-ymag[j]));

}

}

for(int i=1;i<=5 ; i++)

{

for(int j=1 ; j<=5 ; j++)

{

magnet[i]+=magneticfield(constant,r[i][j]);

}

}

for(int i=1;i<=5 ; i++)

{

printf("%d번째 홀센서의 5개 자석에 의한 자기장 : %f\n",i,magnet[i]);

}

}