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program movimiento_en_campo_gravitatorio_3;
{Movimientos de dos soles desiguales y planetas en torno a ellos dos}
{Tierra y Marte}
{tiempo aconsejable const t=500 o menor}
uses
  Crt, Graph;
const
  t=1000; {constantes generales}
  pi=3.141592653598793;
  g=6.67384E-11;
  mA=3.978E+29; {1/5 masa solar}
  mB=1.989E+30;
  e=150/1.7E+11; {factor de escala: hasta la orbita de Marte}
var
  GraphDriver : integer; { The Graphics device driver }
  GraphMode : integer; { The Graphics mode value }
  MaxX, MaxY : word; { The maximum resolution of the screen }
  ErrorCode : integer; { Reports any graphics errors }
  OldExitProc : Pointer; { Saves exit procedure address }

  asa,asax,asay,rsa0,rsax0,rsay0,vsax0,vsay0,physa0,psisa:real; {sol A}
  asb,asbx,asby,rsb0,rsbx0,rsby0,vsbx0,vsby0,physb0,psisb:real; {sol B}

  a,aa,ab,ax,ay,rpa0,rpax0,rpax0,rpax0,rpax0,rpax0,rpax0,rx0,ry0,vx0,vy0,phy0,psi:real;

  a2,a2a,a2b,a2x,a2y,r2pa0,r2pax0,r2pay0,r2pb0,r2pbx0,r2pby0,r20,r2x0,r2y0,
  v2x0,v2y0,phy20,psi2:real; {planeta}
  rab:real;
  arsax0,arsay0,arsbx0,arsby0:real;
  t:integer;

{$F+}
procedure MyExitProc;
begin
  ExitProc := OldExitProc; { Restore exit procedure address }
  CloseGraph; { Shut down the graphics system }
end; { MyExitProc }
{$F-}

procedure Inicia_modos_grafico;
{ Inicializa el modo grafico e informa de los errores que puedan ocurrir}
var
  InGraphicsMode : boolean; { Flags initialization of graphics mode }
  PathToDriver : string; { Stores the DOS path to *.BGI & *.CHR }
begin
  { when using Crt and graphics, turn off Crt's memory-mapped writes }
  DirectVideo := False;
  OldExitProc := ExitProc; { save previous exit proc }
  ExitProc := @MyExitProc; { insert our exit proc in chain }
  PathToDriver := '';
  repeat

{$IFDEF Use8514} { check for Use8514 $DEFINE }
  GraphDriver := IBM8514;
  GraphMode := IBM8514Hi;
{$ELSE}

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    GraphDriver := Detect;                { use autodetection }
{$ENDIF}

    InitGraph(GraphDriver, GraphMode, PathToDriver);
    ErrorCode := GraphResult;             { preserve error return }
    if ErrorCode <> grOK then               { error? }
    begin
        Writeln('Graphics error: ', GraphErrorMsg(ErrorCode));
        if ErrorCode = grFileNotFound then { Can't find driver file }
        begin
            Writeln('Enter full path to BGI driver or type <Ctrl-Break> to
quit:');
            Readln(PathToDriver);
            Writeln;
        end
        else
            Halt(1);                      { Some other error: terminate }
        end;
    until ErrorCode = grOK;
    MaxX := GetMaxX;                      { Get screen resolution values }
    MaxY := GetMaxY;
end; { Initialize }

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procedure dibuja_sol(x,y,c:integer);
begin
    PutPixel(MaxX div 2 +x, MaxY div 2 +y, 1);
    SetLineStyle(SolidLn,0,NormWidth);setColor(c);
    Line(MaxX div 2 +x, MaxY div 2 +y+6,MaxX div 2 +x,MaxY div 2 +y-6);
    Line(MaxX div 2 +x-4,MaxY div 2 +y,MaxX div 2 +x+4,MaxY div 2 +y);
    PutPixel(MaxX div 2 +x+6, MaxY div 2 +y, c);
    PutPixel(MaxX div 2 +x-6, MaxY div 2 +y, c);
    PutPixel(MaxX div 2 +x, MaxY div 2 +9 +y, c);
    PutPixel(MaxX div 2 +x, MaxY div 2 -9 +y, c);
    PutPixel(MaxX div 2 +x+1, MaxY div 2 +y+1, c);
    PutPixel(MaxX div 2 +x+1, MaxY div 2 +y-1, c);
    PutPixel(MaxX div 2 +x-1, MaxY div 2 +y+1, c);
    PutPixel(MaxX div 2 +x-1, MaxY div 2 +y-1, c);
    PutPixel(MaxX div 2 +x+3, MaxY div 2 +y+3, c);
    PutPixel(MaxX div 2 +x+3, MaxY div 2 +y-3, c);
    PutPixel(MaxX div 2 +x-3, MaxY div 2 +y+3, c);
    PutPixel(MaxX div 2 +x-3, MaxY div 2 +y-3, c);
end;

procedure dibuja_los_ejes;
begin
    SetLineStyle(DottedLn,0,NormWidth);
    SetColor(4);
    Line(MaxX div 2,MaxY div 2 +230,MaxX div 2,MaxY div 2 -230);{
vertical }
    Line(MaxX div 2 -310,MaxY div 2,MaxX div 2 +310,MaxY div 2);{
horizontal }
    SetColor(8);ellipse(MaxX div 2, MaxY div 2,0,360,round(53*0.85),53);
    SetColor(6);ellipse(MaxX div 2, MaxY div 2,0,360,round(96*0.85),96);
    SetColor(1);ellipse(MaxX div 2, MaxY div
2,0,360,round(132*0.85),132);
    {SetColor(4);ellipse(MaxX div 2, MaxY div
2,0,360,round(202*0.85),202);}
    gotoxy(65,2);write('Escala:');

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    TextColor(4);gotoxy(65,3);write('Marte');
    TextColor(3);gotoxy(65,8);write('Tierra');
    TextColor(14);gotoxy(65,10);write('Venus');
    TextColor(7);gotoxy(65,12);write('Mercurio');
end;

procedure presentacion;
begin
    SetTextStyle(TriplexFont,0,3);SetTextJustify(CenterText,CenterText);
    SetColor(15);OutTextXY(320,70,'GRAVITY.EXE');
    SetColor(15);
    OutTextXY(540,410,'Pulsa Enter');
    Readln;ClearViewPort;
end;

procedure DatosIniciales;
begin
    rx0:=0;ry0:=1.5E+11;      {planeta1 azul: Tierra}
    r0:=sqrt(rx0*rx0+ry0*ry0);
    vx0:=-32800;vy0:=0;      {probar -22000 -33578 -32578 teorico
inestable}

    r2x0:=0;r2y0:=2.27936E+11; {2.27936E+11 planeta2 rojo: Marte}
    r20:=sqrt(r2x0*r2x0+r2y0*r2y0);
    v2x0:=-26550;v2y0:=0;      {-26600}

    rab:=5E+10;
    rsax0:=-4+10;rsay0:=0;{posiciones iniciales sol A}
    rsbx0:=rab+rsax0;rsby0:=0; { sol B}
    vsax0:=0;vsay0:=-47000; {velocidades iniciales sol A}
    vsbx0:=0;vsby0:= 18212; { sol B}
    physa0:=pi; { angulo inicial sol A}
    physb0:=0; { sol B}
end;

procedure calcula_phy;
begin
    if (ry0>0)and(rx0>0)then phy0:=arctan(ry0/rx0);
{planeta1}
    if (ry0>0)and(rx0<0)then phy0:=arctan(ry0/rx0)+pi;
    if (ry0<0)and(rx0<0)then phy0:=arctan(ry0/rx0)+pi;
    if (ry0<0)and(rx0>0)then phy0:=arctan(ry0/rx0);

    if (r2y0>0)and(r2x0>0)then phy20:=arctan(r2y0/r2x0);
{planeta2}
    if (r2y0>0)and(r2x0<0)then phy20:=arctan(r2y0/r2x0)+pi;
    if (r2y0<0)and(r2x0<0)then phy20:=arctan(r2y0/r2x0)+pi;
    if (r2y0<0)and(r2x0>0)then phy20:=arctan(r2y0/r2x0);
end;

procedure calcula_psi;
{ ngulos entre planeta1 y soles AyB y aceleraciones sufridas}
var psia,psib,axa,aya,axb,ayb:real;
begin
    { ngulo entre planeta y sol A}
    if ((ry0-rsay0)>0)and((rx0-rsax0)>0)then psia:=arctan((ry0-
rsay0)/(rx0-rsax0))+pi;
    if ((ry0-rsay0)>0)and((rx0-rsax0)<0)then psia:=arctan((ry0-
rsay0)/(rx0-rsax0));
    if ((ry0-rsay0)<0)and((rx0-rsax0)<0)then psia:=arctan((ry0-
rsay0)/(rx0-rsax0));

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        if ((ry0-rsay0)<0)and((rx0-rsax0)>0)then psia:=arctan((ry0-
rsay0)/(rx0-rsax0))+pi;
        axa:=aa*cos(psia);aya:=aa*sin(psia);
        { ngulo entre planeta y sol B}
        if ((ry0-rsby0)>0)and((rx0-rsbx0)>0)then psib:=arctan((ry0-
rsby0)/(rx0-rsbx0))+pi;
        if ((ry0-rsby0)>0)and((rx0-rsbx0)<0)then psib:=arctan((ry0-
rsby0)/(rx0-rsbx0));
        if ((ry0-rsby0)<0)and((rx0-rsbx0)<0)then psib:=arctan((ry0-
rsby0)/(rx0-rsbx0));
        if ((ry0-rsby0)<0)and((rx0-rsbx0)>0)then psib:=arctan((ry0-
rsby0)/(rx0-rsbx0))+pi;
        axb:=ab*cos(psib);ayb:=ab*sin(psib);
        {suma cartesiana de las dos aceleraciones experimentadas}
        ax:=axa+axb;ay:=aya+ayb;
    end;
procedure calcula_psi2;
{ ngulos entre planeta2 y soles AyB y aceleraciones sufridas}
var psia,psib,axa,aya,axb,ayb:real;
begin
    if ((r2y0-rsay0)>0)and((r2x0-rsax0)>0)then psia:=arctan((r2y0-
rsay0)/(r2x0-rsax0))+pi;
    if ((r2y0-rsay0)>0)and((r2x0-rsax0)<0)then psia:=arctan((r2y0-
rsay0)/(r2x0-rsax0));
    if ((r2y0-rsay0)<0)and((r2x0-rsax0)<0)then psia:=arctan((r2y0-
rsay0)/(r2x0-rsax0));
    if ((r2y0-rsay0)<0)and((r2x0-rsax0)>0)then psia:=arctan((r2y0-
rsay0)/(r2x0-rsax0))+pi;
    axa:=a2a*cos(psia);aya:=a2a*sin(psia);
    if ((r2y0-rsby0)>0)and((r2x0-rsbx0)>0)then psib:=arctan((r2y0-
rsby0)/(r2x0-rsbx0))+pi;
    if ((r2y0-rsby0)>0)and((r2x0-rsbx0)<0)then psib:=arctan((r2y0-
rsby0)/(r2x0-rsbx0));
    if ((r2y0-rsby0)<0)and((r2x0-rsbx0)<0)then psib:=arctan((r2y0-
rsby0)/(r2x0-rsbx0));
    if ((r2y0-rsby0)<0)and((r2x0-rsbx0)>0)then psib:=arctan((r2y0-
rsby0)/(r2x0-rsbx0))+pi;
    axb:=a2b*cos(psib);ayb:=a2b*sin(psib);
    a2x:=axa+axb;a2y:=aya+ayb;
end;
procedure calculos1;
var x1,x2,x3,y1,y2,y3,x4,y4:integer;
begin
    calcula_phy;
    SetColor(0);
    line(MaxX div 2 +round(r2x0*e*0.85), MaxY div 2 -round(r2y0*e), MaxX div
2 +round(arsax0*e), MaxY div 2 -round(arsay0*e));
    line(MaxX div 2 +round(r2x0*e*0.85), MaxY div 2 -round(r2y0*e), MaxX div
2 +round(arsbx0*e), MaxY div 2 -round(arsby0*e));
    {rsa0:=sqrt(rsax0*rsax0+rsay0*rsay0);
    asa:=g*mb/(rab*rab);psisa:=physb0;
    asax:=asa*cos(psisa);asay:=asa*sin(psisa);

    rsax0:=rsax0+vsax0*t+(asax*t*t)/2;rsay0:=rsay0+vsay0*t+(asay*t*t)/2;}
    arsax0:=rsax0;arsay0:=rsay0;
    physa0:=physa0-t*vsay0/4E+10;if physa0>2*pi then physa0:=physa0-
2*pi;
    rsax0:=4E+10*cos(physa0);rsay0:=4E+10*sin(physa0);

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dibuja_sol(round(arsax0*e*0.85),-round(arsay0*e),0);
dibuja_sol(round(rsax0*e*0.85),-round(rsay0*e),13);
{vsax0:=vsax0+asax*t;vsay0:=vsay0+asay*t;}

{rsb0:=sqrt(rsbx0*rsbx0+rsby0*rsby0);
asb:=g*ma/(rab*rab);psib:=physa0;
asbx:=asb*cos(psisb);asby:=asb*sin(psisb);

rsbx0:=rsbx0+vsbx0*t+(asbx*t*t)/2;rsby0:=rsby0+vsby0*t+(asby*t*t)/2;}
arsbx0:=rsbx0;arsby0:=rsby0;
physb0:=physb0-t*vsay0/4E+10;if physb0>2*pi then physb0:=physb0-
2*pi;
rsbx0:=(rab-4E+10)*cos(physb0);rsby0:=(rab-4E+10)*sin(physb0);
dibuja_sol(round(arsbx0*e*0.85),-round(arsby0*e),0);
dibuja_sol(round(rsbx0*e*0.85),-round(rsby0*e),14);
{vsbx0:=vsbx0+asbx*t;vsby0:=vsby0+asby*t;}

{planeta2}
r2pa0:=sqrt((r2x0-rsax0)*(r2x0-rsax0)+(r2y0-rsay0)*(r2y0-rsay0));
r2pb0:=sqrt((r2x0-rsbx0)*(r2x0-rsbx0)+(r2y0-rsby0)*(r2y0-rsby0));
a2a:=g*ma/(r2pa0*r2pa0);a2b:=g*mb/(r2pb0*r2pb0);
calcula_psi2;
r2x0:=r2x0+v2x0*t+(a2x*t*t)/2;r2y0:=r2y0+v2y0*t+(a2y*t*t)/2;
SetColor(3);
line(MaxX div 2+x1,MaxY div 2-y1,MaxX div 2+x4,MaxY div 2-y4);
SetLineStyle(DottedLn,0,NormWidth);SetColor(4);
line(MaxX div 2 +round(r2x0*e*0.85), MaxY div 2 -round(r2y0*e), MaxX div
2 +round(arsax0*e), MaxY div 2 -round(arsay0*e));
line(MaxX div 2 +round(r2x0*e*0.85), MaxY div 2 -round(r2y0*e), MaxX div
2 +round(arsbx0*e), MaxY div 2 -round(arsby0*e));
PutPixel(MaxX div 2 +round(r2x0*e*0.85), MaxY div 2 -
round(r2y0*e), 12);
v2x0:=v2x0+a2x*t;v2y0:=v2y0+a2y*t;
end;
procedure dibuja_asteroide(x,y,c:integer);
begin
PutPixel(MaxX div 2 +x, MaxY div 2 +y, c);
PutPixel(MaxX div 2 +x+2, MaxY div 2 +y, c);
PutPixel(MaxX div 2 +x, MaxY div 2 +y+2, c);
PutPixel(MaxX div 2 +x-2, MaxY div 2 +y, c);
PutPixel(MaxX div 2 +x, MaxY div 2 +y-2, c);
end;
procedure borra_asteroide(x,y,c:integer);
begin
PutPixel(MaxX div 2 +x, MaxY div 2 +y, c);
PutPixel(MaxX div 2 +x+2, MaxY div 2 +y, 0);
PutPixel(MaxX div 2 +x, MaxY div 2 +y+2, 0);
PutPixel(MaxX div 2 +x-2, MaxY div 2 +y, 0);
PutPixel(MaxX div 2 +x, MaxY div 2 +y-2, 0);
end;
procedure calculos2(c:integer);
begin
calcula_phy;
{SetColor(0);
line(MaxX div 2 +round(rx0*e), MaxY div 2 -round(ry0*e), MaxX div
2 +round(arsax0*e), MaxY div 2 -round(arsay0*e));
line(MaxX div 2 +round(rx0*e), MaxY div 2 -round(ry0*e), MaxX div
2 +round(arsbx0*e), MaxY div 2 -round(arsby0*e));}

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    arsay0:=rsay0;
    physa0:=physa0-t*vsay0/4E+10;if physa0>2*pi then physa0:=physa0-
2*pi;
    rsax0:=4E+10*cos(physa0);rsay0:=4E+10*sin(physa0);
    dibuja_sol(round(arsax0*e*0.85),-round(arsay0*e),0);
    dibuja_sol(round(rsax0*e*0.85),-round(rsay0*e),13);

    arsbx0:=rsbx0;arsby0:=rsby0;
    physb0:=physb0-t*vsay0/4E+10;if physb0>2*pi then physb0:=physb0-
2*pi;
    rsbx0:=(rab-4E+10)*cos(physb0);rsby0:=(rab-4E+10)*sin(physb0);
    dibuja_sol(round(arsbx0*e*0.85),-round(arsby0*e),0);
    dibuja_sol(round(rsbx0*e*0.85),-round(rsby0*e),14);

{planeta2}
    r2pa0:=sqrt((r2x0-rsax0)*(r2x0-rsax0)+(r2y0-rsay0)*(r2y0-rsay0));
    r2pb0:=sqrt((r2x0-rsbx0)*(r2x0-rsbx0)+(r2y0-rsby0)*(r2y0-rsby0));
    a2a:=g*ma/(r2pa0*r2pa0);a2b:=g*mb/(r2pb0*r2pb0);
    calcula_psi2;
    r2x0:=r2x0+v2x0*t+(a2x*t*t)/2;r2y0:=r2y0+v2y0*t+(a2y*t*t)/2;
    PutPixel(MaxX div 2 +round(r2x0*e*0.85), MaxY div 2 -
round(r2y0*e), 12);
    v2x0:=v2x0+a2x*t;v2y0:=v2y0+a2y*t;

    rpa0:=sqrt((rx0-rsax0)*(rx0-rsax0)+(ry0-rsay0)*(ry0-
rsay0));{planeta1}
    rpb0:=sqrt((rx0-rsbx0)*(rx0-rsbx0)+(ry0-rsby0)*(ry0-rsby0));
    aa:=g*ma/(rpa0*rpa0);ab:=g*mb/(rpb0*rpb0);
    calcula_psi;
    borra_asteroide(round(rx0*e*0.85),-round(ry0*e), c);
    rx0:=rx0+vx0*t+(ax*t*t)/2;ry0:=ry0+vy0*t+(ay*t*t)/2;
    PutPixel(MaxX div 2 +round(rx0*e*0.85), MaxY div 2 -round(ry0*e),
c);
    dibuja_asteroide(round(rx0*e*0.85),-round(ry0*e), 15);
    {SetLineStyle(DottedLn,0,NormWidth);SetColor(3);
    line(MaxX div 2 +round(rx0*e), MaxY div 2 -round(ry0*e), MaxX div
2 +round(arsax0*e), MaxY div 2 -round(arsay0*e));
    line(MaxX div 2 +round(rx0*e), MaxY div 2 -round(ry0*e), MaxX div
2 +round(arsbx0*e), MaxY div 2 -round(arsby0*e));}
    vx0:=vx0+ax*t;vy0:=vy0+ay*t;
end;
procedure calculos3(c:integer);
begin
    calcula_phy;
    {SetColor(0);
    line(MaxX div 2 +round(rx0*e), MaxY div 2 -round(ry0*e), MaxX div
2 +round(arsax0*e), MaxY div 2 -round(arsay0*e));
    line(MaxX div 2 +round(rx0*e), MaxY div 2 -round(ry0*e), MaxX div
2 +round(arsbx0*e), MaxY div 2 -round(arsby0*e));}

    arsay0:=rsay0;
    physa0:=physa0-t*vsay0/6.6667E+10;if physa0>2*pi then
physa0:=physa0-2*pi;
    rsax0:=6.6667E+10*cos(physa0);rsay0:=6.6667E+10*sin(physa0);
    dibuja_sol(round(arsax0*e*0.85),-round(arsay0*e),0);
    dibuja_sol(round(rsax0*e*0.85),-round(rsay0*e),13);

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        arsbx0:=rsbx0;arsby0:=rsby0;
        physb0:=physb0-t*vsay0/6.6667E+10;if physb0>2*pi then
physb0:=physb0-2*pi;
        rsbx0:=(rab-6.6667E+10)*cos(physb0);rsby0:=(rab-
6.6667E+10)*sin(physb0);
        dibuja_sol(round(arsbx0*e*0.85),-round(arsby0*e),0);
        dibuja_sol(round(rsbx0*e*0.85),-round(rsby0*e),14);

{planeta2}
        r2pa0:=sqrt((r2x0-rsax0)*(r2x0-rsax0)+(r2y0-rsay0)*(r2y0-rsay0));
        r2pb0:=sqrt((r2x0-rsbx0)*(r2x0-rsbx0)+(r2y0-rsby0)*(r2y0-rsby0));
        a2a:=g*ma/(r2pa0*r2pa0);a2b:=g*mb/(r2pb0*r2pb0);
        calcula_psi2;
        r2x0:=r2x0+v2x0*t+(a2x*t*t)/2;r2y0:=r2y0+v2y0*t+(a2y*t*t)/2;
        PutPixel(MaxX div 2 +round(r2x0*e*0.85), MaxY div 2 -
round(r2y0*e), 12);
        v2x0:=v2x0+a2x*t;v2y0:=v2y0+a2y*t;

        rpa0:=sqrt((rx0-rsax0)*(rx0-rsax0)+(ry0-rsay0)*(ry0-
rsay0));{planeta1}
        rpb0:=sqrt((rx0-rsbx0)*(rx0-rsbx0)+(ry0-rsby0)*(ry0-rsby0));
        aa:=g*ma/(rpa0*rpa0);ab:=g*mb/(rpb0*rpb0);
        calcula_psi;
        borra_asteroide(round(rx0*e*0.85),-round(ry0*e), c);
        rx0:=rx0+vx0*t+(ax*t*t)/2;ry0:=ry0+vy0*t+(ay*t*t)/2;
        PutPixel(MaxX div 2 +round(rx0*e*0.85), MaxY div 2 -round(ry0*e),
c);
        dibuja_asteroide(round(rx0*e*0.85),-round(ry0*e), 15);
        {SetLineStyle(DottedLn,0,NormWidth);SetColor(3);
        line(MaxX div 2 +round(rx0*e), MaxY div 2 -round(ry0*e), MaxX div
2 +round(arsax0*e), MaxY div 2 -round(arsay0*e) );
        line(MaxX div 2 +round(rx0*e), MaxY div 2 -round(ry0*e), MaxX div
2 +round(arsbx0*e), MaxY div 2 -round(arsby0*e));}
        vx0:=vx0+ax*t;vy0:=vy0+ay*t;
    end;
procedure DatosIniciales2;
begin
    rx0:=0;ry0:=1.5E+11;        {planeta1 azul: Tierra}
    r0:=sqrt(rx0*rx0+ry0*ry0);
    vx0:=-33578;vy0:=0;        {probar -22000 -33578 -32578 teorico
inestable}

    r2x0:=0;r2y0:=2.27936E+11; {2.27936E+11 planeta2 rojo: Marte}
    r20:=sqrt(r2x0*r2x0+r2y0*r2y0);
    v2x0:=-26750;v2y0:=0;        {-26600 modificado}

    rab:=8E+10;
    rsax0:=-6.6667+10;rsay0:=0;{posiciones iniciales sol A}
    rsbx0:=rab+rsax0;rsby0:=0; { sol B}
    vsax0:=0;vsay0:=-40722;    {velocidades iniciales sol A}
    vsbx0:=0;vsby0:= 18212;    { sol B}
    physa0:=pi;                { angulo inicial sol A}
    physb0:=0;                { sol B}
end;
procedure calculos0;
begin
    SetColor(0);

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line(MaxX div 2 +round(rsax0*e*0.85),MaxY div 2 -round(rsay0*e),MaxX div
2 +round(rsbx0*e*0.85),MaxY div 2 -round(rsby0*e));

    arsax0:=rsax0;arsay0:=rsay0;
    dibuja_asteroide(round(arsax0*e*0.85),-round(arsay0*e),0);
    PutPixel(MaxX div 2 +round(rsax0*e*0.85), MaxY div 2 -
round(rsay0*e), 13);
    physa0:=physa0-t*vsay0/4E+10;if physa0>2*pi then physa0:=physa0-
2*pi;
    rsax0:=4E+10*cos(physa0);rsay0:=4E+10*sin(physa0);
    dibuja_asteroide(round(rsax0*e*0.85),-round(rsay0*e),13);

    arsbx0:=rsbx0;arsby0:=rsby0;
    dibuja_asteroide(round(arsbx0*e*0.85),-round(arsby0*e),0);
    PutPixel(MaxX div 2 +round(rsbx0*e*0.85), MaxY div 2 -
round(rsby0*e), 14);
    physb0:=physb0-t*vsay0/4E+10;if physb0>2*pi then physb0:=physb0-
2*pi;
    rsbx0:=(rab-4E+10)*cos(physb0);rsby0:=(rab-4E+10)*sin(physb0);
    dibuja_asteroide(round(rsbx0*e*0.85),-round(rsby0*e),14);

    SetLineStyle(DashedLn,0,NormWidth);SetColor(8);
line(MaxX div 2+round(rsax0*e*0.85),MaxY div 2-round(rsay0*e),MaxX div
2+round(rsbx0*e*0.85),MaxY div 2-round(rsby0*e));
    end;
begin
    Inicia_modos_grafico;Presentacion;DatosIniciales;
    dibuja_los_ejes;t:=200;    {Movimiento de soles}
    repeat calculos0 until keypressed;
    readLn;ClearViewPort;DatosIniciales;
    dibuja_los_ejes;t:=1000;    {Marte}
    repeat calculos1 until keypressed;
    readLn;ClearViewPort;DatosIniciales;
    dibuja_los_ejes;t:=1000;    {Tierra}
    repeat calculos2(3) until keypressed;
    readLn;ClearViewPort;DatosIniciales;
    rx0:=0;ry0:=1.08E+11;
    r0:=sqrt(rx0*rx0+ry0*ry0);
    vx0:=-39400;vy0:=0;
    dibuja_los_ejes;t:=1000;    {planeta1 amarillo: Venus}
    repeat calculos2(14) until keypressed;
    readLn;ClearViewPort;DatosIniciales2;
    dibuja_los_ejes;t:=1000;    {Tierra en soles separados}
    repeat calculos3(3) until keypressed;
    readLn;ClearViewPort;DatosIniciales2;
    rx0:=0;ry0:=1.08E+11;
    r0:=sqrt(rx0*rx0+ry0*ry0);
    vx0:=-42500;vy0:=0;
    dibuja_los_ejes;t:=1000;    {Venus en soles separados}
    repeat calculos3(14) until keypressed;
end.

```